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## 2022-2023 Graduate School Catalog

Assistant to Associate Vice President for Graduate Studies and Senior Associate Dean

University of Maine Graduate School

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# Catalog Home

## President's Message

Welcome to the University of Maine, located in the homeland of the Penobscot Nation.

UMaine is student-centered and community-engaged, with a foundational commitment to diversity, equity, and inclusion, and we are so proud to have you join us!

As a graduate student in Black Bear Nation, you are joining a 140-year-plus legacy of scholarship and creativity. Our students have earned Fulbrights, Switzer Fellowships, and National Science Foundation Graduate Research Fellowships.

You and your peers represent more than 67 countries and your shared scholarship spans 140 programs - from business administration and biomedical engineering to history, horticulture, musical performance, marine science, and more. Your ideas and interests will inform public health, create opportunities for art and innovation, contribute to the greater good, and positively impact economic development in Maine and beyond.

As a former researcher and professor of mathematics, I believe that education is our best hope to improve lives and forge a healthy, sustainable, and equitable future. My hope is that the expertise, experiences, and connections that you gain here will prepare and inspire you to do just that.

I encourage you to get engaged in as many ways as possible. As the state's only R1 research institution, there are countless opportunities for you to engage in the research happening in our 18 major research centers, or in field sites around the state and world. Our world-class faculty will empower you in your academic pursuits so that your scholarship can lead to new knowledge, deeper understanding, and contributions to the greater good. There are also many ways to enjoy our rich campus culture and the beautiful region of Maine in which you now live, whether you participate in Student Government and intramural sports or prefer time spent exploring local lands and waterways.

There are many ways to shape your experience here, and I welcome your thoughts and ideas on how we can help make your graduate experience even more meaningful, robust, and rewarding. Thank you for choosing to pursue your studies at UMaine! I look forward to learning more about you and your interests soon.

Sincerely,

Joan Ferrini-Mundy  
Preside

## University Overview

### University Overview

The University of Maine, established in Orono in 1865 under the provisions of the Morrill Act, is located on Marsh Island in the homeland of the Penobscot Nation. UMaine's regional coastal campus, the University of Maine at Machias, is located in the Passamaquoddy homeland. The universities are student-centered and community-engaged, with a foundational commitment to diversity, equity and inclusive excellence.

UMaine is the state's land grant, sea grant and space grant institution. As Maine's only top-tier R1 research university, UMaine has a statewide mission of teaching, research and community engagement, with agricultural field stations - Aroostook, Highmoor and Blueberry Hill farms, and J.F. Witter Teaching and Research Center - and one marine sciences research facility at Darling Marine Center; 17 interdisciplinary research centers and institutes; and University of Maine Cooperative Extension offices, camps and learning centers serving the 16 counties. UMaine Machias has an integral regional focus in Down East Maine, including a marine sciences field station at Downeast Institute. Both universities extend the resources of the learning communities to address educational, economic, cultural and social needs of Maine, the nation and the world.

UMaine is the flagship institution of the University of Maine System, broadening opportunities for students, faculty and staff statewide. In 2020, the University of Maine System received a \$240 million investment from the Harold Alfond Foundation - the largest gift ever given to a public institution of higher education in New England. The grant - \$90 million for Black Bear athletics, \$75 million for a Maine College of Engineering, Computing and Information Science, \$55 million for the Maine Graduate and Professional Center, and \$20 million for student success and retention - will propel UMaine to new heights as the state's largest educational, research, innovation and talent development asset. It aligns with UMS unified accreditation goals and UMaine Strategic Vision and Values, which focus on fostering student success, discovering and innovating, and growing and advancing partnerships.

UMaine is a vibrant community of more than 11,900 students from Maine, the United States and the world, offering more than 90 undergraduate and 100 graduate programs taught by world-class faculty and grounded in research about how people best learn. It is featured in multiple national guides of best colleges and is one of the Princeton Review's green colleges. UMaine Machias offers its more than 700 students baccalaureate degrees within an active and diverse community of learners who share a commitment to exploration, leadership, collaboration, interdisciplinary problem solving and the Washington County region.

UMaine has the Maine Business School and five colleges - College of Engineering; College of Natural Sciences, Forestry, and Agriculture; College of Education and Human Development; College of Liberal Arts and Sciences; and Honors College. The Honors College offers one of the longest established programs in the country. UMaine Machias offers two-year and four-year programs through its divisions of Environmental and Biological Sciences; Professional Studies; and Arts and Letters.

Among the state's public universities, UMaine awards 42% of all four-year degrees, 45% of all master's degrees, and 89% of the state's Ph.D.s and Ed.D.s. The newest graduates join more than 110,000 alumni worldwide.

UMaine is home to Maine's only Division I athletics program with 17 sports programs. The Black Bears boast numerous team and individual conference championships, many trips to the NCAA Tournament, academic champions, and two National Championships in Men's Ice Hockey. Maine Athletics has developed student-athletes who have gone on to achieve much success, both in sports and in their chosen professions, including several professional athletes, Super Bowl Champions, Stanley Cup Champions and Olympians.

Fogler Library, the state's largest library, is a regional depository for federal government publications, and official depository for Canadian federal and Maine state government publications. It also is the designated State Research Library for Business, Science and Technology, and is the only Patent and Trademark Resource Center in Maine.

UMaine is a cultural hub for the state - with the Zillman Art Museum, Hudson Museum and Page Farm and Home Museum; visual and performing arts events at the Lord Hall Gallery, Collins Center for the Arts and School of Performing Arts; Versant Power Astronomy Center and more - that enhances and advances community engagement, learning for all ages, diversity and inclusion.

For more than a century, UMaine has conducted research of global and local relevance, contributing to the greater good in Maine and beyond. Faculty, staff and students have conducted nationally and internationally recognized research and scholarship in every county in Maine, on all continents and in all the oceans of the world. UMaine's impact comes through research and innovation in climate change, engineering, advanced structures and composites, advanced manufacturing, forestry, marine sciences, agriculture, and the arts and humanities.

UMaine and UMaine Machias partner with the private and public sectors to stimulate and support the state's economic growth and development. The university has a sustained focus on research, innovation and entrepreneurship, and 2021 research and development expenditures exceeding \$179 million. In 2022, UMaine achieved the highest Carnegie Classification as a doctoral university with very high research activity (R1) through the outstanding work of faculty and students.

The UMaine student experience in and out of the classroom reflects the breadth and depth of a research university, with interdisciplinary, immersive learning opportunities and mentoring by faculty and graduate students who are leaders in their fields. Those opportunities begin in the first year with new Research Learning Experience at UMaine and UMaine Machias focused on education through knowledge creation, with students engaged in research, creativity and community - building a mindset that will help undergraduates solve problems for life. Immersive learning and community engagement - from volunteerism and capstone projects to internships - ignite passion in students, and help address issues globally and locally.

UMaine and UMaine Machias are committed to accessible lifelong learning for learners of all ages, the creation of new knowledge and research-based problem solving to address needs and inform the future, and comprehensive outreach to improve lives and communities. Providing opportunities in an atmosphere that honors heritage and diversity are cornerstones of our mission. Through integrated teaching, research and outreach, UMaine and its regional campus improve the quality of life for people in Maine and around the world, and promote responsible stewardship of human, natural and financial resources.

## Academic Calendar

Classes begin	Monday, August 29
Last day to add classes	Sunday, September 4
No Classes Labor Day	Monday, September 5
Last day to drop classes for refund **	Monday, September 12
Classes dropped on or before this date will not appear on transcript	Wednesday, September 28, 4:30 p.m.
Application for Graduate filing deadline (Dec)	Saturday, October 1
Fall break begins	Monday, October 10
Classes Resume	Wednesday, October 12
Enrollment for Spring 2023 (tentative)	Monday, October 24
Last day to withdraw from a class and receive 'W' grade (Withdrawn classes after this date will receive failing grade.)	Thursday, November 10, 4:30p.m.
No Classes Veterans' Day	Friday, November 11
Thanksgiving break begins	Wednesday, November 23
Classes Resume	Monday, November 28

Classes end	Friday, December 9
Final exams begin	Monday, December 12
Final exams end	Friday, December 16
Final grades due	Friday, December 23

**Winter Session:** Tuesday, December 27, 2022 - Friday, January 13, 2023 (tentative)

<https://umaine.edu/wintersession/>

Spring Semester 2023	
Classes begin	Tuesday, January 17
Last day to add classes	Monday, January 23
Last day to drop classes for refund **	Monday, January 30
Application for Graduation filing deadline (May)	Wednesday, February 1
Classes dropped on or before this date will not appear on transcrip	Wednesday, February 15, 4:30 p.m.
No Classes Presidents' Day	Monday, February 20
Spring break begins	Monday, March 13
Classes resume	Monday, March 20
Enrollment for Fall 2023 (tentative)	Monday, March 27
Last day to withdraw from a class and receive 'W' grade (Withdrawn classes after this date will receive failing grade.)	Wednesday, April 5, 4:30 p.m.
Maine Day- no classes	Wednesday, April 26
Classes end	Friday, April 28
Final exams begin	Monday, May 1
Final exams end	Friday, May 5
Commencement	Friday, May 5- Graduate
	Saturday, May 6- Undergraduate
Final grades due	Friday, May 12

**Summer University:** Monday, May 9 - Friday, August 19, 2022 (tentative)

**For information and schedule of summer sessions please visit** <https://umaine.edu/summeruniversity/>

*\*No classes except classes that meet once per week.*

*\*\* Class information is based on full semester classes.*

*Summer University classes have variable start and end dates.*

*MaineStreet provides information on non-standard dated classes.*

## Administration

## Officers and Faculty of the University

Graduate Board

Executive Committee

Award Recipients

Officers of the University of Maine

University of Maine System Board of Trustees

## Admission

Consideration for admission to the Graduate School will be given to applicants holding a bachelor's degree from an accredited institution, or the equivalent. Applicants for admission must present evidence that they have had the necessary academic preparation to enable them to pursue the graduate program for which they are applying. The Graduate School has no fixed minimum grade point average requirement for admission; however, the applicant should have a strong undergraduate record. Students who have undertaken graduate work at another institution must be in good standing at that institution to be eligible for admission to the University of Maine.

Specific requirements and deadlines for admission differ by program, as described elsewhere in this catalog. Applicants should consult with the program's graduate coordinator to confirm that all departmental admission requirements have been met. All material submitted as part of an application receives careful consideration. Contact the Graduate School for further information concerning general admission criteria.

## Application Procedures

An applicant for admission must submit the following materials directly to the Graduate School, 5775 Stodder Hall, Room 42, University of Maine, Orono, ME 04469-5775.

- An application for admission submitted electronically
- An official transcript from each institution attended, showing the grades earned in all of the applicant's previous academic work (graduate and undergraduate), and degree(s) earned. International transcripts, if not in English, must have an official translation, either from the institution or a public company such as World Education Services. (WES.org)
- Letters of recommendation from persons in a position to judge the applicant's preparation for and ability to undertake graduate study (e.g. previous instructors or co-workers). Individual programs may waive this requirement. Letters should be sent directly by the writer to the Graduate School through the online form request portal. Online submission of recommendation letters through the online Graduate School's graduate application is preferred.
- A non-refundable application fee.
- Official report of scores achieved on the Graduate Record Examination (GRE). Exceptions to this requirement are as follows: Applicants to the MBA program must submit scores on the Graduate Management Admission Test (GMAT) in lieu of the GRE. The Graduate School does not require GRE, but some programs do. Many of the University of Maine master's degree programs will waive the test score requirement. Please consult the individual department web site pages. Contact information is listed on the Graduate School's website under "[Programs](#)". Applicants to the Educational Specialist (Ed.S.) programs in Education and the Certificate of Advanced Study (CAS) in Nursing are also excluded from the test score requirement. Applicants to the Master of Music program must take departmental entrance exams in lieu of the GRE. In limited cases, Graduate Record Examination scores may not be required for admission to certain doctoral programs for those students who hold a recent master's degree requiring a thesis from an accredited university.
- Official report of scores achieved on the Test of English as a Foreign Language (TOEFL) is required for all international applicants whose native language is not English. The Graduate School requires a minimum score of 80 on the iBT TOEFL or equivalent. To be awarded a Teaching Assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent. Applicants with iBT TOEFL scores below 80 or equivalent will be required to take English language training. IELTS, Pearson PTE Academic English and DuoLingo proficiency scores are accepted on a case-by-case basis. (IELTS: Minimum 6.5 for admission and minimum 7.0 to receive a teaching assistantship; Pearson: Minimum 55 for admission and minimum 65 to receive a teaching assistantship; DuoLingo: Minimum 105 for admission and minimum 110 to receive a teaching assistantship).

All application materials become part of the permanent records of the University and will not be returned.

Fall applicants who wish to be considered for assistantships or fellowships should submit an application and all supporting materials no later than January 15th of that year. All programs set their own individual application deadlines, and some are earlier than January 15th, so please check with your program's website or the graduate coordinator. A list of graduate programs, with website links and contact information for graduate coordinators is available [here](#). Some programs admit students in the Fall only, or may have other deadlines; such deadlines are noted in the program description section of the catalog.

When the application and all required supporting materials have been received, the application is reviewed by faculty members of the appropriate program. This review is normally conducted by an admissions committee, composed of graduate faculty members, which makes recommendations to the Graduate School concerning the admission of

applicants to the program. Upon receiving the committee's recommendation, the Graduate School reviews the applicant's file. After making the final decision, the Graduate School will inform the applicant of the action taken. Admissions decisions when made may also be viewed on the Graduate School's application portal.

The timing of admissions decisions varies by program. Consult the graduate coordinator in your program to check admission status.

### **Immunization Law**

Maine Law requires all degree-seeking students and full-time, non-degree students born after December 31, 1956 to provide proof of immunization against measles, mumps, rubella, tetanus and diphtheria with the Office of Student Records. Failure to provide your immunization documents may effect your eligibility to enroll in classes, your financial aid, your housing and other academic areas. For complete information regarding the required immunization documentation and submission process, visit [studentrecords.umaine.edu/home/records/immunizations-information/](https://studentrecords.umaine.edu/home/records/immunizations-information/)

### **Types of Admission**

**Regular admission** is granted to students whose academic records and supporting documents indicate they are qualified to undertake graduate study in their chosen fields.

**Tentative admission** is granted to a student admitted during the final year of undergraduate work. Admission on this basis is contingent upon the satisfactory completion of the undergraduate program and submission of a complete, final transcript showing receipt of the degree.

**Provisional admission** is granted to a student who has not yet met all the prerequisites for admission to graduate study in the academic field. Prerequisite and elective courses must be included as part of the student's program of study.

**Conditional admission** may be granted to a student whose academic record may not meet all established academic requirements but suggests promise for success in graduate study. Conditional admission is equivalent in every way to regular admission with the single exception that students may not receive graduate assistantships or fellowships. In order to be removed from conditional status a student must maintain the same level of academic excellence expected of all graduate students. Specifically, to be removed from condition, a student must earn grades of "A" or "B" in his or her first nine hours of graduate credit in order to continue graduate study.

**Certificate admission.** All students applying to graduate certificate programs must submit a certificate application to the Graduate School prior to completion of 50% of the required coursework. Certificate students must also send a transcript indicating completion of a bachelor's degree. Additional credentials may be required for certain programs. Please refer to the website, <https://umaine.edu/graduate/programs/>

**Non-degree admission.** All students enrolling in 500-and 600-level courses, regardless of whether or not they intend to receive graduate degree credit for course work, must apply for non-degree graduate admission, and will be billed at graduate rates for all classes taken at any level. Proof of an earned baccalaureate degree is required if the degree was not earned within the University of Maine System. Non-degree status is good for one calendar year. International students must also provide a minimum iBT TOEFL score of 80 or equivalent for non degree status.

**Visiting student admission.** An international student in good standing in another recognized graduate school who wishes to enroll for a limited number of course credits, and who plans to resume work at the school of original admission, may be admitted as a visiting graduate student. Admission is granted through submission of a "Visiting Graduate Student Application" signed by an official of the Graduate School in which the student is enrolled. International students who apply this way must document finances and have a minimum iBT TOEFL score of 80 or equivalent.

### **Readmission to the Graduate School**



A student previously admitted to the Graduate School who has failed to maintain continuous enrollment and who wishes to resume graduate work must file an "Application for Readmission to the Graduate School" and pay the appropriate readmission fee.

The student's readmission must be recommended by the program involved and approved by the Graduate School. An applicant for readmission will not necessarily have preference over new applicants, and will be treated in the same manner as an applicant for initial admission. Any student readmitted to Graduate School will be governed by policies listed in the Graduate Catalog and departmental handbook for the year of readmission.

## International Applicants

The University welcomes applications from graduates of institutions of higher education in other nations. Prospective students are urged to begin the application process as early as possible. In addition to the material required of all applicants, applicants from non-English speaking countries must furnish proof of their proficiency in English by submitting scores achieved on the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service.

International transcripts, if not in English, must have an official translation, either from the institution or a public company such as World Education Services. WES.org

Arrangements for taking this examination should be made directly with the Educational Testing Service, Box 899, Princeton, NJ 08541 or ets.org. The Graduate School requires a minimum score of 80 on the iBT TOEFL or equivalent. To be awarded a Teaching Assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent. TOEFL scores may be waived if the applicant has attended and received a degree from an English speaking institution. IELTS, PTE Academic and DuoLingo scores are also accepted on a case by case basis. (IELTS: Minimum 6.5 for admission and minimum 7.0 to receive a teaching assistantship; Pearson: Minimum 55 for admission and minimum 65 to receive a teaching assistantship; DuoLingo: Minimum 105 for admission and minimum 110 to receive a teaching assistantship). The University of Maine offers ESL instruction for international students seeking conditional admission in order to study English in the U.S. prior to beginning their graduate studies (see: [umaine.edu/iei/](http://umaine.edu/iei/)).

Health insurance is required of all international students and dependents residing in the U.S. Health insurance may be purchased through the University. Students with comparable insurance coverage must provide proof of acceptable coverage. Please visit the Office of International Programs website for more information on international health insurance.

Financial aid from The University of Maine is awarded competitively. Students not receiving university support must provide proof of sufficient funds to meet all expenses while studying in the United States. Further information about funding for international students is found in the catalog section on Financial Awards and Assistance.

### **The Clery Act**

The Clery Act requires universities to disclose three-year statistics regarding campus crime, including public property within, or immediately adjacent to and accessible from the campus. This report includes our policies for campus security, such as those concerning alcohol and drug use, crime prevention, the reporting of crimes, sexual assault, and other matters. You can obtain a copy of this report by accessing the following website, [umaine.edu/security](http://umaine.edu/security) or obtain a paper copy upon request by contacting the Police Department, University of Maine, 81 Rangeley Road, Orono, ME 04469-5794 or by calling 207-581-4040.

### **Registration/Enrollment/Insurance**

Students are strongly encouraged to register (enroll) for classes as early as possible. Otherwise, the student may experience delays in making housing arrangements, obtaining library access, and other matters requiring identification. Registration for classes is also required before students may be appointed as graduate assistants and may enroll in the student or GA health insurance policies.

Graduate students may register for classes themselves using student self-service in Maine Street, or register through the administrative specialists in their respective departments. The Graduate School can register students, the two pre-registration periods for matriculated graduate students are in the Fall and Spring semesters.

For first time registrations, new students must contact their advisor for initial advising. If the student has not been assigned an advisor, the graduate coordinator of the department may advise him/her on course selection. If a new student does not complete class registration before classes begin, the advisor or graduate coordinator should complete a registration form and send it to the Graduate School to guarantee that the student has been formally matriculated.

Add/drop deadlines are set by the Office of Student Records and must be strictly followed. The University enforces these deadlines and students are financially responsible for courses dropped after the add/drop period.

Graduate assistants must maintain full-time registration status (usually six or more credit hours per semester) while they hold an assistantship. Recipients of some fellowships and scholarships are required to register for at least nine degree hours each semester. Students holding assistantships in the summer must register for at least one graduate credit hour. All graduate assistants, fellows, and trainees earning a half-time equivalent stipend (\$1,833.33 month) must purchase the University's health insurance or provide proof of insurance coverage.

The assistantship will not cover tuition for courses audited, courses taken as pass/fail when the course also has a graded option, and courses numbered below 400-level. You are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

#### **Add-and-Drop**

Beginning on the first day of classes each semester, there is a five-day period during which a student may add or drop a course, change divisions of a course, or change credit status. Courses may be dropped without penalty only during the official add-and-drop period. Consult the Graduate School and/or department for registration and add-and-drop procedures. Failure to properly drop a course may result in tuition charges to the student's account. Graduate Assistants are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

#### **Continuous Enrollment**

Continuous enrollment means every graduate student admitted for full-time study is required to register each fall and spring semester for at least 6 credit hours except as noted in the "General Policies and Regulations" of the Graduate School website. Full-time students must register each semester from the time of the first enrollment in the Graduate School until the completion of all requirements for the graduate degree, including filing the thesis or dissertation and passing the final oral examination.

A graduate student who has been admitted on a part-time basis is required to enroll and register at least once every 12 months from the time of first registration in the Graduate School until the completion of all requirements for the graduate degree. All students must also be registered in the semester in which they receive their degrees.

Course work included in a student's program of study taken at a campus other than The University of Maine may satisfy the continuous enrollment requirement, provided the student's University of Maine advisor and the Graduate School have approved the registration in advance and in writing (see Away Registration below).

A student who fails to maintain continuous enrollment is considered inactive and must apply for readmission to the Graduate School in order to resume work on a graduate degree.

#### **Leave of Absence**

Degree students who will not be taking classes must apply for on-leave status. Failure to file for on-leave status results in broken enrollment, and the student must apply for readmission to finish his or her degree. The time spent officially on leave does not count in the time limits for earning degrees. Students may not register as graduate students while on leave.

#### **Additional Policy Texts for Continuous Enrollment**

At <http://gradcatalog.umaine.edu/content.php?catoid=36&navoid=709>

Full-time registration for a graduate student is normally defined as six or more degree hours per semester or summer session; part-time status is five hours or less per year. Full-time students are required to register for a minimum of 6 credits each fall and spring semester to maintain active status. In the case of doctoral students who have been admitted to candidacy, 1 credit each fall and spring semester is considered full-time. Part-time students are required to register at least once each academic year to maintain active status. Students who need to switch their enrollment status (full-time to part-time or part-time to full-time) should contact their advisor. Doctoral students who have been admitted to candidacy, psychology and human nutrition students on approved internships, and students in their final semester of study may maintain full-time enrollment status by registering for a minimum of one thesis or internship credit. Students who have completed at least 6 thesis credits may substitute UGR 501 for the thesis registration requirement and still be considered full-time. Registration for a minimum of one thesis credit during the summer session also satisfies the requirement for registration as a graduate student.

### **Away Registration**

A student may arrange to study at another institution after being admitted as a graduate student at the University of Maine. This study may be undertaken at another campus in the University of Maine System or another accredited institution within or outside of the state of Maine. Such arrangements must, however, be approved by the student's advisor and by the Graduate School prior to registration in the course. The Domestic Study Away Registration form, which is available from the Graduate School website, should be used. The conditions for transfer shall comply with basic transfer policy and may not exceed 50 percent of the student's entire course work for the degree. Away registration for credit will also satisfy the continuous enrollment requirement. It is particularly important that students receiving financial aid fill out the Domestic Study Away Registration form. Failure to do so may stop receipt of financial aid funds.

### **Summer Session**

The University offers the opportunity to pursue graduate studies during the summer. Although many graduate-level courses are offered during the summer session, the University does not guarantee that any particular course will be offered. Details regarding courses offered may be found at Summer University.

The availability of individual faculty members to supervise research or to participate in final oral examinations during the summer session varies. Graduate students should determine, in advance, whether the members of their advisory committee will be available during a particular summer session.

### **600-Level Courses**

Enrollment in 600-level courses is limited to graduate students admitted to a degree program; or to those who have received a non-degree admission; or to a student from another recognized school who has been admitted as a visiting graduate student. The instructor is normally the final authority in judging a student's qualifications to take a particular course. In the case of 600-level business administration courses, prior approval from the Maine Business School is required, and involves submission of GMAT scores and official transcripts to the MBA program director. Students whose application to the Graduate School is pending may take one graduate level business course without submission of GMAT scores.

## **Disclaimers**

### **Non-Discrimination Notice**

The University of Maine is an EEO/AA employer and does not discriminate on the grounds of race, color, religion, sex, sexual orientation, transgender status, gender expression, national origin, citizenship status, age, disability, genetic information or veteran's status in employment, education, and all other programs and activities. The following person has been designated to handle inquiries regarding non-discrimination policies: Director of Equal Opportunity, 101 North Stevens Hall, University of Maine, Orono, ME 04469-5754, 207.581.1226, TTY 711 (Maine Relay System).

## **Sex Discrimination, Sexual Harassment, Sexual Assault, Relationship Violence, Stalking and Retaliation and Title IX Sexual Harassment**

The University of Maine does not discriminate on the basis of sex in any of its educational programs or activities, including admission and employment; such discrimination is strictly prohibited by Title IX.

The University will respond to complaints and reports of violations of this policy in a prompt, fair, impartial and equitable manner. Regardless of whether a complaint is filed, the University will respond promptly and reasonably when it has notice of potential sexual misconduct that is covered by this policy. The University will take steps to end and prevent recurrence of violations of this policy and to correct their discriminatory effects on the complainant and others when a determination of responsibility has been made against a respondent. In responding to all complaints and reports, the University will act to ensure the safety of students, guests, and employees while complying with state and federal laws and provisions of applicable collective bargaining agreements and employee handbooks.

Individuals with questions about Title IX, or who would like to report a violation, are encouraged to contact any of the persons or agencies listed below. In addition, any person may report sex discrimination, including sexual harassment (whether or not the person reporting is the person alleged to be the victim of conduct that could constitute sex discrimination or sexual harassment), in person, by mail, by telephone or by electronic mail by using the contact information listed below for the Title IX Coordinator and Deputy Title IX Coordinators, or by any other means that results in the Title IX Coordinator receiving the person's verbal or written report. Reports can be made during non-business hours by mail to the listed office addresses or by using the listed telephone numbers or e-mail addresses. Inquiries about the application of Title IX may be referred to the Title IX Coordinator, to the Assistant Secretary of the U.S. Department of Education Office for Civil Rights, or both.

The grievance procedures and process, including how to file a report and how the University will respond can be found at <https://www.maine.edu/title-ix/>

The Sex Discrimination, Sexual Harassment, Sexual Assault, Relationship Violence, Stalking, and Retaliation and Title IX Sexual Harassment policy and procedures may be found at: <https://www.maine.edu/board-of-trustees/policy-manual/section-402/>

### **Title IX Coordinator**

Elizabeth Lavoie  
UMS Title IX Coordinator  
101 North Stevens Hall  
Orono, ME 04469  
Ph: 207-581-5866  
Fax: 207-581-5856  
[titleix@maine.edu](mailto:titleix@maine.edu)

### **External Complaints**

Assistant Secretary of the U.S. Department of Education Office for Civil Rights  
Lyndon Baines Johnson Department of Education Bldg  
400 Maryland Ave, SW  
Washington, DC 20202-1100  
Ph: 1-800-421-3481  
Fax: 202-453-6012  
[OCR@ed.gov](mailto:OCR@ed.gov)

For more information about resources available for students who have been victims of sexual discrimination or violence, please visit the Office of Title IX Student Services website at <https://umaine.edu/titleix/> or contact Deputy Title IX Coordinator at 5748 Memorial Union, Room 308, Orono, ME 04469 Ph: 207-581-1406, Email:

um.titleix@maine.edu

### Consenting Relationships

Consenting relationships may constitute sexual harassment. When a professional power differential exists between members of the University of Maine System and a romantic or sexual relationship develops, there is a potential for abuse of that power, even in relationships of apparent mutual consent. Faculty and staff members are strongly advised not to engage in such relationships and must report any such relationship to Human Resources, without exception.

The Consenting Relationship Guidelines can be found at: <https://www.maine.edu/human-resources/human-resources/guidelines-regarding-consenting-relationships/>. Further, the University System prohibits the abuse of power in romantic or sexual relationships.

To assure that power is not abused and to maintain an environment free of sexual harassment, a faculty or staff member must eliminate any current or potential conflict of interest by removing himself or herself from decisions affecting the other person in the relationship. Decisions affecting the other person include grading, evaluating, supervising, or otherwise influencing that person's education, employment, housing, or participation in athletics or any other University System activity.

## Financial Information

### Graduate Tuition and Fees (2022-2023)

#### Semester Charges (based on 9 credit hours)

	Resident	Non-Resident	New England Regional Program	Canadian Res Tuition Rate
<b>Tuition</b>	\$4,869.00	\$14,607.00	\$8523.00	\$4869.00
<b>Technology Fee</b>	108.00	108.00	108.00	108.00
<b>Student Activity Fee</b>	75.00	75.00	75.00	75.00
<b>Room and Board</b>	5946.00	5946.00	5946	5946.00

The financial requirements of the University, changing costs, state and legislative action, and other matters may require an adjustment of these charges and expenses. The University reserves the right to make such adjustments to the estimated charges and expenses as it may be necessary in the opinion of the Board of Trustees up to the date of final registration for a given academic term. The applicant acknowledges this reservation and agrees to the financial terms and conditions of the University by the submission of an application or by registration.

#### **Tuition:**

**Maine Resident:** \$541.00 per credit hour

**Non-Resident:** \$1,623.00 per credit hour

**New England Regional:** 75% above the Maine resident rate (\$947.00)

**Canadian Resident Tuition Rate:** Maine resident rate. (\$541.00)

All courses at the 500 level and above will be billed at graduate tuition rates. Also, all course work taken by matriculated and non-degree graduate students will be billed at the graduate rate. This includes prerequisites and electives, regardless of the level of the course.

**Technology Fee:**

\$12.00 per credit hour

**Program Tuition Differential:**

Program	Less than 6 Cr hours	6+ Cr Hours
Engineering	\$163	\$325
Business	\$150	\$225
Nursing	\$193	\$385

**UMaine Online Tuition\*:**

Business \$650 per credit hour

Engineering \$700 per credit hour

Education \$550 per credit hour

All other programs or certificates \$590 per credit hour

\*UMaine Online rates apply only to students enrolled in online programs through UMaine Online. Technology Fee, Activity Fee and Tuition Differential described above do not apply.

**Room and Board:** Rate shown above is based on a double room plus the most commonly selected meal plan. Information on the various Room and Board options and rates available for graduate students can be found at <http://umaine.edu/housing/graduate-housing/>

**Health Insurance:** Health insurance is voluntary and available for all graduate students enrolled in 6 credit hours or more. For more information on student health insurance requirements go to: <https://umaine.edu/bursar/insurance/>

**Residency Guidelines**

*Residency Classification.* There are many factors considered in determining residency for in-state tuition purposes. No one factor can be used to establish domicile. Rather, all factors and circumstances must be considered on a case-by-case basis. A domicile or residency classification assigned by a public or private authority neither qualifies nor disqualifies a student for University of Maine System (UMS) in-state status.

Eligibility for in-state tuition will be determined at the time of registration; when a student applies to a degree program at any University of Maine System campus. The decision, made by the Graduate School, shall be made based on information and documentation furnished by the student as well as other sources available to the University. No student is eligible for in-state tuition classification until he/she has become domiciled in Maine, in accordance with University guidelines, before such registration. If the student is enrolled full-time in an academic program, as defined by the University, it will be presumed that the student is in Maine for

educational purposes, and that the student is not in Maine to establish a domicile. A residence established for the purpose of attending a UMS institution would not, by itself, constitute domicile. The burden will be on the student to prove that he/she has established a Maine domicile for other than educational purposes. An individual who has lived in the State of Maine, for other than educational purposes, one year prior to registration or application to a campus is considered an in-state student.

A current member of the United States Armed Forces or a Veteran of the United States Armed Forces who has been honorably discharged will be billed at the in-state tuition rate. Veterans must supply a DD214, Certificate of eligibility for the GI bill ®, or Military ID card. Active duty members must supply a copy of their Military ID card.

In general, dependents of members of the Armed Forces will be granted in-state tuition during such periods of time as they are on active duty in the State of Maine or if their Military State of residency is Maine as evidenced by appropriate official documentation. Individuals who have been granted in-state tuition under these conditions, but then cease active duty would continue to be granted in-state tuition. All dependents using the GI Bill ® are billed at the in-state tuition rate.

*GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at [www.benefits.va.gov/gibill](http://www.benefits.va.gov/gibill).*

A student, spouse, or domestic partner of a student, who currently has continuous, permanent full-time employment in Maine before the student decides to apply for degree status at the University will be considered in-state for tuition purposes.

A student who is dependent on his/her parent(s) and/or legally appointed guardian (or to whom custody has been granted by court order) is considered to have a domicile with the parent(s) for tuition purposes.

In-state tuition is not available to anyone who holds a non-immigrant U.S. visa. If an individual is not a domiciliary of the United States, they cannot be a domiciliary of the State of Maine.

A student who attended an out-of-state educational institution at in-state tuition rates in the immediately preceding semester, shall be presumed to be in Maine for educational purposes and not to establish a domicile. Again, the burden will be on the individual to prove that he/she has established a Maine domicile for other than educational purposes.

### **Change of Residency Classification**

To change tuition status, the following procedures are to be followed:

1. "Request for Change in Tuition Status" cover sheet and application must be filed with the Associate Bursar at The University of Maine, Bursar's Office, 5781 Wingate Hall, Orono, Maine 04469-5781 before the first day of classes for the summer session, fall or spring semester for which residency is requested. All applications are prospective.
2. If the Associate Bursar's written decision, to be issued within 30 days of the first day of classes is considered incorrect by the student, the student may appeal that decision in writing within 30 days, in the following order.
  - The Bursar & Senior Finance Officer. After receiving a written decision from this level within 30 days, the student has 30 days to submit a written appeal to the Chief Business Officer.
  - The Chief Business Officer. After receiving a written decision from this level within 30 days, the student has 30 days to submit a written appeal to the President (or designee).
  - The President (or designee) will issue a final decision within 30 days.

In the event that the Associate Bursar, or other designated official, possesses facts or information indicating a student's change of status from in-state to out-of-state, the student shall be informed in writing of the change in status and will be given an opportunity to present facts in opposition to the change. The student may appeal the decision of the Associate Bursar or other designated official as set forth in the preceding paragraph.

### **New England Regional Student Program**

Expanded graduate study opportunities are made available each year to New England residents through the New England Regional Student Program (RSP), administered by the New England Board of Higher Education (NEBHE). NEBHE's Tuition Break RSP program enables thousands of New England residents to enroll at out-of-state New England public colleges and universities at a discount. Students are eligible for the RSP Tuition Break when they enroll in an approved major or program. Depending on the institution in which they enroll, students qualifying for study under the Program are charged either the institution's resident tuition or some percentage above the resident tuition. The University of Maine charges 75 percent above the resident tuition. Typically, degree programs offered under the Regional Student Program are high-cost, specialized, professional programs such as forestry, oceanography, hydrology, occupational therapy, and pharmacology, although general areas of study also are offered.

Requests for detailed information should be directed to the graduate school of participating state universities. It is essential that students read the individual catalog, since degree nomenclature differs by institution. Application for enrollment is made directly to the institution, which has sole authority over admissions. Applicants must clearly indicate, both in their initial inquiries and on their application forms, that they are seeking admission under the terms of the New England Regional Student Program. Further information is available from the New England Board of Higher Education, New England Regional Student Program, 45 Temple Place, Boston, MA 02111, 617-357-9620. Information about qualifying programs can also be found online at [www.nebhe.org](http://www.nebhe.org)

### **Canadian Resident Tuition Rate**

Residents of Canada are assessed reduced tuition equivalent to the resident tuition rate for any course work taken as a graduate student at The University of Maine.

### **Invoices and Due Dates**

Charges are calculated using pre-registrations, room sign-up information, and data supplied by the Admissions Office. Billing statements will be available online only. Email notifications concerning student accounts will be sent periodically to the student's @maine.edu email address. Students may view their account statements on Student Self-Service on MaineStreet.

The University expects the student to be financially responsible. All accounts are carried in the name of the student, regardless of the source of payment. Bills and statements are emailed to the student, not the parent. All charges are payable in full by the due date on the invoice. After that, a \$50.00 late fee is assessed. The initial due dates are September 15 for the Fall semester and January 15 for the Spring semester.

Delinquent students will be subject to the following administrative sanctions:

1. They are prevented from receiving an official certified copy of their transcript and diploma without first contacting the Bursar's Office. A reasonable payment plan may be required.
2. They are prevented from registration or pre-registration at any university in the University of Maine System.



3. The University of Maine System or its universities may disclose (directly or through its collection agencies) to a credit bureau organization that the student has failed to pay an assessed charge.
4. The University of Maine System or its universities may use in-house collection efforts, commercial collection firms, legal services, and the State of Maine Bureau of Taxation for collection on the accounts.

#### Authorized User Access

Students may authorize parents or other third parties to view and pay on their accounts online. Instructions for adding an authorized user can be found at [umaine.edu/bursar/user/](https://umaine.edu/bursar/user/).

#### 3rd Party/Sponsor Billing

Once the student receives an invoice, he/she can use the Anticipated Resources area of Student Self-Service on MaineStreet to notify the Bursar's Office of any third party sponsorship.

It is the student's responsibility to provide authorization (purchase order/authorization form) from the third party/sponsor. The student sends the purchase order/ authorization form, which indicates how much the third party/sponsor will be paying and any payment due for charges not covered by the third party/sponsor to the Bursar's Office by the due date.

If these items are received by the payment due date shown on the statement, no late fee will be assessed.

Please view the following link for detailed 3rd party billing information:

<https://umaine.edu/bursar/3rd-party-billing/>

#### Late Payment Fee

A \$50 late payment fee will be assessed each month to students who fail to pay their bills or fail to notify the Bursar's Office of any third party sponsorship or anticipated resources by the due date. To avoid being charged the late fee, students who have not received a bill should contact the Bursar's Office.

With the first bill for the fall, spring and summer semesters, students will use the Anticipated Resources page of Student-Self-Service on MaineStreet (Path: Student Self-Service / Self Service / Campus Finances / Anticipated Resources) to notify the University of any credits from other resources that are not shown on the billing statement (i.e. third party/sponsor payments, waivers/scholarships, loans). Instructions for entering anticipated resources can be found at <https://umaine.edu/bursar/resources/>

#### Financial Aid Refunds

A credit balance created by the disbursement of financial aid is normally disbursed to the student by the start of each semester, unless the student has requested that funds be held on his/her account. Excess financial aid will be held on accounts if the financial aid award is based on full-time enrollment and current enrollment is not full-time. Full-time enrollment for graduate students is 6 or more credits or 1 thesis credit. For more information please visit <http://umaine.edu/bursar/refunds/>. Credit balance refunds are available by check through the mail or direct deposit to a US bank account. Instructions for enrolling in direct deposit are online at <https://umaine.edu/bursar/directdeposit/>

#### Refund for Tuition and Fees

Student charges will be adjusted for voluntary withdrawals from the university and for drops or withdrawals from individual classes in accordance with the schedule and provisions set forth below.

For refunding purposes the following definitions apply:

- "Standard" full semester classes are classes which are scheduled to start during the first week of a semester and meet through the end of that semester.
- "Non-standard" classes are classes whose starting and ending dates do not coincide with the starting and ending dates of the Fall or Spring semester, (including Winter Session) term including all Summer University classes. These classes fall into two groups:
  - Classes with duration of less than 12 weeks in length.
  - Classes with duration of 12 weeks or longer.
- The "Drop" period is the time frame a student may drop classes from their schedule without academic or financial penalties. For Standard full semester classes, the drop period ends:
  - September 12, 2022 for Fall 2022
  - January 30, 2023 for Spring 2023
- Dropping classes is a reduction in a student's class load during the Drop period while remaining enrolled in other classes at any of the University of Maine campuses.
- Withdrawing from classes is a reduction in a student's class load after the Drop period while remaining enrolled in other classes at any of the University of Maine campuses.
- A "Withdrawal from the University," either temporary or permanent, involves the student withdrawing from all classes at all University of Maine System campuses for which he/she is registered as well as notifying appropriate administrative officials of his/her decision to leave.
- Students who stop attending any or all of their classes, without providing official notification are not entitled to a refund. If a student ceases attendance for emergency reasons, the University will accept a written appeal.

#### **For Dropped Classes:**

"Standard" Full Semester Classes:

<b>Drop/Withdrawal</b>	<b>Percent of Refund</b>
Prior to the end of the Drop Period	100%
After the Drop Period	0%

"Non-standard" classes:

<b>Drop/Withdrawal</b>	<b>Percent of Refund</b>
Withdrawal on or before the number of days equal to the number of weeks a class is scheduled. For example, for a six week course, a refund will be granted through the sixth day.	100%
After the number of days equal to the number of weeks a class is scheduled.	0%

**For Withdrawals from the University:**

"Standard" Full Semester classes and "Non-standard" classes of 12 weeks or more:

<b>Withdrawal</b>	<b>Percent of Refund</b>
Prior to the end of the second week	100%
Prior to the end of the fourth week	75%
Prior to the end of the sixth week	50%
Prior to the end of the eighth week	25%
After the eighth week	0%

"Non-Standard" short classes - classes of less than 12 weeks in length:

<b>Withdrawal</b>	<b>Percent of Refund</b>
Withdrawal on or before the number of days equal to the number of weeks a class is scheduled. For example, for a six week course, a refund will be granted through the sixth day.	100%
After the number of days equal to the number of weeks a class is scheduled	0%

**Determination of Attendance**

For "standard" full semester classes, the attendance period begins on the opening day of scheduled university classes, includes weekends and holidays, and ends on the date the student notifies the Graduate School Office in writing, that he/she is withdrawing.

For "Non-standard" classes, the attendance period begins on the start date of the class as specified on the class schedule of classes, includes weekends and holidays, and ends on the date the student notifies the Graduate School Office in writing, that he/she is withdrawing.

These policies are available on-line at <https://umaine.edu/bursar/refund-policies/>

**Room and Board Cancellations**

For information on room and board cancellation policies, please refer to the University of Maine Housing Services website - <http://umaine.edu/housing/cancellation-fee/>

### **Involuntary Withdrawals**

Consideration for retroactive refunds of tuition and fees for involuntary withdrawals, e.g. extended illness or military service, will be considered by the University on a case-by-case basis. Administrative dismissals are not covered by these procedures and thus are not entitled to refunds of institutional charges.

### **Statute of Limitations**

Appeals for the exception to the established refund practice may be made to the designated university official. Normally, appeals will be considered up to 90 days after the close of the semester/session for which the student is claiming a refund. For a typical semester/session the dates are no later than March 31 (Fall), August 31 (Spring) and November 30 (Summer). University academic appeals committees hear appeals on academic matters and have no authority to authorize refunds.

### **Department of Veteran Affairs' "Covered Individual Policy":**

In compliance with United States Code section 3679 of title 38, any individual who is entitled to educational assistance under chapter 31, Vocational Rehabilitation and Employment, or chapter 33, Post-9/11 GI Bill® benefits will be permitted to attend or participate in the course of education during the period beginning on the date on which the individual provides to the educational institution a certificate of eligibility for entitlement to educational assistance. A certificate of eligibility can also include a "Statement of Benefits" obtained from the Department of Veterans Affairs' eBenefits website, or a VA form 28-1905 form for chapter 31 authorization purposes.

The University of Maine will not impose any penalty, including the assessment of late fees, the denial of access to classes, libraries, or other institutional facilities, or the requirement that a covered individual borrow additional funds, on any covered individual because of the individual's inability to meet his or her financial obligations to the institution due to the delayed disbursement funding from the VA under chapter 31 or 33.

This agreement will terminate on the date on which payment from the VA is made to the institution or 90 days after the date the institution certified tuition and fees following the receipt of the certificate of eligibility, whichever date is most beneficial to the covered individual.

*GI Bill® is a registered trademark of the U.S. Department of Veterans Affairs (VA). More information about education benefits offered by VA is available at the official U.S. government website at [www.benefits.va.gov/gibill](http://www.benefits.va.gov/gibill).*

### **Satisfactory Academic Progress (SAP) for Financial Aid Recipients**

Federal financial aid regulations require financial aid recipients to make progress toward earning their degree, stay above specific GPA minimums and to complete the degree within a maximum time-frame. You can lose eligibility for aid if you are not doing well in your classes and/or frequently withdraw from classes and/or if it is taking you a very long time to earn your degree. If you are not meeting the minimum standards, even if you are allowed by your academic dean to continue your enrollment, you will have to do so without the benefit of financial aid. *Additionally, at this point VA benefits will no longer be certified, until such a time that the reason for unsatisfactory progress is resolved.*

Progress is reviewed once each academic year normally at the end of the spring semester. This review includes all attempted coursework, even if the student did not receive financial aid for some or all of that coursework. Students who are not meeting the minimum standards for Satisfactory Academic Progress are notified in writing on the MaineStreet Message Center of the loss of eligibility for further financial aid, effective the following enrollment period.

A grade of D or below is unsatisfactory SAP.

If a student is dismissed for failure to make SAP, there is no probationary period and no readmission. The probationary period if implemented will be up to the point where the student has exceeded the maximum number of C grades.

A copy of the Satisfactory Academic Progress Policy is available in the Office of Student Financial Aid, as well as on the Office of Student Financial Aid website at [umaine.edu/stuaid/sap](http://umaine.edu/stuaid/sap).

### **Financial Awards and Assistance**

School financing is generally offered to students through their graduate programs. However, if financial support is unavailable, it is the graduate student's responsibility to identify sources for financial assistance.

The University of Maine offers assistantships, fellowships and traineeships. A typical assistantship appointment will require students to work 20 hours a week. The benefits of these positions include a monthly stipend, a tuition waiver, and coverage of half of the cost of the group health insurance plan provided to graduate assistants, fellows and trainees by the University. All full-time graduate students must provide proof of health insurance. Graduate assistants, fellows and trainees on the equivalent of half-time appointments and who require health insurance must enroll in the GA health insurance plan, or the International plan (for international students).

All applicants who wish to be fully considered for nomination for assistantships, fellowships or traineeships, should have a completed application on file at the Graduate School no later than January 15<sup>th</sup> for the following summer or fall terms. Students should contact their academic unit directly to inquire about the possibility of securing an assistantship, or to be nominated for any of the authorized positions offered by the Graduate School. Most awards are highly competitive and based on academic performance rather than financial need. A student may normally hold only one assistantship or financial award per year.

The following is a description of financial support opportunities for graduate students.

**Graduate Assistantships.** Awarded by individual departments or offices, graduate assistantships are generally available in most academic fields which offer a degree program, as well as in such areas as admissions, student aid, and residence life. Some assistantships and fellowships are also awarded competitively through the Graduate School each spring for the following academic year. For most assistantships, up to nine hours of tuition per semester is paid, exclusive of audited and pass/fail courses, and courses numbered below 400-level. The assistantship will not cover tuition for courses audited, courses taken as pass/fail when the course also has a graded option, and courses numbered below 400-level. You are financially responsible for the tuition of courses dropped after the add/drop period of that given semester.

The assistantship also pays for 50% of the premium for the group health insurance plan for graduate assistants and fellows or the International plan (for international students) offered by the University. In some cases, a limited amount of tuition for the summer following the academic year in which the assistantship appointment is effective may also be paid by the sponsoring unit.

Graduate assistants normally devote half-time (20 hours per week) to work-activities. International students' visas prohibit them from working elsewhere in addition to the assistantship. Most graduate assistants are required to register for a full-time load of at least six hours of degree credit in the fall and spring semesters. Exceptions are doctoral students who have been admitted to candidacy, doctoral students in Psychology who are taking clinical internships, master's students in dietetic internships, and graduate students in their final semester of study. In these instances, one credit may be considered full-time. If an assistantship continues through the summer, the graduate assistant must register for at least one graduate credit hour.

Admission to the Graduate School and enrollment in courses is required before an appointment to a graduate assistantship is processed. Because these assistantships are awarded by the departments, the student should correspond directly with the appropriate program coordinator regarding the availability of assistantships.

Announcements of many graduate assistantships are available on the Graduate School's website and through the CareerLink site on the Career Center web page.

## **Selected Financial Awards and Descriptions, see The Graduate School website for full listing.**

**Chase Distinguished Research Assistantships (CDRA).** Up to ten research assistantships are awarded annually by the Graduate School. The awards include a monthly stipend, a tuition waiver for up to nine hours per semester exclusive of courses taken as audit or pass/fail or below 400 level and coverage of 50% of the University's health insurance plan. Some receive a tuition waiver during the summer following the academic year of the award. These awards are made on a competitive basis and involve nomination by the department of study and submission of a research proposal delineating the research to be undertaken. Nominations are sought in December-January.

**Resident Life Positions.** Assistant Community Coordinator positions in the University residence halls are available each year. The position involves working with students, advising complex governments, programming, interpreting and enforcing policies and procedures, advising residents and making referrals, and assisting the Community Coordinator with managing the complex. ACC's receive a stipend, an apartment for the academic year, and a meal plan for themselves while the University is in session, plus tuition up to 18 hours per year. The selection process begins in February so applicants are encouraged to apply early. A limited number of resident assistant positions and internship positions are also available through Residence Life. For information on application procedures, contact Residence Life Room 315, 5748 Memorial Union Orono, Maine 04469-5748 telephone, 207/581-4801.

**Atlantic Provinces Graduate Scholarships.** Three scholarships, which pay up to 18 hours of tuition per academic year, are available on a competitive basis to graduates of higher education institutions in the Atlantic Provinces and Quebec. Applicants interested in being nominated for this award should consult their department. Nominations are sought in January-February. The award may be continued beyond the first year if the student remains in good standing and is re-nominated by his/her program coordinator.

**Graduate Trustee Tuition Scholarships.** Fifteen to twenty scholarships, which pay up to 18 hours of tuition per academic year, are available annually on a competitive basis to students enrolled in graduate programs. Scholarship recipients must be full-time students and may register for up to nine hours of credit each semester. The Graduate School requests nominations from the departments in January-February. Interested students should seek nomination through their departments of study.

**Thurgood Marshall Scholarships.** At least two scholarships which pay up to 18 hours of tuition are available to graduate students whose socioeconomic background, prior academic or work experience, and/or graduate educational interests would bring a unique perspective to the University of Maine community. Preference for these scholarships is given to individuals from groups that have been traditionally underrepresented in specific programs at The University of Maine. Scholarship recipients must be full-time students and may register for up to nine hours of credit each semester. The Graduate School requests nominations from departments in January-February. Interested students should seek nomination through their departments of study.

**Federally Funded Traineeships and Fellowships.** Subject to the availability of federal funds, federal traineeships and fellowships are available to graduate students in some programs such as special education, social work, nursing, biological sciences, communication sciences and disorders, and clinical psychology. Students should inquire in their field of interest.

**Janet Waldron Doctoral Research Fellowships (formerly UMDRF).** The Janet Waldron Doctoral Research Fellowships are open to all doctoral students, regardless of discipline and designed to stimulate research and

scholarship at UMaine as measured by research productivity and doctoral-degree graduation rate. Therefore, successful applicants must explicitly address how fellowship support would result in an overall increase in research productivity. The fellowship is intended to provide doctoral students with up to two years (24 months) of support with a stipend of \$25,000 per year and coverage of 1 credit or more of tuition per semester and 50% of the University's group health insurance plan to provide financial support through the completion of their degrees. Nominations are sought in December.

**Susan J. Hunter Teaching Assistantships.** Up to four Hunter teaching assistantships are awarded annually for the spring semester to doctoral students who have passed their comprehensive exams and who intend to enter the professoriate. The Hunter award provides one half of the annual minimum graduate stipend, one credit of graduate tuition, and 50% of the one-semester health insurance premium for graduate assistants, if the student is not already enrolled in the insurance program. Hunter assistantants teach one undergraduate course as the sole instructor, under the mentorship of the normal course instructor, and must attend at least 3 graduate student professional development workshops. The student's mentor or another graduate faculty member of the student's unit must teach a 1-3 credit graduate course that otherwise would not be offered. These awards are made on a competitive basis and involve nomination by the department of study and submission of a plan delineating both the course to be taught by the student and the graduate course to be taught by a unit member. Nominations are sought in the spring semester for the following spring.

**Summer Dissertation Fellowships.** Dissertation writing fellowships are open to doctoral students who have passed their comps and are actively writing their dissertations. Depending on number of applicants, the Graduate School will consider master's students who have completed four semesters of study and are actively engaged in writing a thesis, but preference will be given to doctoral students. Each fellow will receive an office in Stodder Hall and a \$1,833 monthly stipend at the end of June, July, and August. Offices will be equipped with desk, chair, and a large table. Fellows are expected to spend at least 5 hours a day, five days a week using the offices to work on their dissertations; however, they may not live in these rooms.

**Other Fellowships** may be available through individual departments or units. For example, the Canadian-American Center offers several fellowships for graduate students pursuing study of a regional nature involving New England, the Atlantic Provinces of Canada, and Quebec. Students should inquire in their field of interest.

### **Student Financial Aid**

The Office of Student Financial Aid administers several financial aid programs to help University of Maine graduate students finance their education. Office staff award, process, and disburse financial aid for University of Maine students, and advise students and their families, the campus community, and the general public on issues related to financial aid. Our contact hours are from 8:30 a.m. to 4:30 p.m. Monday, Wednesday, Thursday, and Friday and from 9:30 a.m. to 4:30 p.m. on Tuesday. . Advisors are available on a walk-in basis between 8:30 a.m. and 3:30 p.m. Monday, Wednesday, Thursday, and Friday and from 9:30 a.m. to 3:30 p.m. on Tuesday. . All correspondence concerning financial aid should be addressed to the Office of Student Financial Aid, 5781 Wingate Hall, Orono, ME 04469-5781. For assistance with the application process, status updates, or answers to other questions about financial aid, contact the office at (207) 581-1324, or via e-mail [umfinaid@maine.edu](mailto:umfinaid@maine.edu).

#### *Applying for Financial Aid*

To determine the amount and types of assistance each student can receive, students are required to apply for financial aid. The University of Maine requires only one financial aid application: the **Free Application for Federal Student Aid (FAFSA)**. Students must apply for financial aid each year, using FAFSA at [fafsa.gov](http://fafsa.gov).

The FAFSA allows students to enter application information and electronically submit their application directly to the federal processing center. Some information can be "pre-filled" from the prior year's application when the Federal Student Aid ID (FSA ID) is used. An FSA ID can be created at: [fsaid.ed.gov](http://fsaid.ed.gov). The student's signature must be provided before the FAFSA can be processed. There are two ways in which the application can be signed: the student can use their FSA ID to electronically sign the FAFSA or a paper signature page can be printed, signed, and mailed to the address provided. Students should note the confirmation number that is given when the application is submitted.

After applying, the student will receive an email from the federal processing center that directs them how to access their Student Aid Report (SAR) online. The student is expected to review the SAR and make any necessary corrections immediately, or contact the Office of Student Financial Aid for assistance. As long as the University of Maine is listed on the SAR in the school section, the Office of Student Financial Aid will receive the application data, generally within two to three business days. The application will be reviewed and the student will be notified on his/her MaineStreet To Do List if any additional documentation (IRS Data Retrieval, verification forms, or other information) is required. The IRS Data Retrieval tool allows applicants to request and retrieve their tax data directly from the IRS. Once this data is retrieved from the IRS, it can be transferred to the FAFSA application.

Once the student's file is considered complete, a financial aid award will be made available to the student. The student should accept (or decline) each type of aid offered and follow all instructions to ensure continued processing and disbursement of funds to the student's account at the University of Maine Bursars Office.

### *Eligibility for Financial Aid*

To be eligible for most types of Federal, State and University financial aid, each student must:

- be a U.S. citizen or eligible non-citizen
- have earned a high school diploma or G.E.D.
- be offered admission to a University of Maine degree program
- not be in default on a previous Federal educational loan program
- continue to be in good academic standing
- continue to make satisfactory progress toward a degree (see Satisfactory Academic Progress for Financial Aid Recipients).

Most types of financial aid require at least half-time enrollment in order to be eligible. Full-time registration for a graduate student is normally defined as six or more degree hours per semester; part-time status is three to five credit hours per semester. Doctoral students who have been admitted to candidacy, psychology and human nutrition students on approved internships, and students in their final semester of study may maintain full-time enrollment status by registering for a minimum of one thesis or internship credit. Students enrolled in summer session are eligible for aid. However, for students taking one credit, overall financial aid eligibility is less than the eligibility for a graduate student enrolled for 6 or more credit hours due to the reduced cost of tuition and fees.

Financial aid is initially awarded based upon the assumption of full time enrollment regardless of official University status. Each student's enrollment level is verified at the end of the Add/Drop period each semester; financial aid eligibility is recalculated and awards are adjusted if necessary. The student is notified by email if the financial aid award changes. Students participating in cooperative employment programs, practicums, internships and field experience may not be eligible for financial aid unless they are enrolled at least half time.

Federal, State and University financial aid programs are not available for non-degree enrollment. Some lending institutions offer loan programs to students who are currently taking classes in non-degree programs. Further information is available upon request.

NOTE: early registration for classes, including enrollment for Thesis Credits, helps ensure timely processing and disbursement of financial aid funds.

### **Financial Aid Programs**

Graduate students may be offered assistance from the following financial aid programs:

**Federal Direct Unsubsidized Loans** are funded through the federal government and are awarded to students enrolled in a degree program at least half-time who have applied for federal financial aid. Graduate students are allowed to borrow up to \$20,500 in unsubsidized Direct Loan per year. As of July 1, 2012, graduate students are no longer eligible for subsidized Direct Loans. Actual eligibility may be less than the annual maximum depending upon enrollment level and the amount of all other financial educationally-related assistance, if any. Students must accept the Federal Direct Loan via MaineStreet. More information is available on the Financial Aid website, located at [www.umaine.edu/stuaid](http://www.umaine.edu/stuaid).



NOTE: Repayment of principal is deferred on unsubsidized loans while a student is enrolled at least half time. Interest rates are fixed at each academic year and are available on our website at [umaine.edu/stuaid/loans/stafford/](http://umaine.edu/stuaid/loans/stafford/). Interest begins to accrue or can be paid by the student immediately after disbursement on any unsubsidized loan. Any break in continuous enrollment, such as a leave of absence, will result in the student entering into the 6-month grace period, and repayment could begin before the student re-enrolls in a degree program at least half-time.

NOTE: first-time borrowers of a Federal Direct Loan must complete Entrance Counseling before loan proceeds will be released. To complete the requirement on the web, visit [studentloans.gov](http://studentloans.gov). Students who have borrowed previously and completed an Entrance Interview/Loan Counseling session at another college or university should contact the Office of Student Financial Aid. First time Federal Direct Loan borrowers must also complete a new Master Promissory Note (MPN) at [studentloans.gov](http://studentloans.gov).

### **Other Sources of Funding:**

**Scholarships** may be available from the student's academic department or from outside scholarship agencies, to which the student applies directly, and do not have to be repaid.

**Graduate Assistant Tuition Scholarships** are awarded by offices and departments on campus and reported to the Student Financial Aid Office. These assistance programs are usually offered to full-time graduate students in return for the students' efforts in research and/or teaching while working on a graduate degree (contact the Graduate School, Academic Department, or the Office of Student Employment for more information).

**Payment Plans** give students the option of making periodic payments of part or all of the amount due to the University of Maine. For more information visit [umaine.edu/bursar/payment-options](http://umaine.edu/bursar/payment-options) and click on Installment Payment Plan, or contact the University of Maine Bursar's Office at 581-1521.

**Credit-Based Loan Programs** are available through the Federal Direct Plus loan program and various lending institutions throughout the United States. Please visit the Office of Student Financial Aid's website at [umaine.edu/stuaid/types-of-aid/loans](http://umaine.edu/stuaid/types-of-aid/loans) for more information on Direct Plus and alternative loans.

### *Changes to Financial Aid Awards*

Changes to awards can occur even after a financial aid award has been offered, and aid can be retracted even after it has been posted to a student's account with the Bursar's Office. Students are notified by email any time their financial aid award is adjusted. Changes to awards may be necessary at any time during the academic year due to any or all of the following circumstances:

- changes in enrollment level each semester
- auditing a course
- withdrawal from all classes
- discontinued attendance in classes
- corrections and updates to original application data
- receipt of additional information affecting continued eligibility
- changes in housing plans
- changes in residency status
- changes in student and/or family circumstances
- receipt of additional assistance and/or scholarships
- changes in Satisfactory Academic Progress status

Students are encouraged to contact the office to discuss the impact on their financial aid eligibility before their status changes, if at all possible.

### *Financial Aid for Summer Session*

Summer Session is considered to be the end of the University's academic year. To be eligible for Summer Session financial aid, students must have applied for federal financial aid for the previous year and enroll in a minimum of one credit. Generally, financial aid is limited to any remaining Federal Direct Loan eligibility. Federal Work-Study may also be available and requires a separate application, which is available early in the Spring Semester and must be turned in prior to the deadline listed on the application. Students are encouraged to contact the Office of Student Financial Aid to request further information; the best time to discuss specific eligibility is midway through the spring semester and after the student is pre-registered.

#### *Limits on Financial Aid Eligibility*

Most University of Maine students will have enough financial aid eligibility to complete a graduate degree, but limits do exist and eligibility is impacted by academic performance. To maintain eligibility for financial aid, each student must make progress toward a degree according to the University's *Satisfactory Academic Progress for Financial Aid Recipients Policy*, measured in three areas; Grade Point Average (GPA), successful completion of credit hours attempted, and length of time it takes to reach completion.

The Federal Direct Loan program places limits, called aggregate limits, on the total amount that may be borrowed by any student. These limits are specified by Federal Student Aid on their website ([studentaid.ed.gov/sa/types/loans/subsidized-unsubsidized](http://studentaid.ed.gov/sa/types/loans/subsidized-unsubsidized)).

#### *Withdrawal from All Classes*

If a student withdraws from the University after the semester begins, federal regulations stipulate that financial aid eligibility must be re-evaluated and pro-rated based on the portion of the semester the student completed. Eligibility for continued deferment of any prior loans is also affected. Any potential refund of tuition and fees from the University may be retained to repay financial aid programs before any reimbursement may be made to the student. In some cases, the student may be required to repay some or all financial aid funds previously disbursed to them by the University's Bursars Office. Students considering withdrawing from all classes must contact the Graduate School who will collaborate with the Office of Student Financial Aid to determine the impact of the withdrawal on financial aid. A copy of the withdrawal policy is available in the Office of Student Financial Aid and on their website.

#### *Institutional (Unofficial) Withdrawal*

Federal regulations require that the Office of Student Financial Aid determine the last date of attendance for an academic related activity for all students who discontinue class attendance. For those students who do not officially withdraw, the mid-point of the semester may be used as the official withdrawal date. Once a withdrawal date has been determined, charges and financial aid will be recalculated based on this date. Please be aware that as a result of this action, financial aid funds may be adjusted and money may be owed the University. You will be notified of any change. A copy of this policy is available in the Office of Student Financial Aid.

#### *Special Circumstances*

Special circumstances, such as leaving full-time employment to pursue a graduate degree, changes in spousal employment, loss of a benefit or other type of income, changes in marital status, or unexpected/unusual costs, should be brought to the attention of the staff of the Office of Student Financial Aid. Students may meet with an advisor or contact the office at (207) 581-1324 to explain their circumstances.

#### *Satisfactory Academic Progress for Graduate Financial Aid Recipients*

Federal financial aid regulations limit how long any student can continue to receive financial aid. In order to maintain eligibility for financial aid, each student must be making progress toward a degree. Students can lose eligibility for financial aid if they are not meeting academic standards for continued enrollment, if they are not completing a sufficient number of the credits they have enrolled for, and/or if it is taking too long to earn their degree. Each student's progress is reviewed annually. Students who are not meeting the minimum standards for Satisfactory Academic Progress are notified in writing of the loss of eligibility for further financial aid. Students who are not making Satisfactory Academic Progress, but who are allowed to continue enrollment, may have to do so without the benefit of

financial assistance. A copy of the Satisfactory Academic Progress Policy for Financial Aid Recipients is available in the Office of Student Financial Aid.

#### *Satisfactory Academic Progress Appeal Procedure*

Every student has the right to appeal upon notification of loss of financial aid eligibility due to lack of academic progress. Appeals are considered by a committee. Appeals can only be made in writing. The Graduate Appeal Form and policy can be found at [umaine.edu/stuaid/sap](http://umaine.edu/stuaid/sap). All appeals should be submitted along with appropriate supporting documentation, to the attention of the Chair of the Satisfactory Progress Appeal Committee, Office of Student Financial Aid, 5781 Wingate Hall, Orono, ME 04469-5781. Students are notified of the result of the appeal by letter.

Questions about the policy or the appeal procedure can be referred to the Office of Student Financial Aid (207) 581-1324.

## **General Policies**

### **General Policies and Regulations of the Graduate School**

It is the student's responsibility to become familiar with the various requirements of graduate study applicable to them and to satisfy these requirements properly. The following policies and regulations apply to graduate study at The University of Maine. Some graduate programs have additional policies and regulations. Please contact the graduate program coordinator for specific program requirements.

#### **1. Course Levels**

In general, any graduate student working toward a master's degree will be required to present a minimum of 12 hours (exclusive of thesis) of 500- and 600-level course work to partially satisfy requirements for that degree. However, certain degrees have established additional requirements. The same requirement applies to the Certificate of Advanced Study and Education Specialist. Only courses at the 400-level and above may be used for graduate credit.

#### **2. Grades and Credits**

Graduate degree credit will be granted routinely only to students admitted to graduate programs. Only those courses listed in this publication may be counted for graduate credit, and then, only if given by an instructor approved to teach courses for graduate credit. Once admitted to the Graduate School, all courses taken normally count in the graduate GPA, regardless of academic program or degree completion. Courses taken as a non-degree student also count in the GPA if the courses are part of the degree requirements.

Normally, only a grade of A or B is acceptable for course work on a student's program of study. A grade of C may carry graduate degree credit if a student's advisory committee so recommends and if the Graduate School approves such an exception. However, no student will be allowed to accumulate more than six hours of C grades on a program of study for a master's degree, nor more than 12 hours of C grades on a program of study for a Ph.D. or Ed.D. Grades below C are not considered acceptable for any graduate student. Since prerequisite and elective courses, as well as required courses, are part of the program of study, the 6- and 12-hour limits apply to all course work for which a student registers while in a particular degree program. Students receiving hours of C in excess of these numbers (or lower grades) will not be considered as having made satisfactory progress toward completing degree requirements.

Project/thesis/dissertation credits (xxx 699) shall be graded with a P (Pass), I (Incomplete), or F (Fail).

Audited and Pass-Fail Courses are normally not accepted for graduate degree credit.

Incomplete and L Grades. Incomplete grades, unless made up during the period before the degree is awarded, will remain as I's on the student's transcript. Each department offering a course may establish additional requirements for alteration or completion of an incomplete grade. An L grade (stopped attending class) computes as a failing grade. A student may not carry a combination of more than three I or L grades in all enrolled degree programs without permission of the graduate program coordinator(s) and the Graduate School. Any course in which a student earns a grade of I, L, W, or a grade below a C will negatively impact the student's academic progress, and may impact eligibility for financial aid.

### **3. Leave of Absence**

Graduate students in good academic and financial standing with the University can request a leave of absence for up to three (3) successive terms (one full calendar year) if they are unable to maintain continuous enrollment due to personal or professional reasons. Time spent in on-leave status is not considered part of the time limit for completion of degree. Students who are on leave do not need to reapply in order to continue their studies.

In order to be granted on-leave status, students must complete the On-Leave Form and obtain the signature of their Academic Advisor or Program Coordinator. Those with financial holds must reconcile their outstanding balance with the Bursar's Office before a leave of absence can be granted. Upon receipt of the On-Leave Form from the student and approval by the advisor, the Graduate School will conduct a review for final approval.

On-leave requests can be extended by the submission of a new On-Leave Form. However, only a maximum of 2 academic years of on-leave status can be granted during a student's academic career.

In conjunction with a leave of absence, follow the appropriate links for additional information on how to request financial adjustments and the semester withdrawal policy due to medical reasons.

### **4. Registration**

Full-time registration for a graduate student is normally defined as six or more degree hours per semester or summer session; part-time status is five hours or less per year. Full-time students are required to register for a minimum of 6 credits each fall and spring semester to maintain active status. In the case of doctoral students who have been admitted to candidacy, 1 credit each fall and spring semester is considered full-time. Part-time students are required to register at least once each academic year to maintain active status. Students who need to switch their enrollment status (full-time to part-time or part-time to full-time) should contact their advisor. Doctoral students who have been admitted to candidacy, psychology and human nutrition students on approved internships, and students in their final semester of study may maintain full-time enrollment status by registering for a minimum of one thesis or internship credit. Students who have completed at least 6 thesis credits may substitute UGR 501 for the thesis registration requirement and still be considered full-time. Registration for a minimum of one thesis credit during the summer session also satisfies the requirement for registration as a graduate student.

The University of Maine and the University of Maine at Machias acknowledge and adhere to the federal definition of a credit hour with respect to courses offered face to face, in hybrid format, and online, as developed in 2010 and published in the *Code of Federal Regulations* (CFR), Title 34, Part 600.02:

*[A] credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than*

*(1) One hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester or trimester hour of credit [ . . . ] or the equivalent amount of work over a different amount of time; or*

*(2) At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution[,] including laboratory work, internships, practica, studio work, and other academic work leading to the awarding of credit hours.*

([https://www.ecfr.gov/cgi-bin/text-idx?SID=ae813138f65c93bd81a17b66d59d067d&mc=true&node=pt34.3.600&rgn=div5#se34.3.600\\_12](https://www.ecfr.gov/cgi-bin/text-idx?SID=ae813138f65c93bd81a17b66d59d067d&mc=true&node=pt34.3.600&rgn=div5#se34.3.600_12))

## **5. Transfer Credit**

When courses taken at other institutions, outside the University of Maine System, have been accepted toward partial fulfillment of requirements for an advanced degree, only the credit hours (not grades) will be transferred. Evaluation of performance levels and satisfaction of quality standards shall be based entirely on grades earned at the University of Maine.

A maximum of 6 hours of credit in the case of a master's candidate, and 30 hours beyond the bachelor's degree in the case of a PhD candidate (30-45 hours in the case of an Ed.D. candidate), may be accepted in transfer (subject to the approval of the candidate's advisory committee) for appropriate courses completed in residence at other institutions prior to matriculation in the Graduate School at the University of Maine. Courses to be accepted must have been taken at a fully accredited college or university which offers a graduate program, and must be acceptable at that institution in partial fulfillment of its requirements for an advanced degree.

In no case may the number of credit hours transferred into a graduate degree program exceed 50 percent of the student's entire course work for the degree. (see Residence Requirement below).

Credit cannot be transferred for courses which would not, if taken at UMaine, have received graduate credit, courses in which a grade lower than "B" was received, correspondence courses, courses which are inappropriate for inclusion in the student's degree program, and courses completed at such a date as to exceed time limits prescribed for a particular degree program.

Up to twelve credit hours may be transferred from appropriate course work taken at UMaine before matriculation in a graduate degree program if no other work is being transferred.

## **6. Time Limit**

All work for a master's degree Certificate of Advanced Study, and for the Education Specialist must be completed within six years of matriculation.

All work for a doctoral degree must be completed within eight years of matriculation. Students must be admitted to candidacy within four years of registration as a doctoral student; the dissertation must be completed within four years of admission to candidacy.

If requirements for an advanced degree or certificate are not completed within the time specified, they must file a petition for Exemption for Regulation requesting an extension which must first be approved by their department and then by the Graduate School. If the student has broken enrollment and exceeded the time limit of their program, they must apply for readmission before being allowed to continue working toward the degree. Courses exceeding the time limit for the degree may be counted only if revalidated by the instructor. If the application for readmission is approved, the student's program of study will be revised in view of the work completed and/or revalidated.

## **7. Residence Requirement**

In the master's degree, Education Specialist and Certificate of Advanced Study programs, at least 50 percent of course

work applied toward the degree must be taken through The University of Maine. An institutional unit graduate committee may increase this minimum residence requirement.

Residence requirements for doctoral students may be found in the descriptions of the degree of Doctor of Philosophy and Doctor of Education elsewhere in this catalog.

### **8. Advisory Committee**

The graduate student, in conjunction with their advisor, is responsible for initiating activities to establish the student's advisory committee, which is appointed by the Dean of the Graduate School or designee, as early as possible in the student's course of study. The student's major advisor or thesis advisor normally acts as chairperson of this advisory committee. The committee for a master's candidate is composed of a minimum of three members of the Graduate Faculty; a five member committee is required for a doctoral student. It is highly recommended that one committee member be selected from the Graduate Faculty of a department other than that of the student's intended major. The advisory committee guides the student on course work and the thesis, and often serves as the examining committee for the master's final examination and as the core of the examining committee for the doctoral final examination. Advisory committees may not be required for students in professional, nonthesis degree programs. Graduate students should consult with their advisors to clarify this requirement in relation to the degree being pursued.

### **9. Program of Study**

The program of study is an outline of all academic work to be undertaken by a graduate student, and must include prerequisite and elective courses taken while enrolled in a graduate program. It is planned by the student and his or her advisory committee as early as possible in the course of study, and **in order to continue to register for graduate courses, this program must be submitted to the Graduate School before the end of the first year of study for doctorate students holding a master's degree. Those holding only a bachelor's degree must file this form by completion of 12 credit hours or by the third registration, whichever comes first.**

The entire program of study must be presented on a form available from the Graduate School. When it is approved by the student's advisory committee and filed in the Graduate School it becomes the student's required curriculum. Changes in the program of study may be made by submitting a "Request for Change in Program" form approved by the student's advisory committee. It is the student's responsibility to obtain approval of major changes in the course of study at the time such changes are made. Minor changes may be made and the "Request for Change in Program" form filed at the Graduate School during the semester in which graduation occurs.

Certain non-thesis programs such as the M.Ed., C.A.S., Ed.S, and M.B.A., have prepared curricula in photocopied form which satisfy the requirements for a program of study. These are available from the appropriate departmental offices.

### **10. Foreign Language Requirement**

Each institutional unit designates the foreign language requirement, if any, in its catalog description. There is no overall Graduate School language requirement.

### **11. Final Examination**

A final examination is required of all students in thesis programs and in many non-thesis programs. Other members of the faculty may be invited to attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

### **12. Application for Graduation**

Candidates for degrees must apply for graduation within MaineStreet according to the following schedule: by October 1, for degrees to be awarded at the end of fall semester; by July 15, for degrees to be awarded at the end of summer session; and February 1, for degrees to be awarded at the end of spring semester.

For more information about the application process go to [studentrecords.umaine.edu/graduation/](http://studentrecords.umaine.edu/graduation/).

Graduation Timeline: Each unit performs final certification of degree completion by the specified date established by the Office of Student Records each semester.

Students who apply for graduation but do not meet the minimum requirements will be notified by the unit and/or the Graduate School.

### **13. Undergraduate Registration in Graduate Course**

University of Maine undergraduate students with appropriate qualifications and permission of the instructor may also take graduate-level (500-599) courses for undergraduate degree credit. These credits may not be used to fulfill requirements for a graduate degree unless they exceed the bachelors degree requirements or are taken within an approved accelerated graduate program (see below).

Accelerated graduate programs: Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit. Students in approved accelerated undergraduate/graduate programs may begin taking graduate classes with departmental approval in their junior or senior year. Total combined enrollment for the semester may not exceed 15 hours. Up to nine hours of 500 or 600-level degree credit may be applied to both the undergraduate and graduate degrees. The credits will be posted on the graduate transcript when the student completes the undergraduate degree with at least a 3.0 GPA and is formally admitted to Graduate School. The following accelerated programs are currently available at the University of Maine:

#### 4+1 (nonthesis):

##### **Undergraduate program/Graduate program**

biology/biology (this would also include related options in plant science, zoology and ecology)  
any computer science-related undergraduate program/spatial informatics  
any computer science-related undergraduate program/information systems  
any computer science-related undergraduate program/spatial information science and engineering  
economics/economics  
electrical or computer engineering/electrical or computer engineering  
food science/food science  
forestry/forestry  
history/history  
math/math  
political science/global policy  
special education  
business administration  
mechanical engineering  
human development  
intermedia

*Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit.*

#### 4+2 (thesis):

##### **Undergraduate program/Graduate program**

biology/biology (this would also include related options in plant science, zoology and ecology)  
food science/food science  
math/math

*Students in the fourth and fifth years of the Five-Year Program in Pulp and Paper Technology may apply for permission to take part of their course work for graduate credit.*

#### **14. Faculty as Candidates for Advanced Degrees**

Members of the University faculty at the instructor level or above, may become candidates for advanced degrees from any college or school of The University of Maine other than The University of Maine college or school in which they hold faculty appointments.

#### **15. Requests for Exceptions to Regulations**

Students may request exceptions to the Graduate School Policies and Regulations, but must submit convincing evidence the exception is needed and is warranted. Forms for this purpose may be obtained from the Graduate School or from the web site <https://umaine.edu/graduate/facultystaff-resources/>.

#### **16. Withdrawal Procedure**

To ensure proper posting of their academic and financial records, students who withdraw from graduate study must notify the Graduate School in writing.

Graduate students are encouraged to secure a copy of the Student Handbook from the Office of Student Affairs or at [umaine.edu/handbook](https://umaine.edu/handbook). Although primarily for undergraduates, this publication contains many of the University's policies and regulations with which students should be familiar.

#### **17. Grievance Procedure**

Recognizing the highly individualized nature of graduate programs, a student filing an academic appeal is encouraged to request that their thesis advisor or other faculty member of their choice act as a counselor and/or representative at any level of the appeal process which is as follows:

- The student should discuss the concern with the appropriate faculty member(s);
- If the concern persists, the student should follow the department's written appeal procedures if they exist, or if not, consult with the graduate program coordinator or chairperson/school director, (or the college dean, if there is no department);
- If the complaint remains unresolved, the student should write to the Dean of the Graduate School, outlining the situation, and requesting a review. The Dean of the Graduate School or their designee will discuss the situation with the college dean and/or appropriate members of the department or graduate program. The Dean of the Graduate School or their designee will then meet with the student and attempt to resolve the problem;
- If this resolution is not satisfactory, the Dean of the Graduate School will refer the appeal to the Executive Committee of the Graduate Board for one final review. After hearing from the student and the faculty member(s) involved, the Executive Committee will render its decision, which shall be considered binding. The decision will be communicated to the student by the Dean of the Graduate School.

#### **Graduate Certificate**

General Requirements. Graduate certificate programs may be earned by students who have completed at least a bachelor's degree from an accredited university or college. Graduate certificate programs consist of nine to eighteen credit hours of course work at the 400-level or higher. At least 50% of the course work applied towards the requirements for the certificate must be 500-level or above.

Students who are currently enrolled in the Graduate School and who wish to pursue an approved graduate certificate program simultaneously must apply for admission to the certificate program **before one-half of the required credits are completed.**



A maximum of 40% of the credit hours towards any certificate program may be accepted as transfer credit. One course in which a grade of "C" was earned may be applied towards the requirements for a graduate certificate. Acceptance of a course towards a certificate or acceptance into a graduate certificate program does not necessarily guarantee acceptance of the same course towards a graduate degree.

The student will be required to complete the certificate program within the time limit specified for the program; if no time limit is specified, it shall be the same as that for completion of the master's degree (six years).

Students in graduate certificate programs are not eligible for federal financial aid unless also enrolled in a degree program. However, nonresident students in on-line graduate certificate programs are eligible for an e-tuition rate of 125% of the Maine resident tuition.

### **Master's Degree**

**General Requirements.** The following requirements apply to the degrees of Master of Arts and Master of Science: A minimum of 30 semester hours, including credit given for the thesis, is required. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. If more than 10 semester hours are allowed, the candidate must spend at least two academic years in resident graduate study.

A thesis is required of all candidates for the degrees of Master of Science and Master of Arts with the exception of specific non-thesis options. A final copy of the thesis must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library. Students in thesis programs must have an advisory committee of three members of the Graduate Faculty. All MS and MA students in thesis programs must complete an appropriately approved Responsible Conduct of Research course ([umaine.edu/graduate/students/progress/rcr/](http://umaine.edu/graduate/students/progress/rcr/)) before the commencement of the fourth \_699 credit.

A graduate student working toward a master's degree will be required to present a minimum of 12 hours (exclusive of thesis) of 500- and/or 600-level course work to partially satisfy requirements for that degree.

Departmental or program requirements for master's students may be found in the program descriptions elsewhere in this catalog.

### **Awarding of Posthumous Degrees for Undergraduate and Master's Programs**

The following policy is to govern the awarding of degrees posthumously at The University of Maine.

#### **Requirements:**

A posthumous degree may be awarded if:

- At the time of death the student had completed all requirements of their degree program and would have qualified for graduation; or
- At the time of death the student was enrolled in their final semester, was taking the necessary courses to complete their degree requirements, and their instructors and/or advisor can show that the student was likely to complete the coursework satisfactorily.

#### **Procedure:**

- A request for a posthumous degree is made to the chair of the students department by family, friends, or faculty members who have worked with the student. A death certificate and proof of their relationship to the student must be made available;

- If the above requirements have been met, the request will go to the Associate Dean of the college/Graduate School for approval;
- Provost reviews and makes recommendation to the President
- President has final approval;
- The approved request is forwarded to the Office of Student Records.

#### **Awarding of Posthumous Degree:**

- The students diploma and transcript will note that the degree was awarded posthumously;
- The students name will appear in the Commencement program, with a note that the degree was awarded posthumously;
- The President, Provost or their designee(s) will hold a private reception with the family and friends of the deceased and present the degree at the reception.

#### **Doctor of Philosophy**

The Ph.D., the highest of academic degrees, is awarded to candidates demonstrating outstanding achievement in a specialized field of scholarship and primarily for demonstrated ability for independent research in a subdivision of this field.

The following requirements apply to the Ph.D. degree:

**Residence Requirement.** The minimum residence requirement for Ph.D. programs is met by registering for courses or thesis research through the University of Maine for four semesters beyond the baccalaureate degree. Students entering doctoral programs with a master's degree must register for at least two semesters of course work or research. Individual institutional units may increase this requirement. At least 50% of the credits applied to the degree must be earned from the University of Maine.

**Tuition Requirement.** Doctoral students will be charged tuition based on the number of credit hours for which they register. A full-time student must register for a minimum of 6 credit hours per semester in order to satisfy the requirements for the doctoral degree, except students who have been admitted to candidacy, students on psychology internships, and students in their final semester, in which case 1 thesis or internship credit may be considered full-time. The total number of credits required is determined by the academic department and the student's advisory committee. In general, no more than 30 semester hours of transfer credit from a master's degree will be accepted.

**Language Requirement.** There is no overall Graduate School language requirement. Each department or institutional unit offering graduate programs designates the language requirement, if any. This may be found in departmental descriptions elsewhere in this catalog. A student must meet the appropriate language requirement before being admitted to candidacy.

**Comprehensive Examinations.** Comprehensive examinations, which may be written, oral, or both, will be administered by the student's major department and passed to the satisfaction of the advisory committee. These examinations may not be taken until the student has completed at least one and one-half years, or the equivalent, of study beyond the bachelor's degree. These examinations are given to determine whether the student's progress in studies has been satisfactory and whether pursuit of research for the thesis will be profitable and the training requirements for the degree will likely be met.

**Admission to Candidacy.** Admission to candidacy signifies the student has successfully fulfilled all degree requirements except for completing the dissertation, and the final oral examination. Graduate students in doctoral programs will be admitted to candidacy when the Graduate School is informed the student has successfully passed the comprehensive examination and has met any other departmental requirements. All students admitted to candidacy may maintain full-time status by registering for a minimum of 1 thesis credit. A student must be admitted to candidacy

within four years of registration as a doctoral student. All work for a doctoral degree must be completed within four years of admission to candidacy.

**Dissertation.** The doctoral dissertation must demonstrate the candidate's mastery of the area of research, and must embody the results of an original investigation in the principal field of study. It must give evidence of an exhaustive study of a specialized field and must be an authoritative statement of knowledge on the subject or produce a new interpretation by rearrangement or reanalysis of existing data. The work must be a definite contribution to knowledge of sufficient importance to warrant its publication. All PhD students must complete an appropriately approved Responsible Conduct of Research course ([umaine.edu/graduate/students/progress/rcr/](http://umaine.edu/graduate/students/progress/rcr/)) before the commencement of the fourth \_699 credit.

A final copy of the dissertation must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library. While more credits are allowed, doctoral students must register for a minimum of 6 credits of thesis (\_699).

**The Final Examination.** After the doctoral dissertation has been accepted by the candidate's advisory committee, the original copy shall be presented to the Graduate School. The candidate must then appear for final examination by an examining committee of no fewer than five members (usually the student's advisory committee) appointed by the Dean of the Graduate School upon recommendation of the major advisor. Other members of the faculty may attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

The final examination, which is oral, is concerned with the subject of the dissertation and with the candidate's understanding of related matters important to a proficiency in the principal field of study. The examination must demonstrate the candidate's mastery of the techniques of research and skill in organizing and presenting the material.

The committee vote need not be unanimous for a doctoral candidate to pass the final oral examination; however, only one (1) negative vote will be permitted.

## **Doctor of Education**

The Ed.D. is given primarily for outstanding achievement in educational leadership or higher education, for demonstrated ability in independent research, and in recognition of a significant contribution to education as evidenced by the dissertation. The holder of the degree is expected to have demonstrated a comprehensive understanding and knowledge of the foundations of education and proficiency in applying that understanding to the field of specialization.

**Admission to Candidacy.** A graduate student in the doctoral program will be admitted to candidacy when the Graduate School is informed that the student has successfully completed all examinations and has met any other College of Education and Human Development departmental requirements. All students admitted to candidacy may maintain full-time status by registering for a minimum of 1 thesis credit. A student must be admitted to candidacy within four years of registration as a doctoral student. All work for the doctoral degree must be completed within four years of admission to candidacy.

**Residence Requirement.** The minimum residence requirement for Ed.D. programs is met by registering for courses or thesis research through The University of Maine for four semesters beyond the baccalaureate degree. Students entering doctoral programs with a master's degree must register for at least two semesters of course work or research. Individual institutional units may increase this requirement.

**Tuition Requirement.** Doctoral students will be charged tuition based on the number of credit hours for which they register. A full-time student must register for a minimum of 6 credit hours per semester in order to satisfy the requirements for the doctoral degree. The total number of credits required is determined by the academic department and the student's advisory committee. In general, no more than 50% of post-baccalaureate credits will be accepted in transfer credit towards the degree.

**Comprehensive Examination.** The comprehensive examination will be in the area of specialization and will be administered by the student's advisory committee. The nature of the examination, and determinations regarding the

level of performance, as well as all other aspects of the examination shall be made by the Graduate Faculty of the area of specialization. The final decision as to the student's performance in the examination shall rest with the advisory committee.

**Dissertation.** The doctoral dissertation must demonstrate the candidate's mastery of the area of research. It must give evidence of an exhaustive study of a specialized field and must be an authoritative statement of knowledge on the subject or produce a new interpretation by rearrangement or reanalysis of existing data. The work must be a definite contribution to knowledge of sufficient importance to warrant its publication. All EdD students must complete an appropriately approved Responsible Conduct of Research course ([umaine.edu/graduate/students/rcr/](http://umaine.edu/graduate/students/rcr/)) before the commencement of the fourth \_699 credit.

A final copy of the dissertation must be presented to the Graduate School in PDF format to be placed in DigitalCommons through the University Library.

While more credits are allowed, doctoral students must register for a minimum of 6 credits of thesis (\_699).

**The Final Examination.** After the doctoral dissertation has been accepted by the candidate's advisory committee, the original copy shall be presented to the Graduate School. The candidate must then appear for final examination by an examining committee of no fewer than five members appointed by the Dean of the Graduate School upon recommendation of the major advisor. Other members of the faculty may attend and participate in the questioning, but only members of the committee may evaluate the student's performance.

The final examination, which is oral, is concerned with the subject of the dissertation and with the candidate's understanding of related matters important to a proficiency in the principal field of study. The examination must demonstrate the candidate's mastery of the techniques of research and skill in organizing and presenting the material.

## **Awarding of Posthumous Degrees for Doctoral Programs**

### **Preamble:**

The University of Maine ordinarily awards undergraduate and graduate degrees only to those candidates who have completed all course work and other requirements necessary to earn the degree. However, given the somewhat extended nature of a graduate student's dissertation preparation, occasions may arise in which a student passes away just prior to completing the final doctoral degree requirements. This policy permits the University of Maine to confer a doctoral degree to a deceased graduate student who has been admitted to candidacy and has completed all work except submission of the final dissertation, and who would likely have finished the remaining degree requirements within a year of the death.

### **Procedure:**

Upon receiving signed approval from the student's dissertation committee, the graduate program coordinator and/or department chair forwards a nomination letter to the Dean of the Graduate School expressing support for the conferral of the posthumous doctoral degree. The letter should address how close the student was to completing the dissertation at the time of his/her death. The nomination packet should also include the student's Curriculum Vitae and may also contain letters of support from other faculty members. The Dean of the Graduate School will confer with the Executive Committee of the Graduate Board about awarding the degree posthumously. If the review is favorable, the Dean will forward a recommendation to the Provost and the President that the doctoral degree be conferred posthumously. The President will inform the UMS Vice Chancellor for Academic Affairs of the University's decision.

## **Dual Degrees**

The University of Maine Graduate School allows students to pursue two graduate degrees under the circumstances detailed below. In all cases, dual degrees should be interpreted to include separate majors within the same degree (e.g.,

Master of Science), a combination of two different degrees, or a combination of a graduate degree and certificate of advanced study/education specialist. In all cases, students will receive separate diplomas or certificates.

1. **Consecutive Degrees.** Enrollment in consecutive dual degrees refers to matriculation in a second graduate degree program at the University of Maine after completion of the requirements for a first graduate degree earned at The University of Maine. A student may apply up to 9 credits earned in a graduate degree program at The University of Maine toward a masters degree or a Certificate of Advanced Study or Education Specialist with approval of the students graduate advisory committee and/or graduate program coordinator in the second graduate program. Thesis or research credits from the first program may not be counted toward the requirements of the second program. Additional policies on transfer credit in graduate certificate programs and doctoral programs are included elsewhere in the Policies and Regulations of the Graduate School.
2. **Concurrent Degrees.** Enrollment in concurrent dual degrees occurs when a student is matriculated in two graduate degree programs simultaneously. A student may not be enrolled in more than two graduate programs simultaneously. In general, a student may pursue concurrent degrees only with approval of the appropriate graduate program coordinator(s) and the Dean of the Graduate School. The student must apply and be admitted to both programs. With approval of the students graduate advisory committee(s) and/or the graduate program coordinator(s), a student may apply up to 9 University of Maine credits earned in one masters degree toward the requirements for a second masters degree or Certificate of Advanced Study. Transfer policy for doctoral degrees is covered elsewhere in the Policies and Regulations of the Graduate School. Generally, students must complete separate theses if required by both programs. Completion of the degree requirements for the two programs need not be at the same time. If a students tuition is funded by one or more units, it is up to the funding unit to decide if tuition may cover courses taken solely for completion of the second program.
3. **Integrated Dual Degrees.** Some units have formalized concurrent dual degrees between programs which create an integrated program linking the two disciplines, while continuing to award separate degrees. Generally, these dual degree programs follow the rules outlined above. However, if the formalized dual degree program features further integration, such as a single admissions process, submission of a single thesis, a single advisory committee composed of members from both programs, or more than 9 credits of common courses, the program, including proposed programs of study, must be approved by the Dean of the Graduate School and the Graduate Board of the University of Maine.

### **Thesis/Dissertation Preparation**

Rules for thesis and dissertation preparation are outlined in a separate publication, "Thesis Guidelines," which is available at [umaine.edu/graduate/students/progress/thesis](http://umaine.edu/graduate/students/progress/thesis). It is the student's responsibility to be familiar with the format(s) acceptable to the Graduate School. The student's advisor should have the thesis or dissertation about one month prior to the final examination, or at an alternate time specified by the institutional unit concerned.

A complete draft of the thesis, in a form acceptable for examination purposes, must be delivered to the Graduate School in PDF format no later than 24 hours prior to the final oral examination. The advisor must send the "Tentative Thesis Acceptance Statement" via email. At this time, the format and major components will be reviewed as acceptable or not. A checklist of required changes and the thesis draft will be sent back to the student via email. The student should allow approximately one week for the Graduate School to review the thesis draft. The final copy of the thesis must be submitted in PDF format to the Graduate School.

A checklist of dates for potential graduates is available each semester on the Graduate School website. It is the student's responsibility to consult this checklist to ascertain appropriate due dates.

**Doctoral Commencement Eligibility.** May doctoral candidates must have successfully completed **all** degree requirements, including acceptance of dissertation by the Graduate School, prior to the Commencement date. Candidates who are unsure of their academic status should contact the Graduate School (207.581.4217).

NOTE: Doctoral students graduating in **August** may participate in Commencement if the following requirements are **ALL** met:

- Apply to graduate for August graduation in MaineStreet [studentrecords.umaine.edu/graduation/](http://studentrecords.umaine.edu/graduation/). Applying for May graduation is reserved **ONLY** for students completing all the requirements.
- Submit a Notice of Oral Examination to the Graduate School (2 weeks prior to the defense).
- Submit the tentative dissertation to the Graduate School office at least 24 hours prior to the defense.
- Successfully present and orally defend the dissertation by the last Friday in April, the established deadline for participation in Commencement.
- Submit a copy of the Final Thesis Acceptance Form demonstrating an affirmative vote of the Committee. The original form with all signatures must accompany the final dissertation and other required forms.

## Graduate Courses

### Animal & Veterinary Sciences

#### AVS 546 - Forage Science and Range Management

Participants will be introduced to the biological fundamentals needed for understanding and managing forage and grassland resources used to feed livestock and wildlife.

AVS 446 and 546 cannot both be taken for credit.

##### Prerequisites & Notes

None.

Credits: 3

#### AVS 554 - DNA Sequencing Analysis Lab

This course will take students from raw DNA sequencing data through quality assurance, through to data interpretation, statistical

analysis, and presentation of the results as a mock scientific article. A background in microbiology, microbial ecology, or genetics would be beneficial.

No programming or data analysis experience is required. Students who are performing research may bring their own sequencing data to process in

class. Students will become familiar with command-line programs and basic computer programming techniques; understand bioinformatics methods

such as quality trimming, assembling contigs, sequence alignment, using reference databases, and statistical comparisons; gain hands-on experience

in bioinformatic analysis of DNA sequences using the R platform and its packages; primarily, DADA2, phyloseq, vegan, ggplot2; and be able to apply

the knowledge gained in class to other sequence types and programs.

##### Prerequisites & Notes

Graduate standing

Graduate students may bring their own data, or some can be provided.

AVS 454 and AVS 554 can not both be taken for credit.

Credits: 2

### **AVS 555 - Animal Nutrition**

An increased efficiency of nutrient use is not only imperative for achieving profitability in the currently globalized livestock markets, but also for the sustainable use of natural resources and climate change mitigation. Considering that around 70% of the costs of raising animals is due to feeding and that global demand for animal products is increasing, understanding the basic foundations of animal nutrition is essential for professionals that work with livestock, poultry, companion animals and wildlife. This course will cover the biochemistry of nutrient use, gastrointestinal physiology and metabolism, feedstuff nutritional analysis, mathematical modelling of nutrient requirements and the life-cycle of feeding animals.

#### **Prerequisites & Notes**

Must have a Graduate standing in animal science or food science and human nutrition or permission.

Credits: 3

### **AVS 577 - Zoonoses and Animal Health**

This course focuses on the ecology, evolution and epidemiology of infectious diseases from a One Health perspective that considers wild and domestic animals, public health and ecosystem health. Core biological principles as well as ecological and social issues will be explored. The historical and contemporary literature in disease ecology and evolution as it relates to animal health will be reviewed, with an emphasis placed on wildlife and livestock diseases. Additional topics covered include the factors driving heterogeneity in disease transmission in animal populations, the ecology of disease spillover in wildlife and livestock, host-pathogen evolution, antibiotic resistance, and animal disease management strategies.

AVS 477 and AVS 577 cannot both be taken for credit.

#### **Prerequisites & Notes**

Graduate standing.

Credits: 3

### **AVS 590 - Special Topics in Animal Science**

Anatomy, breeding, diseases, management, nutrition, physiology as related to poultry or dairy.

#### **Prerequisites & Notes**

permission.

Credits: Ar

### **AVS 633 - Graduate Seminar in Animal Science**

Instruction in the techniques of, and the opportunity to practice, the oral presentation of scientific information to a critical audience. (Pass/Fail Grade Only.)

Credits: 1

## **AVS 690 - Graduate Research in Animal Science**

Varies.

Credits: Ar

## **AVS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Anthropology**

### **ANT 500 - Advanced Social Theory**

Seminar for students with and without exposure to social science theory at undergraduate level. Brief, intensive review of basic, undergraduate-level, social theory followed by advanced social theory. Emphasis on core ideas relevant to environmental policy. Focus on basic ideas and frameworks rather than minutiae.

### **Prerequisites & Notes**

Graduate standing in AEP or instructor permission.

Credits: 3

### **ANT 510 - Climate, Culture, and the Biosphere**

Explores the coupled dynamics of humans and the biosphere through time, from hominid evolution more than 2.5 million years ago to the present era. Curriculum draws from anthropology, geography, paleoecology, and climate science to inform on the integrated human-environment relationship in the context of global change. This course is identical to BIO 510.

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **ANT 521 - Geographic Information Systems I**

Students will build an understanding of the fundamentals of a GIS through lecture, readings, and computer activities. Students will learn to use a specific GIS software system, ArcGIS, and to define and complete a simple GIS



project using existing data. This computer-intensive course includes a detailed discussion and related computer activities on the following topics: basic geography and map concepts, what a GIS is, data sources, data quality, databases, data classification, vector and raster data, spatial analysis, project management, cartographic communication, projections, datums, coordinates, and ethics.

**Prerequisites & Notes**

None

Credits: 3

## **ANT 522 - Geographic Information Systems II**

This is an intermediate/advanced course for students who have had some introduction to GIS and wish to pursue applications in the natural and social sciences. We will focus on grid-based data models for visualization, modeling, and analysis. Assessment will be based on problem sets, lab work, and a final project. Readings, assignments, activities, and discussions will cover: The raster data model, generating and working with grid data, georeferencing images and grids, remote sensing technologies and data, visualizing and managing raster data sets, interpolation methods for generating continuous surface data, mathematical operations with grid data for spatial analysis with satellite imagery, evaluating and documenting error and uncertainty, ethics and accountability in spatial analysis, modeling and visualization.

**Prerequisites & Notes**

ANT 521 GIS I or permission of instructor

Credits: 3

## **ANT 530 - Human Dimensions of Climate Change**

Multi-disciplinary overview of selected social science topics on humans and climate change. Critical anthropological attention to what this literature overlooks and how these omissions can be dealt with.

Credits: 3

## **ANT 550 - Anthropological Dimensions of Environmental Policy**

Seminar on basic principles of environmental policy and analysis in both industrialized and Third World societies. Covers policies and institutions of states, local governments and co-management systems. Emphasis on anthropological case studies on the management of key common-pool resources, including fisheries, wildlife, irrigation systems and forests.

Credits: 3

## **ANT 553 - Governance of the Commons and Global Change**

This course examines different theoretical perspectives on environmental governance through the lens of diverse common pool resources such as forests, fisheries, pastures, water, agricultural systems, and oceans. This course uses comparative perspectives to explore how diverse institutions or embedded cultural practices facilitate the ability of certain societies to self-organize, overcome collective action problems, and avoid a tragedy of the commons at different scales. Provides theoretical insights into challenges and opportunities for commons governance in the context of global capitalism and change. This course is identical to SMS 553

**Prerequisites & Notes**

Senior or graduate standing or permission.

Credits: 3

### **ANT 555 - Resource Management in Cross-cultural Perspective**

Examines the institutions used to reduce risk and uncertainty in selected societies dependent on renewable resources. Emphasis on fishing societies around the world with some discussion of the utilization of forests and rangeland by different societies. Studies the governance structures used to manage common pool resources including state systems, local level management systems and co-management systems. This course is identical to SMS 555.

#### **Prerequisites & Notes**

Senior or graduate standing or permission.

Credits: 3

### **ANT 560 - Research Design and Methods**

This seminar course for graduate students emphasizes the integration of social science theories and methods for the development of research proposals. In this course, students define a research problem, identify a set of research questions or hypothesis, and design a plan of action to carry out their own research. In the process, students become familiar with research ethics, IRB protocols, and suite of methodological tools used by anthropologists and others to produce social science research. In-class discussions allow students to critically assess benefits and limitations of various field methods, qualitative vs. quantitative approaches, and analytical techniques. In-class workshops allow students to discuss their own research ideas on a regular basis with classmates and instructor while turning those ideas into a proposal. By the end of the course, students will have a solid research proposal that can be adapted for submission to various funding agencies.

#### **Prerequisites & Notes**

Graduate standing.

Credits: 3

### **ANT 564 - Ecological Anthropology**

Comparative study of human populations in ecosystems. Topics include the adaptive nature of culture, implications of the ecological approach for anthropological theory, sociocultural evolution and change, and contemporary problems. Case studies from simple and complex societies.

ANT 464 and ANT 564 cannot both be taken for degree credit.

#### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **ANT 566 - Economic Anthropology**

Comparative study of production, consumption and exchange in selected Western and non-Western societies. Emphasis on factors influencing economic decisions in a variety of social and cultural settings.

ANT 466 and ANT 566 cannot both be taken for degree credit.

#### **Prerequisites & Notes**

Graduate Standing or permission.

Credits: 3

### **ANT 576 - Method and Tehory in Archaeology**

The history of and current debates in archaeological method and theory, with a focus on Americanist archaeology.

#### **Prerequisites & Notes**

ANT 317, ANT 372.

Credits: 3

### **ANT 597 - Advanced Topics in Anthropology**

Advanced students study selected topics with a staff member. Credits to be arranged with instructor.

#### **Prerequisites & Notes**

Graduate student standing and advanced undergraduates by permission. Departmental approval required.

Credits: 1-3

### **ANT 598 - Independent Study**

Independent study in Anthropology; specific content, scheduling, and credit hours to be arranged in consultation with the instructor

#### **Prerequisites & Notes**

Permission required.

Credits: 1-3 variable

### **ANT 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Art**

### **ART 570 - Intermedia Studio I**

Intended to provide an environment for guided independent art/research/production in intermedia. Emphasis placed on the conceptual and interdisciplinary nature of this art form, awareness and manipulation of traditional art boundaries,

and the exploration of non-traditional art media. This is an advanced graduate-level studio course emphasizing independent levels of work, theoretical engagement in the creative process and an ongoing commitment to individual studio praxis. May be repeated for credit. (This course is identical to NMD 570.)

**Prerequisites & Notes**

Graduate standing and permission

Credits: 3

## **ART 597 - Independent Study in Studio Art**

Graduate level independent study in studio art (painting, sculpture, printmaking, drawing), or related areas. Projects must be designed by the student and approved by the graduate instructor in studio art.

**Prerequisites & Notes**

permission of the instructor.

Credits: Ar

## **ART 598 - Directed Study in Studio Art**

Graduate level study and research in studio art or related areas directed by a graduate faculty member in studio art.

**Prerequisites & Notes**

permission of the instructor.

Credits: Ar

## **Art Education**

### **AED 574 - Topics in Art Education**

Advanced seminar and workshop with research projects in art education and related areas. Specific topic to be announced or arranged. The course may be repeated once for credit.

**Prerequisites & Notes**

Art teaching experience.

Credits: 3

### **AED 597 - Independent Study in Art Education**

Advanced level projects, readings or seminars in art education. Topic and form of study to be determined by the student in consultation with faculty member. May be repeated for credit.

**Prerequisites & Notes**

graduate standing and permission.

Credits: 1-3

### **AED 598 - Directed Study in Art Education**

Structured projects, readings or seminars in art education at an advanced level. Topics and form of study to be determined by the student under the direction of a faculty member. May be repeated for credit.

**Prerequisites & Notes**

graduate standing and permission.

Credits: 3

## **Art History**

### **ARH 597 - Independent Graduate Study**

Entails advanced research and writing projects in the history of art.

**Prerequisites & Notes**

Graduate Standing and instructor's permission.

Credits: 1-3

### **ARH 652 - Critical Methods in History of Art**

Immerses students within the historiography of History of Art, familiarizing them with the philosophical underpinnings, historical context, rhetorical tones, critical vocabularies and intended goals of each investigative strategy. The exploration of the various methodological approaches includes: Connoisseurship, Iconography, Reception Theory, Marxism, Feminism, Deconstruction, Visual Linguistics and perhaps other emerging intellectual frameworks.

**Prerequisites & Notes**

Permission

Credits: 3

### **ARH 692 - Baroque Research Seminar**

Addresses focused topics within the field of Baroque History of Art such as the development of genre painting, the rise of viewer engagement, visions of the New World, etc. Students will define and research their own individual projects, present them within the forum of the seminar, with the aim of delivering them at a professional conference and bring them to fruition as publishable papers.

**Prerequisites & Notes**

Permission

Credits: 3

### **ARH 693 - Medieval Research Seminar**

Focus on special topics selected by the instructor in the field of Medieval History of Art. Students will define and research their own individual projects, present them within the forum of the seminar, with the aim of delivering them at a professional conference and bring them to fruition as publishable papers.

**Prerequisites & Notes**

Permission

Credits: 3

## **ARH 694 - Renaissance Research Seminar**

Focus on special topics selected by the instructor in the field of Renaissance History of Art. Students will define and research their own individual projects, present them within the forum of the seminar, with the aim of delivering them at a professional conference and bring them to fruition as publishable papers.

### **Prerequisites & Notes**

Permission

Credits: 3

## **Astronomy**

### **AST 598 - Special Topics in Theoretical or Experimental Astrophysics**

Varies.

### **Prerequisites & Notes**

departmental permission.

Credits: Ar

## **Biochemical Engineering**

### **BEN 551 - Biological and Medical Image Analysis I**

Introduction to computational analysis of imaging data from biological and medical contexts. Math and physics-based algorithmic development and programming skill centered on scripting languages such as ImageJ and R. Development of a term project.

### **Prerequisites & Notes**

MAT 228, MAT 258 (or MAT 262 & MAT 259) or permission from instructor.

Credits: 3

### **BEN 552 - Biological and Medical Image Analysis II**

Advanced computational analysis of imaging data from biological and medical contexts. Math and physics-based algorithmic development and programming centered on scripting languages such as ImageJ/Fiji and R. Development of a term project.

### **Prerequisites & Notes**

BEN 551 or permission from the instructor.

In consultation with the instructor, each student will work on the computational analysis/modeling of one or more biomedical image datasets.

Credits: 3

## **Biochemistry, Microbiology and Molecular Biology**

### **BMB 502 - Introduction to Bioinformatics**

A multidisciplinary study of fundamental biological questions through the organization, integration and analysis of increasingly large and complex datasets. Topics include primary data repositories, data integration and curation, sequence analysis methods, functional annotation, high-throughput sequence analysis workflows, statistical analysis of gene expression data, clustering methods and modeling biological networks.

#### **Prerequisites & Notes**

BMB 280 or instructor's permission.

Credits: 3

### **BMB 530 - Cellular Signal Transduction Mechanisms**

Signal transduction mechanisms used by cells to perceive extracellular messages and to produce proper responses in regulating growth, development and metabolism. (Offered every other year.)

#### **Prerequisites & Notes**

BMB 460 or permission.

Credits: 3

### **BMB 580 - Seminar in Microbiology**

Preparation and presentation of papers dealing with current research in the field of microbiology.

#### **Prerequisites & Notes**

Seniors and graduate students only.

Credits: 1

### **BMB 582 - Seminar in Biochemistry**

Preparation and presentation of papers dealing with current research in the field of biochemistry.

#### **Prerequisites & Notes**

Seniors and graduate students only.

Credits: 1-3

### **BMB 597 - Special Topics in Biochemistry**

A graduate-level readings, lecture, seminar, or laboratory course covering timely topics in Biochemistry. Can be repeated for graduate credit.

**Prerequisites & Notes**

Permission of Instructor.

Credits: 1-3

## **BMB 598 - Special Topics in Microbiology**

Covers selected topics or areas within the field of Microbiology. May be repeated for graduate credit.

**Prerequisites & Notes**

permission.

Credits: 1-3

## **BMB 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Biological Engineering**

### **BLE 597 - Advanced Topics in Biological Engineering**

Advanced topics not regularly covered in other BLE courses. Content varies based on instructor interest area. May be repeated for credit.

**Prerequisites & Notes**

Senior or graduate standing; permission.

Credits: 1-3

### **BLE 599 - Independent Study in Biological Engineering**

Advanced independent study for qualified students who present suitable projects for intensive investigation in the area of faculty interest. May be repeated for credit.

**Prerequisites & Notes**

Senior or graduate standing; permission.

Credits: 1-3



## **BLE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Biological Sciences**

### **BIO 500 - Biological Inquiry and Analysis**

This course provides an overview of the broad field of biology, including: foundational topics and research frontiers, interests and perspectives of UMaine faculty, the structure of graduate study in the School of Biology and Ecology (SBE), research facilities and opportunities. Required for graduate students in SBE.

### **Prerequisites & Notes**

Matriculation in a graduate program at the University of Maine.

Credits: 2

### **BIO 501 - Evolutionary Theory and Application**

This course is a graduate-level survey of modern evolutionary theory. The course emphasizes an understanding of the interplay between different evolutionary forces in wild populations. Through lecture, student-led discussion, and problem sets students will gain a working familiarity with modern evolutionary theory and practice many of the quantitative approaches used to study evolution in wild populations.

### **Prerequisites & Notes**

None.

Credits: 3

### **BIO 504 - Advanced Developmental Biology**

Cellular mechanisms of animal development, including fertilization, cell cleavage, cell movement, cellular interactions, extracellular matrix, developmental genetics and cancer.

### **Prerequisites & Notes**

Graduate Standing

Credits: 3

### **BIO 505 - Professionalism in Biology**

A graduate-level survey of the fundamental principles of professional development, including oral and written communication skills, the roles of mentors and colleagues, professional ethics, career planning and the job application process.

**Prerequisites & Notes**

Graduate standing.

Credits: 2

**BIO 510 - Climate, Culture, and the Biosphere**

Explores the coupled dynamics of humans and the biosphere through time, from hominid evolution more than 2.5 million years ago to the present era. Curriculum draws from anthropology, geography, paleoecology, and climate science to inform on the integrated human-environment relationship in the context of global change. This course is identical to ANT 510.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: e

**BIO 511 - Insect Ecology**

This course covers fundamental concepts in ecology as they apply to insects on population, community, and ecosystem levels. Students will learn about intricate interactions between insects and their environment and about insect contribution to maintaining diversity of life on Earth.

**Prerequisites & Notes**

Beginning course in ecology and background in statistics, physiology and entomology or permission.

This course is taught Spring of odd years.

BIO 411 and BIO 511 cannot be both taken for credit.

Credits: 3

**BIO 512 - Advanced Seminar in Biology**

Readings, presentations, and student-led discussions of recent primary literature in specific areas of biology. Topics vary and may involve both theoretical and applied studies.

**Prerequisites & Notes**

Graduate standing or permission of the instructor. May be repeated for credit.

Credits: 1-3

**BIO 515 - Thermal Ecology-Animals and Climate Change**

This seminar will focus on providing an understanding of the thermal physiology and energetics of animals. Students will become familiar with animal physiology, and the relationships between environmental temperatures, performance, and fitness. The course will include a tutorial on compiling and interpreting long-term temperature datasets including

use of UMaine's Climate Reanalyzer. By the end of the course, students will be familiar with the literature and techniques used for predicting the vulnerability of vertebrates to global change using mechanistic physiological models.

Credits: 3

## **BIO 525 - Community Ecology**

An advanced discussion of the organization of biological communities including community structure, stratification and patterns, niche division and species diversity, competition, predation, community classification and description, biogeography of communities, succession and climax. Lec 3.

### **Prerequisites & Notes**

BIO 319 or equivalent.

Credits: 3

## **BIO 530 - Biology of the Fungi**

The major taxa of fungi are examined in relation to their ecology and physiology.

### **Prerequisites & Notes**

BIO 100 or equivalent and/or a basic ecology course or permission.

Credits: 3

## **BIO 531 - Fungal Biology Laboratory**

An optional laboratory to accompany BIO 530. Lab 2.

### **Prerequisites & Notes**

Corequisite: BIO 532.

Credits: 1

## **BIO 532 - Biology of the Fungi**

Ecology, physiology and classification of the major groups of fungi and their impact on human affairs. Laboratory and fieldwork will emphasize current techniques used to study fungi. (This course is identical to BIO 432.) . Lec 2, Lab 4.

### **Prerequisites & Notes**

BIO 100 and BIO 200 or equivalents or permission.

Credits: 4

## **BIO 550 - Biogeochemistry of Terrestrial Ecosystems**

Biogeochemical patterns and processes in forest ecosystems. Comparative data from the ecological literature are used to examine the important processes of element cycling, including atmospheric deposition, canopy processes, plant nutrient circulation, decomposition, animal-insect interactions, soil chemical phenomena, weathering, leaching, gaseous fluxes, forest hydrology and overall watershed biogeochemical responses to disturbance. Lec 3.

**Prerequisites & Notes**

permission plus BIO 319 and one year of college chemistry.

Credits: 3

**BIO 555 - Biological Invasions**

Analysis of mechanisms behind species establishment in new areas, their impact on native ecology, theoretical bases of invasion-related phenomena, and economic and sociopolitical costs inflicted by exotic species. (Note: BIO 455 and BIO 555 cannot both be taken for degree credit).

**Prerequisites & Notes**

graduate standing and permission of the instructor.

Credits: 3

**BIO 572 - Paleoecology**

Explores how paleoecology expands the temporal scale of ecology, how climate change has affected terrestrial and freshwater systems over the Quaternary, and how lake ecosystems have changed in recent centuries. BIO 572 and BIO 476 can not both be taken for degree credit. Lec 3, Lab 3.

**Prerequisites & Notes**

An ecology course, e.g. BIO 319 or permission.

Credits: 4

**BIO 574 - Neurophysiology**

A biophysical approach to the detailed workings of peripheral and central nervous systems connecting structure (molecular, subcellular and specialized tissues) to function (physical and neural), through wet lab experiments on living cells, and/or computer-assisted exercises. Lec 2, Lab 1.

**Prerequisites & Notes**

graduate standing and permission of the instructor.

Credits: 3

**BIO 580 - Cell Biology**

Examines the fundamental cellular, sub-cellular and molecular characteristics of cells with emphasis on structure and function of organelle systems common to eukaryotic cells. Note: Because of overlap, BIO 480 and BIO 580 cannot both be taken for degree credit. Lec 3.

**Prerequisites & Notes**

BIO 200 or BIO 208 or SMS 201, and either CHY 252 or BMB 322; or consent of instructor.

Credits: 3

**BIO 583 - Cell Biology (Lab)**

A laboratory course consisting of exercises employing techniques commonly utilized in cell biological research, with an emphasis on skills essential for a career involving cell biology lab work including mammalian cell culture and cellular energetics. Note: Because of overlap, BIO 483 and BIO 583 cannot both be taken for degree credit. Lab 2.

**Prerequisites & Notes**

BIO 580 or concurrently; or consent of the instructor.

Credits: 1

**BIO 593 - Advanced Biometry**

A course in advanced graduate statistics oriented towards the environmental sciences. This course is intended as a breadth-oriented survey course that will expose the student to all types of statistics one might encounter in environmental research. It will review and place into a more general context ANOVA and regression, cover philosophy of science/modes of statistics (Bayesian and Monte Carlo), random/mixed/hierarchical models, generalized linear models (including logistic and Poisson regression), modern regression (robust, non-linear, machine-learning), multivariate statistics, and spacial/temporal statistics.

**Prerequisites & Notes**

None

Credits: 4

**BIO 597 - Special Topics in Biology**

As available.

**Prerequisites & Notes**

Graduate standing or permission of the instructor. May be repeated for credit.

Credits: 1-6

**BIO 687 - Problems in Biological Sciences I**

Individual research projects conducted by graduate students under faculty supervision. Research topics should be different from topics of their thesis research.

**Prerequisites & Notes**

Permission of the instructor. May be repeated for credit.

Credits: 1-6

**BIO 688 - Problems in Biological Sciences II**

Varies.

**Prerequisites & Notes**

Permission of instructor

Credits: 1-6

## **BIO 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Biomedical Sciences**

### **BEN 502 - Advanced Materials in Bio-inspired Engineering**

This course will cover advanced materials inspired by nature using directed problem solving and hands-on exploration, building on information learned in BEN 403. Students will be exposed to the power of an integrated approach to engineering which draws on biological principles and materials science to create the materials of the future. Class notes: students will need to have a good background in chemistry, physics, biology, and mathematics.

### **Prerequisites & Notes**

BEN 403.

Credits: 3

### **BEN 503 - Advanced Instrumentation Design**

This project based course will focus on the rational design of instrumentation for the observation and quantification of specific phenomena in complex and biological systems. A range of widely used clinical, diagnostic and therapeutic techniques will be reviewed through study of literature. Individual student projects form the basis for class discussion where theory, design, component specification and assessment, of capabilities and limitations, are explored. Sensitivity analysis will be employed to identify design weaknesses and fundamental design limitations. Detailed and fully specified instrumental designs will be produced and their feasibility assessed.

### **Prerequisites & Notes**

None.

Credits: 3

### **BEN 512 - Modeling of Biomedical Systems**

This course will focus on the use of advances computational tools to help quantify biomedical solutions that address clinical, therapeutic, and diagnostic problems. The use of a finite element program to describe situations such as blood flow in complex passages, flow in microfluidic devices, oxygen transport in tissue, and drug delivery will be emphasized as well as other techniques.

### **Prerequisites & Notes**

None.

Credits: 3

## **BEN 580 - Computational Methods in Biomedical Engineering**

In this course we explore cutting-edge computational methods and their applications to study biomedical data, from DNA sequence data, to fluorescence microscopy, radiography, holography, and next-generation label free imaging techniques. Computational tools studied including scripting languages such as Python and Perl, statistical software such as R, and image analysis software such as ImageJ.

### **Prerequisites & Notes**

None.

Credits: 3

## **BMB 520 - Introduction to Image Analysis**

The current expectations of rigor and reproducibility in biomedical sciences require quantification of results obtained through microscopy. This course introduces students to the basics of working with the digital microscopy images and focuses on the quantification of fluorescence microscopy data using ImageJ and MATLAB.

### **Prerequisites & Notes**

None.

Credits: 3

## **BMS 525 - Molecular Genetics**

Material covered includes structure of DNA, genes, and genomes and how they affect the gene expression and regulation as well as an introduction to web-based tools for viewing sequence and genomics information. This course will also require reading and discussion of the recent scientific literature.

### **Prerequisites & Notes**

Permission of instructor.

Credits: 3

## **BMS 605 - Professionalism and Responsible Conduct of Research in Biomedical Science and Engineering**

The National Institutes of Health defines responsible conduct of research as the practice of scientific investigation with integrity. It involves the awareness and application of established professional norms and ethical principles in the performance of all activities related to scientific research. Case studies will be used to explore current issues related to the responsible conduct of research, with a focus on the professional and ethical principles. Through weekly readings, didactic presentations and small group discussions and role playing, students will learn to critically examine ethical questions that arise in the practice of scientific research, and identify the most responsible course of action. Topics include mentor/mentee responsibilities and relationships, collaborative research, authorship, peer review, conflicts of interest, data management, human subject protections, animal welfare, laboratory safety, research misconduct, and ethical issues in biomedical research. Application of the established norms and ethical principles will promote honesty, accuracy, rigor, and reproducibility in research while providing an inclusive and supportive scientific research environment.

**Prerequisites & Notes**

None.

Credits: 1-3

**BMS 625 - Foundations of Biomedical Science & Engineering**

Course provides an overview of fundamental/critical issues in biomedical science and engineering today.

**Prerequisites & Notes**

None

Credits: 1-4

**BMS 630 - Journal Club in Biomedical Science and Engineering**

Reading, critiquing, and discussion of primary literature.

**Prerequisites & Notes**

None.

Credits: 1-3

**BMS 635 - Current Approaches in Biomedical Science & Engineering**

Current techniques, methods and concepts in Biomedical Science & Engineering topics.

**Prerequisites & Notes**

BMS 625

Credits: 1-3

**BMS 640 - Experimental Methods in Cell & Molecular Biology**

Focuses on a wide range of common techniques used in cell and molecular biology. Students will be expected to understand principals, assays, methods, and interpretation of data generated using these techniques.

**Prerequisites & Notes**

None.

Credits: 3

**BMS 645 - Biology Tissue Development and Function**

Cellular biology of tissue development in the context of receptor signaling, cell-cell interactions, and tissue function, including major receptor-mediated signaling pathways and how these pathways integrate to control tissue development and function.

**Prerequisites & Notes**

BMS 640



Credits: 3

### **BMS 650 - Grant Writing in Biomedical Science & Engineering**

This course is intended to teach you the basics of writing a grant to secure funding for your scientific and/or engineering research.

#### **Prerequisites & Notes**

None

Credits: 3

### **BMS 660 - Cell, Molecular and Developmental Neurobiology**

Directed reading with discussion, supplemented by reading and discussion of classic papers in the field of Neuroscience.

#### **Prerequisites & Notes**

None.

Credits: 3

### **BMS 690 - Special Topics in Biomedical Science & Engineering**

Current and emerging topics in the field of Biomedical Science and Engineering. May be repeated for credit.

#### **Prerequisites & Notes**

Graduate Standing.

Credits: 1-3

### **BMS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Business Administration**

### **ACC 507 - Advanced Accounting**

This course covers several major topics: the theory of accounting for business combinations including mergers and acquisitions; foreign currency transactions and translations; and formation, operation and dissolution of general

partnerships.

**Prerequisites & Notes**

BUA 301, BUA 302.

Credits: 3

**ACC 515 - Advanced Federal Tax Topics**

The course examines federal tax principles associated with the formation and operation of corporations, partnerships and S corporations. The basic concepts and process of doing tax research are also introduced. An overview of other topics such as the federal estate and gift taxes, tax-exempt organizations, and current tax issues are discussed.

**Prerequisites & Notes**

BUA 312 or equivalent or permission from Business School Office of Graduate Programs.

Credits: 3

**ACC 608 - Topics in Accounting**

Course coverage varies. Recent courses have included readings in accounting history and theory, accounting research using the FASB's Codification to answer complex accounting issues presented in case studies and discussions of contemporary national and international accounting issues.

**Prerequisites & Notes**

BUA 301 and BUA 302 or equivalents. Must be in a graduate degree or certificate program.

Credits: 3

**ACC 697 - Field Experience in Accounting**

Field experience in accounting relevant to the student's educational development and career goals. Neither past work experience nor field experience courses taken at other campuses or universities will be permitted as substitutes. Course may be repeated, but student may not earn more than 3 internship credits.

**Prerequisites & Notes**

Permission of Business School Office of Graduate Programs; only open to students in the Accounting MBA.

Credits: 1-3

**BUA 561 - Knowledge Management and Decision Support Systems**

This course is designed to explore the dimensions of knowledge management that influence the competitive advantage of organizations. Major topics include the ability to harness intellectual capital for innovation, knowledge creation, sharing, storage and accessibility. Appropriate technologies will be used to apply these concepts.

**Prerequisites & Notes**

Seniors or graduate students in good standing.

Credits: 3

## **BUA 601 - Strategic Data Analysis**

To inform organizational decisions, students will learn to identify business problems, differentiate types of big data, propose a research question, and think critically about which statistical processes and applications will yield insights from the data.

### **Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

## **BUA 680 - Foundations of Business Intelligence and Analytics**

This course presents the philosophical and technical foundations of business intelligence and analytics. The philosophical principles of business intelligence and analytics are discussed. Important fundamental concepts and tools in business intelligence and analytics are introduced using a structured and integrated approach that moves from initial data collection to final decision outcome assessment. Throughout the course, conditional reasoning and logical thinking in terms of process and systems are emphasized.

### **Prerequisites & Notes**

MBA student or permission from Business School Office of Graduate Programs.

Must be in a graduate degree or certificate program.

Credits: 3

## **BUA 681 - Data Management and Analytics**

This course introduces students to different types of data commonly collected in business settings. Students will also learn basic skills of managing and wrangling the business data using analytical techniques like structured query language and data visualization in R, an environment for statistical computing and visualization. Knowledge of basic statistics through linear regression is helpful, but not necessary. The course assumes students have had no previous exposure to computer programming.

### **Prerequisites & Notes**

BUA 601 or instructor permission

Credits: 3

## **BUA 682 - Data Pre-Processing for Business Analytics**

This course is designed to enhance student's understanding of data quality problems commonly encountered in business environments including but not limited to missing data, noisy data, and data biases. This course discusses mechanisms of these problems and their impact on data analysis and modeling results and presents how to solve these problems by using different data pre-processing techniques such as imputation, integration, normalization, and transformation. Students practice these techniques with business data sets using mainstream analytical software.

### **Prerequisites & Notes**

BUA 680 or permission

Credits: 3

### **BUA 683 - Information Visualization**

This course presents a variety of data visualization techniques to graphically summarize business data information. Students will learn to create charts, maps and other visualizations to create effective graphical displays of business data that tell meaningful business stories. Students will also learn to critically evaluate examples from print media and the internet after learning the foundations of information visualization.

#### **Prerequisites & Notes**

MBA student or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

BUA 601 or equivalent, or permission

Credits: 3

### **BUA 684 - Business Data Mining and Knowledge Discovery**

This course introduces students to a variety of cutting-edge mining methods for the purposes of supervised learning and unsupervised learning. Students will apply these methods to analyze data in different business functional areas such as marketing, accounting/finance, operation, and management across industry sectors. The course emphasis is on learning valuable data information from the data analysis results and discovering interpretable and meaningful knowledge that can support better business decision making. Mainstream analytical software is used intensively to analyze real business datasets.

#### **Prerequisites & Notes**

BUA 380 or permission

Credits: 3

### **BUA 685 - Problem Solving and Decision Analysis**

This course is dual focused on business problem formulation and decision analysis. First, the course introduces students to a variety of ways to formulate a business problem and identify its decision alternatives using systems thinking and process thinking. Second, the course presents core concepts and techniques for conducting data-driven decision analysis (e.g. utility/objective function, linear/nonlinear optimization, and simulation optimization) with purpose of recommending optimal decision options by taking advantage of the results of predictive analytics.

#### **Prerequisites & Notes**

BUA 685 or permission, MBA student or permission from Business School Office of Graduate Programs, Must be in a graduate degree or certificate program.

Credits: 3

### **BUA 686 - Predictive and Business Forecasting**

This course presents a set of topics in developing analytical methodologies that make prediction and forecasting about future events of interest to individual business and industry in general. Students are introduced to managerial techniques and analytical models that reveal valuable relationships in economic and business data for supporting short-term and long-term planning. Students will learn how to build the models, how to interpret the predictions and forecasts produced from the models, and how to evaluate the reliability of the model results.

**Prerequisites & Notes**

MBA student or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

BUA 601 or equivalent or permission.

Credits: 3

**MBA 545 - Selected Topics in Business Administration**

Detailed study in various aspects of functional areas of accounting, business analytics, finance, management, marketing, and management information systems.

**Prerequisites & Notes**

MBA student or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

Credits: 1-3

**MBA 596 - International Field Study**

Provides an opportunity to learn about foreign culture, to visit with foreign government and business officials, and to learn about business practices worldwide via a hands-on immersion experience. Course includes preparatory class work and a final report.

**Prerequisites & Notes**

Permission of the University of Maine Business School Office of Graduate Programs.

Credits: 3

**MBA 605 - Creating & Capturing Value in the Digital Economy**

Represents an integration of concepts and principles from the Marketing and Management Information Science disciplines. The Internet is offering radical new ways of conducting business. This course presents students with concepts and information-based strategies for capturing and creating value in the new information-based economy by assimilating sound marketing strategies with information systems to create innovative processes and marketing practices.

**Prerequisites & Notes**

BUA 270 or equivalent or Business School Graduate Marketing Tutorial; MBA student or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

Credits: 3

**MBA 609 - Financial Statement Analysis**

This course builds on foundational accounting coursework by focusing on the understanding and interpretation of corporate financial statements. Topics typically include analysis of the primary statements via horizontal, vertical, and ratio analysis, DuPont analysis, and financial statement forecasting.

**Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

### **MBA 620 - Law, Business and Society**

Introduces managers to current U.S. laws and regulations that impact on the operations of business. Employs an interdisciplinary approach to the study of law, utilizing elements of political economy, international business, ethics, social responsibility and management theory.

#### **Prerequisites & Notes**

MBA student or permission of the University of Maine Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

Credits: 3

### **MBA 626 - Management of Contemporary Organizations**

Explores analytical perspectives to understand how individuals organize themselves in accomplishing organizational goals. Topics include organizational structure, culture, teamwork and diversity, the organization and the global environment

#### **Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

### **MBA 637 - Global Supply Chain Networks**

An introduction to managing the flow of material, products, services, information, and cash via the processes, technologies, and facilities that link primary suppliers through to ultimate customers. Attention is given to the functions of forecasting, production planning, supply management, production, transportation, inventory, warehousing, packaging, materials handling, and customer service.

#### **Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

### **MBA 645 - Selected Advanced Topics in Business Administration**

Advanced study in various aspects of functional areas of accounting, finance, management, marketing, and management information systems.

#### **Prerequisites & Notes**

MBA student or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

Credits: 1-3

### **MBA 649 - Strategic Decision Making**

This capstone course studies administrative practices at the strategic level of business management. Develops administrative competence in the formulation of business policy at the decision-making level through case study or practicums.

**Prerequisites & Notes**

Department Permission

Credits: 3

## **MBA 651 - Financial Management**

Provides a foundation in financial management by integrating topics such as measurement of risk, portfolio theory, interest rate determination, valuation, capital budgeting and cost of capital.

**Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

## **MBA 652 - Management of Financial Institutions**

Approaches management of financial institutions through readings, cases and guest speakers. Emphasizes recognition, analysis and management of major risks faced by financial intermediaries in a global environment.

**Prerequisites & Notes**

BUA 350 or equivalent or Business School Graduate Finance Tutorial; must be in a graduate degree or certificate program.

Credits: 3

## **MBA 653 - Investment Management**

Analysis and valuation procedures to determine the investment quality of specific securities. Sets criteria for formulation of a sound investment policy and selection of investment media to implement it. Develops techniques of portfolio management and periodic reappraisal.

**Prerequisites & Notes**

BUA 350 or equivalent or Business School Graduate Finance Tutorial; must be in a graduate degree or certificate program.

Credits: 3

## **MBA 668 - Electronic Commerce**

Prepares current and future managers to gain an understanding of how e-commerce and technologies have radically altered the business environment and how to succeed and thrive in this new economy.

**Prerequisites & Notes**

BUA 605, or BUA 235 and BUA 270 or equivalents (Business School Graduate Marketing Tutorial may substitute for BUA 270); MBA student: or permission from Business School Office of Graduate Programs. Must be in a graduate degree or certificate program.

Credits: 3

## **MBA 670 - Managerial Marketing**

BUA 670 Managerial Marketing is designed to explore both the theory and application of marketing concepts from a managerial perspective. The course emphasizes marketing decision making and marketing strategy development through case studies and marketing planning activities.

### **Prerequisites & Notes**

Graduate Standing in a Degree or Certificate Program or Permission from the Graduate Business Office

Credits: 3

## **MBA 695 - MBA Internship**

Field experience in business relevant to the student's educational development and career goals. (Neither past work experience or field experience courses taken at other campuses or universities will be permitted as substitutes.) Only open to MBA students. Course may be repeated, but student may not earn more than 3 internship credits.

### **Prerequisites & Notes**

Permission of Business School Graduate Director.

Credits: 1-3

## **MBA 698 - Independent Study**

Provides an opportunity for well-qualified students to pursue a selected topic in great depth under the supervision of an individual faculty member. The topic is to be determined in consultation with the faculty instructor.

### **Prerequisites & Notes**

Permission of Business School Graduate Director. Independent study must be approved by the Business School Graduate Curriculum and Learning Committee.

Credits: 3

## **Canadian Studies**

### **CAN 501 - Understanding Canada**

This course provides a multidisciplinary grounding in Canadian history to contemporary issues, using multimedia components, readings, research and writing. The course objective is to extend students' knowledge base of Canada by highlighting the historical trajectory that resulted in the development of a unique culture, economy, and political system. By the end of the course, students shall clearly understand the key cultural, social, political, and economic characteristics that distinguish Canada within the international system

### **Prerequisites & Notes**

None.

Credits: 3



## **CAN 599 - Internship**

Contract work for an external employer. Integrate academic and professional experience. Complete a daily journal and a final project. Eligibility: students from any graduate program whose studies relate to Northeastern Americas.

### **Prerequisites & Notes**

GPA 3.0 or higher.

Credits: 1-3

## **Chemical Engineering**

### **CHE 510 - Introduction to Transport Phenomena**

A study of principles of momentum, energy and mass transport including mathematical modeling of transport processes by exact and approximate techniques. (Fall.)

Credits: 3

### **CHE 540 - Advanced Chemical Engineering Thermodynamics**

Studies of phase and reaction equilibria in multi-component, non-ideal, and complex systems. Flow and non-flow systems. Application of general thermodynamic methods to problems in chemical engineering. Lec 3. (Fall.)

Credits: 3

### **CHE 561 - Advanced Chemical Engineering Kinetics**

Examines theory of homophase and heterophase catalysis and chemical transformation as a base for process design. Includes chain reactions, acid-base catalysis, enzymes, and commercial case studies such as hydrocarbon synthesis, organic oxidations, cracking, and platforming. . Lec 3. (Offered by arrangement.)

Credits: 3

### **CHE 580 - Chemical Engineering Analysis**

Modeling and simulation of chemical engineering processes. Emphasis on the formation of a model using ordinary and partial differential equations, and on the solution of the model using numerical methods. (Offered by arrangement.)

Credits: 3

### **CHE 598 - Special Topics in Chemical Engineering**

Special topics presented as need and interest require. Topics will include studies relevant to fields of application, such as pulp and paper, polymers, process control, materials conversion, and surface properties. (Offered by arrangement.)

### **Prerequisites & Notes**

permission.

Credits: Ar

## **CHE 695 - Graduate Seminar I**

Reports and discussion of recent developments in chemical engineering and related fields, based on the literature or current investigations. Required of all graduate students.

Credits: 1

## **CHE 696 - Graduate Seminar II**

Reports and discussion of recent developments in chemical engineering and related fields, based on the literature or current investigations. Required of all graduate students.

Credits: 1

## **CHE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Chemistry**

### **CHY 502 - Chemistry Instructional Laboratory Leadership**

For chemistry teaching assistants to learn how to effectively communicate, supervise laboratory work, and facilitate group interactions with students in the general laboratory.

Credits: 1

### **CHY 523 - Advanced Polymer Chemistry**

Polymer types, synthesis kinetics and mechanisms, characterization techniques, and molecular structure and applications in contemporary polymer science concepts and literature. Because of overlap, CHY 423 and CHY 523 cannot both be taken for degree credit.

### **Prerequisites & Notes**

A grade of C- or better in CHY 252 or equivalent: or permission

### **CHY 531 - Structure and Mechanism in Biological Chemistry**

Examination of biosynthetic pathways, structure and function of enzymes including metalloenzymes, methods of structure determination and synthetic pathway elucidation, mechanisms of enzyme-catalyzed reactions.

**Prerequisites & Notes**

A grade of C- or better in CHY 252 and CHY 254 or equivalent.

Credits: 3

**CHY 541 - Topics in Advanced Analytical Chemistry**

Topics may include advanced techniques in bioanalytical separation, Fourier transform, spectroscopy, mass spectrometry and other vacuum technologies. Influence of hard- and software components such as analyzers, detectors, sources and digital/electronic filters for noise removal and improved detection limits. Lec 3.

**Prerequisites & Notes**

permission.

Credits: 1-3

**CHY 551 - Topics in Advanced Organic Chemistry**

Recent advances in stereo chemistry, heterocyclic compounds, natural products, and other graduate level topics.

**Prerequisites & Notes**

CHY 555.

Credits: Ar.

**CHY 555 - Intermediate Organic Chemistry**

Detailed study of preparation of complex organic compounds and newer synthetic methods.

**Prerequisites & Notes**

A grade of C- or better in CHY 252.

Credits: 3

**CHY 556 - Theoretical Organic Chemistry**

Includes topics in electronic theory and reaction mechanisms.

**Prerequisites & Notes**

A grade of C- or better in CHY 252.

Credits: 3

**CHY 559 - Problem Solving In Organic Chemistry**

Students will discuss and solve problems in mechanism, synthesis, and structure determination taken from the current organic chemistry literature.

**Prerequisites & Notes**

CHY 252 or equivalent, or permission.

May be repeated up to 3 times for credit.

Credits: 1

## **CHY 560 - Physical Methods of Inorganic Chemistry**

Applications of the principles of group theory and modern spectroscopic techniques, including x-ray diffraction and photoelectron, infrared and Raman vibrational, electronic and magnetic resonance spectroscopies in inorganic chemistry.

### **Prerequisites & Notes**

A grade of C- or better in CHY 461 or CHY 575 or permission.

Credits: 3

## **CHY 562 - Advanced Organometallic Chemistry**

An introductory course for graduate students covering the principles and applications of organotransition metal chemistry. Topics include coordination chemistry, group theory, organometallic reaction mechanisms, electrochemistry, photochemistry, bioinorganic chemistry, catalysis, and applications to organic synthesis. . Lec 3, Lab 3.

### **Prerequisites & Notes**

A grade of C- or better in CHY 252 and CHY 372 or equivalents.

Credits: 3-4

## **CHY 571 - Topics in Advanced Physical Chemistry**

Advanced level subjects such as quantum chemistry, molecular spectroscopy, theory of solutions, statistical mechanics of mixtures, applied group theory, structure and bonding.

Credits: Ar

## **CHY 573 - Computer Simulation Methods**

Computer simulation using Monte Carlo and molecular dynamics techniques with applications in chemistry, physics, materials science and molecular biology.

### **Prerequisites & Notes**

A grade of C- or better in CHY 471 or PHY 236 and knowledge of FORTRAN.

Credits: 3

## **CHY 578 - Nanoscience**

Fundamental concepts in nanoscience explored: Scaling principles, nanoscale materials, micro/nano fabrication techniques, atomic manipulations and nanorobotics. Because of overlap between CHY 477, ECE 457 and CHY 578 only one can be taken for degree credit.

### **Prerequisites & Notes**

CHY 122 (or CHY 131), PHY 122, and MAT 258; CHY 471 and CHY 472 recommended, but not required; or permission.

Credits: 3

### **CHY 583 - Advanced Wood Chemistry**

Fundamental chemistry of carbohydrates, lignin, and extractives.

#### **Prerequisites & Notes**

A grade of C- or better in CHY 252 or permission.

Credits: 3

### **CHY 661 - Topics in Advanced Inorganic Chemistry**

Topics may include advanced level subjects such as ligand field theory and other bonding theories in inorganic chemistry; molecular symmetry and group theory; electronic, infrared and NMR spectroscopic properties of transition metal compounds; nonmetallic and bioinorganic chemistry of transition metals; and structures and properties of inorganic solids.

Credits: 1-3

### **CHY 693 - Graduate Seminar**

Reports and discussion of recent developments in chemistry and related fields based on the literature or on current laboratory investigations. Required of all graduate students every year after the first year.

Credits: 1

### **CHY 698 - Graduate Research**

Varies.

Credits: Ar

### **CHY 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Civil and Environmental Engineering**

## **CIE 521 - Civil Engineering Systems and Optimization**

Formulation of decision-making problems at different hierarchical levels for engineering systems. Formulation of linear, integer and non-linear models; introduction to exact and approximate solution techniques; solution interpretation and sensitivity analysis; network terminology and problems; basics of game theory; multi-objective models, Pareto front and decision analysis; performing simulation analysis; analyzing simulation outputs; queuing analysis; transportation systems. Includes applications in civil engineering, transportation engineering, structural engineering, project selection, networks, allocation, routing/scheduling, and distribution.

### **Prerequisites & Notes**

MAT 126, MAT 127, instructor permission.

Credits: 3

## **CIE 533 - Environmental Aquatic Chemistry**

Fundamental aspects of aquatic chemistry emphasizing environmental engineering applications. (0.0 ED/3.0 ES.) Lec 2, Lab 3. (Spring.)

### **Prerequisites & Notes**

CIE 231.

Credits: 3

## **CIE 534 - Environmental Microbiology**

Fundamentals of microbiology and biochemistry as related to natural and engineered treatment processes; microbial ecology, physiology, metabolism and genetics; energetics and kinetics of microbial growth; public health microbiology; introduction to pollution microbiology. (0.0 ED/3.0 ES.) Lec 3. (Fall.)

### **Prerequisites & Notes**

CIE 331 or permission of the instructor.

Credits: 3

## **CIE 537 - Water Pollution**

An introduction to the major water pollution issues. The major nutrient cycles, and the sources, fates and effects of organic and inorganic pollutants will be discussed, along with technologies to control and prevent pollution. Lec 3.

### **Prerequisites & Notes**

permission.

Credits: 3

## **CIE 540 - Experimental Analysis of Structures**

Stress and strain measurement techniques. Applications to small and full scale structures, dynamic measurements, modal analysis, fracture toughness, nondestructive evaluation. (0.0 ED/3.0 ES.) Lec 3.

### **Prerequisites & Notes**

CIE 440.

Credits: 3

### **CIE 543 - Introduction to Composite Materials in Civil Engineering**

An introduction to the mechanics of fiber-reinforced polymer (FRP) composite materials in civil engineering with a view to structural design. Understanding of material properties, fabrication processes, fundamental mechanics, experimental procedures and methods of analysis and design. Lec 2, Lab 1.

#### **Prerequisites & Notes**

Senior or graduate standing in Engineering or Wood Science and Technology; MEE 251 or equivalent and CIE 340 or equivalent. The student should have at least one course each in mechanics, calculus/linear algebra and computer programming.

Credits: 3

### **CIE 544 - Design of Wood and Masonry Structures**

Study of unique mechanical and design characteristics of structural wood and masonry members and design of systems containing these members. Analysis of lateral load force resisting systems that incorporate diaphragms and shear walls. (4.0 ED/0.0 ES.) Lec 3, Lab 3.

#### **Prerequisites & Notes**

CIE 443 or permission.

Credits: 4

### **CIE 545 - Structural Dynamics**

Examines free vibration and response to harmonic and general dynamic loading of the single degree of freedom system, Fourier analysis and response in the frequency domain, response spectra, framed structures modeled as discrete multi-degree-of-freedom systems, dynamic analysis of nonlinear systems. Response of structural systems to earthquake excitation. Lec 3.

#### **Prerequisites & Notes**

CIE 440.

Credits: 3

### **CIE 547 - Prestressed Concrete Structures**

Design and behavior of prestressed concrete components and structures; pretensioning and post-tensioning technology. (3.0 ED/0.0 ES.) Lec 3 (Spring.)

#### **Prerequisites & Notes**

CIE 442.

Credits: 3

### **CIE 548 - Bridge Engineering**

History and aesthetics of bridges, construction materials, bridge shapes and types, bridge components, design philosophies, loads on bridges, slab-on-steel beam bridges, plate girder bridges, composite design, box girder bridges, overview of arch, truss, cable-stayed and suspension bridges, bridge evaluation and maintenance. (3.0 ED/0.0 ES) Lec 3. (Fall.)

**Prerequisites & Notes**

CIE 443 or equivalent.

Credits: 3

## **CIE 549 - Numerical Methods in Engineering**

Modern numerical methods for engineering analysis, including numerical linear algebra, numerical methods for solving nonlinear systems of equations, the solution of initial-value problems, finite-difference methods for boundary-value problems, iterative methods for large sparse systems of equations, and an introduction to optimization techniques. This course is identical to MEE 549. (Fall)

**Prerequisites & Notes**

MAT 258 or MAT 259 and an introductory programming course is recommended, or permission of the instructor.

Credits: 3

## **CIE 551 - Water Wave Mechanics**

mechanics of coastal and ocean waves, small-amplitude water wave boundary value problem formulation and solution, wave particle kinematics, wave superposition, geostrophic and frictional effects experienced by long waves in engineered and natural systems and wave propagation over real seabeds.

**Prerequisites & Notes**

MAT 258 or MAT 259, CIE 350, or permission of the instructor.

Credits: 3

## **CIE 552 - Physical Hydrology**

Develop an understanding of hydrologic science based on an emphasis on the physical processes within the coupled ocean-atmosphere-land system. Mathematical description of the principal processes. Flux computation, feedback assessment, engineering and management, policy considerations, and global environmental change impacts.

Credits: 3

## **CIE 553 - Water Resources Sustainability**

Water Resources Sustainability builds on a conceptual understanding of the hydrologic cycle and basic principles of hydrologic analysis, and water resources engineering. Advanced methods for water resources systems analysis and design are presented and discussed. These include systems modeling, probabilistic methods, decision analysis, and optimization.

**Prerequisites & Notes**

CIE 350/Hydraulics or equivalent.



## **CIE 554 - Natural System Hydrodynamics**

This course will cover the basic hydrodynamics and physical processes governing flow patterns in lakes, rivers, estuaries, and oceans. Topics that will be discussed include typical steady dynamical balances in natural systems' the transport and mixing of salt, heat and momentum' and the temporal and spatial scales of variability in natural systems due to atmospheric forcing, tidal forcing, freshwater flows and morphology.

### **Prerequisites & Notes**

CIE 350/351 (Hydraulics/Hydraulics Lab) or equivalent with grade of B or above, MAT 258 or MAT 259 (Differential Equations) with a grade of B or above, or permission of the instructor.

Credits: 3

## **CIE 555 - Computational Methods for Water Resources Engineering**

Numerical treatment of problems in ordinary and partial differential equations with application to water resources engineering. Goal is to apply state of the art developments in computational fluid dynamics to the study of water resources engineering processes.

### **Prerequisites & Notes**

MAT 258 or MAT 259 (Differential Equations) with a grade of B or above, CIE 350/351 (Hydraulics/Hydraulics Lab) with a grade of B or above, or permission from the instructor.

Credits: 3

## **CIE 557 - Measurement Techniques in Water Resources**

This course is an introduction into measuring dynamic variables in coastal, riverine and lake environments. Topics include accuracy, precision, aliasing; instrumentation set up, communication and troubleshooting; participation in a field campaign; preliminary data processing procedures, presentation, and organization.

### **Prerequisites & Notes**

MAT 228 or permission of instructor.

Credits: 3

## **CIE 558 - Coastal Engineering**

An introductory course on the principles of coastal engineering problems in lakes, river mouths, inlets, estuaries and other coastal area. Topics include linear water wave theory; wave generation and forecasting, wave shoaling, refraction and diffraction; wave loading on structures; design wave calculation; stability and design of coastal structure; sediment transport; coastal hazards and environments.

### **Prerequisites & Notes**

CIE 350/MEE 360 and MAT 258/MAT259 or permission of instructor.

Credits: 3

## **CIE 559 - Marine Turbulence**

An introductory course on turbulence and mixing in a marine environment. Topics include the Reynolds-averaged Navier-Stokes equations, energy cascade, turbulence spectrum, measurements of turbulence and mixing in a coastal environment.

**Prerequisites & Notes**

CIE 350, MEE 360 or permission of instructor.

Credits: 3

**CIE 563 - Thermal Soil Mechanics**

A study of the thermal properties of soils, heat transfer, and methods for predicting soil temperature under freezing conditions. Design of pavements, foundations, and excavations to resist the effects of freezing. (1.0 ED/1.0 ES.) Lec 2. (Spring.)

**Prerequisites & Notes**

CIE 365.

Credits: 2

**CIE 564 - Deep Foundations**

The theories, design concepts, and construction of pile and caisson foundations for buildings and bridges. Economic, safety, and reliability constraints are considered in design decisions. (3.0 ED/0.0 ES.) Lec 3. (Fall.)

**Prerequisites & Notes**

or Corequisite: CIE 460.

Credits: 3

**CIE 598 - Selected Studies in Civil Engineering**

Advanced topics in Civil Engineering not regularly covered in other courses. Content varies to suit individual needs. May be repeated for credit with permission of department. (Fall and Spring.)

**Prerequisites & Notes**

permission.

Credits: 1-3

**CIE 640 - Advanced Structural Analysis**

Considers the linear and nonlinear finite-element analysis of framed structures using the principles of minimum potential energy and virtual work as bases. Topics include thermal effects, shear deformations, constraints, beams on elastic foundations, buckling, geometrically nonlinear analysis, materially nonlinear analysis, and an introduction to frequency-based and time-history dynamic analysis. Significant computer programming is required. Lec 3.

**Prerequisites & Notes**

CIE 440 or equivalent, or permission.

Credits: 3

## **CIE 644 - Advanced Composite Materials in Civil Engineering**

Advanced course on engineering mechanics and structural applications of composite materials. Fiber reinforced composites in civil-infrastructure; Viscoelastic response; Fracture, fatigue and impact behavior; Durability; Characterization of structural composite materials; Strength and stiffness design criteria; Engineered Interfaces; Connections; Bridge structures; Strengthening of Reinforced Concrete; Strengthening of Wood. Out of class laboratory assignments will be required. Lec 3.

### **Prerequisites & Notes**

CIE 543; graduate standing in Engineering or Wood Science and Technology or permission.

Credits: 3

## **CIE 647 - Advanced Topics in Steel Design**

Theoretical underpinnings of building code requirements will be derived for topics including: composite steel and concrete flexural and axial members, reliability index (LRFD), local and global buckling, and semi-rigid connection design. Plastic analysis and progressive collapse methodologies will be discussed in depth. Additional topics will be investigated through independent student research.

### **Prerequisites & Notes**

CIE 443

Credits: 3

## **CIE 648 - Fracture Mechanics**

Theoretical foundations of fracture mechanics, including the role of defects in the brittle failure of materials and structures; stress concentrations and the analysis of stress fields around crack tips; fracture modes; crack growth criteria; fatigue effects; ductile failure; experimental analysis. Applications to metals, concrete and rock, wood, ceramics and composites. (0.0 ED/3.0 ES.)

### **Prerequisites & Notes**

MEE 455 or permission of the instructor.

Credits: 3

## **CIE 660 - Advanced Soil Mechanics**

Advanced study of soil properties and soil mechanics principles including the formation and structure of soil, effective stress principle, compressibility and shear strength of subsurface materials. Lec 3.

### **Prerequisites & Notes**

CIE 460 or equivalent.

Credits: 3

## **CIE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Communication**

### **CMJ 506 - Rhetorical Theory: Civic Tradition**

Survey of basic issues in and the contributions of major theorists in the philosophy of rhetoric from classical times to the present, emphasizing the relation of rhetoric to civil societies. This course is identical to ENG 506.

**Prerequisites & Notes**

Permission

Credits: 3

### **CMJ 520 - Media History**

Examines media cultures in the context of technologies, social movements and free expression from oral to digital communication eras applying contrasting approaches to historical inquiry.

**Prerequisites & Notes**

permission.

Credits: 3

### **CMJ 525 - Propaganda and Political Communication**

Survey of theory and practice of propaganda and political communication, with a historical focus on major figures in the field.

**Prerequisites & Notes**

Permission

Credits: 3

### **CMJ 540 - Social Media and Digital Cultures**

This course explores the digital cultures created through social media, the processes that go into their creation, and the impact these cultures have on individuals, groups, society at large. We will take a close look at how participation in digital platforms and on social media contributes to these collaborative, user-driven cultures, and examine the extent to which these cultures interact, impact, and reflect mainstream cultures. The creation of digital cultures is inexorably tied to identity performance and the conceptualization of social media as a potential virtual public sphere. Social media platforms are also often seen as a space for marginalized groups to connect, be heard, and influence dominant narratives. At the same time, corporations, hackers, and trolls are active players on social media sites as well, creating a space that is characterized by a wide array of voices and goals. In this course, we will examine all of these topics and

explore the role these different variables play in the creation of digital cultures through a consideration of relevant theories, extant research, and specific case studies. Students will also become familiar with some of the methodologies associated with research into digital cultures.

**Prerequisites & Notes**

Graduate standing AND permission.

Credits: 3

## **CMJ 545 - Media Ecology**

Study of media environments and cultures, with emphasis on communication technologies' effects on social institutions, representations of self, individual perception and modes of consciousness. Encompasses writing systems, printing technologies and electronic media from the alphabet to the telegraph, satellites and computers, and the movement from oral to chirographic, print and electronic media cultures.

**Prerequisites & Notes**

Permission.

Credits: 3

## **CMJ 579 - The Theory of Composition**

A study in the rhetorical, stylistic and cognitive perspectives--from classical formulations to current research--on the nature of written composition and issues in composition teaching. (This course is identical to ENG 579).

**Prerequisites & Notes**

Graduate standing in Communication or permission.

Credits: 3

## **CMJ 580 - Environmental Communication**

This course provides an introduction to research and practice in the field of Environmental Communication. Through readings, discussion, and active learning approaches, this course examines how communication shapes our collective understanding and decision making about environmental change. We explore diverse environmental communication perspectives and topics, including environmental rhetoric, collaboration and public participation in natural resource issues, news media and environmental journalism, and social and environmental justice.

**Prerequisites & Notes**

None

Credits: 3

## **CMJ 593 - Topics in Communication**

Advanced study of selected topics.

**Prerequisites & Notes**

permission.

Credits: 3

### **CMJ 595 - Teaching Observation and Training**

Observation by graduate assistant of undergraduate or graduate CMJ course in preparation for teaching that course. May be repeated for credit up to 4 credits. Expectations vary with credit hours taken but students will be expected to do background reading in the course topic area and studying course materials as preparation to teach the course.

#### **Prerequisites & Notes**

Permission by Chair in consultation with advisor; open to non-CMJ grad students recruited to teach CMJ students. Pass/Fail.

Credits: 1-2

### **CMJ 600 - Introduction to Graduate Study in Communication**

An overview of principal approaches to conducting research in communication with an emphasis on available resource material in various fields of inquiry within the discipline. Includes responsible conduct of research training.

#### **Prerequisites & Notes**

permission.

Credits: 2

### **CMJ 601 - Seminar in Research Methods**

Advanced study of research methodologies appropriate for quantitative and qualitative studies of speech, language, and communicative behavior. Emphasis is on research questions, assumptions, designs, and procedures for experimental and descriptive studies in communication.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **CMJ 602 - Teaching Communication in College**

Designed to provide teaching assistants and other graduate students with effective methods of teaching basic courses.

#### **Prerequisites & Notes**

permission.

Credits: 1

### **CMJ 603 - Seminar in Rhetorical Criticism**

Examination of principal methodological approaches to the criticism of public discourse with focus on contemporary public communication.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **CMJ 604 - Qualitative Communication Research Methods**

Explores human science modes of inquiry that seek an interpretive understanding of phenomena. The seminar focuses on the theoretical basis for the conduct of qualitative research, the practices of participant observation and interviewing, and the practices of analysis through rigorous description, reduction, and interpretation.

#### **Prerequisites & Notes**

Permission

Credits: 3

### **CMJ 606 - Rhetorical Theory: Critical Tradition**

Survey of basic issues in and the contributions of major theorists in the critical tradition of the philosophy of rhetoric. (This course is identical to ENG 606.)

#### **Prerequisites & Notes**

Permission.

Credits: 3

### **CMJ 608 - Communication Theory**

Advanced study of phenomena of human communication. Examines how experience is perceived, interpreted, processed, encoded and used in intrapersonal, interpersonal and public communication.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **CMJ 610 - Seminar in Risk Communication**

Examines social scientific theories and concepts relevant to risk communication, including risk perception, strategic communication, media effects, public engagement, and judgment and decision-making. Includes relating course content to case studies of recent environmental, health, and science-related risk issues.

#### **Prerequisites & Notes**

Permission

Credits: 3

### **CMJ 690 - Directed Research**

The opportunity to study a particular problem under faculty supervision. May be repeated up to 6 credit hours.

**Prerequisites & Notes**

permission of Department Chairperson.

Credits: 1-3

**CMJ 693 - Reading for Graduate Comprehensive Exams**

Reading for Graduate Comprehensive Exams

**Prerequisites & Notes**

permission.

Credits: 1

**CMJ 695 - Graduate Internship**

Field experience in observing, analyzing, and solving communication problems in organizations. May be repeated for credit.

**Prerequisites & Notes**

permission.

Credits: 1-3

**CMJ 698 - Contemporary Issues in Human Communication**

Selected contemporary research topics on speech, language, and communication behavior. Topics vary.

**Prerequisites & Notes**

permission.

Credits: 3

**CMJ 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

**CSD 680 - Augmentative and Alternative Communication**

This course surveys the needs of individuals who can benefit from augmentative and alternative communication (AAC) across life span. It includes history of AAC and social communication theories related to evidence-based practice.

**Prerequisites & Notes**



Graduate student or permission.

Credits: 3

## **Communication Sciences and Disorders**

### **CSD 581 - Articulation and Phonology Disorders**

Theoretical perspectives on disordered phonology and articulation in children with emphasis on applications related to clinical management. Evaluation, assessment techniques and strategies for remediation of articulation and phonological disorders.

#### **Prerequisites & Notes**

One course in anatomy and physiology of the speech mechanism.

CSD graduate students only.

Credits: 3

### **CSD 582 - Voice Disorders**

Study of anatomy, physiology and pathology of the voice mechanism. Diagnostic methods, issues related to faulty voice production and current treatment techniques. Evaluation techniques will be employed in the clinical setting.

#### **Prerequisites & Notes**

One course in anatomy and physiology of the speech mechanism.

CSD graduate students only.

Credits: 3

### **CSD 583 - Fluency Disorders**

Fluency disorders from theoretical, etiological and developmental perspectives. Principles of assessment and intervention, including integration of fluency shaping and stuttering modification techniques.

#### **Prerequisites & Notes**

CSD graduate students only.

Credits: 3

### **CSD 584 - Language Disorders in Children: Preschool**

Theoretical perspectives, contributing factors, special populations and basic assessment and intervention principles. Emphasis on disorders of emerging language in infants, toddlers and preschoolers.

#### **Prerequisites & Notes**

one course in normal language development.

CSD graduate students only.

Credits: 3

### **CSD 585 - Language Disorders in Children: School-Age**

Theoretical perspectives, contributing factors, special populations and basic assessment and intervention principles. Emphasis on disorders of language, literacy and learning in the school-age population.

#### **Prerequisites & Notes**

One course in normal language development.

CSD graduate students only.

Credits: 3

### **CSD 586 - Current Issues in Clinical Practice**

Advanced study of topics related to current professional and clinical issues in speech-language pathology. Topics to be arranged. May be repeated for credit.

#### **Prerequisites & Notes**

CSD graduate students only.

Credits: 3

### **CSD 588 - Aural Rehabilitation**

Effects of hearing loss upon the educational, social and personal development of children and adults Principles of habilitative and rehabilitative procedures, auditory training and speech reading as approaches to speech and language development in the person who is hard of hearing.

#### **Prerequisites & Notes**

One course in audiology.

CSD graduate students only.

Credits: 3

### **CSD 601 - Seminar in Research Methods**

Research methodologies appropriate for quantitative and qualitative studies in communication sciences and disorders.

#### **Prerequisites & Notes**

CSD graduate students only.

Credits: 3

### **CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia**

Advanced study of topics related to Aphasia, Right Hemisphere Deficits and Dementia.

**Prerequisites & Notes**

CSD graduate students only.

Credits: 3

**CSD 683 - Seminar in Clinical Procedures**

Discussions, demonstrations and expectations of clinical practicum. Required of students enrolled in their first semester of CSD 686.

**Prerequisites & Notes**

CSD graduate students only.

Credits: 1

**CSD 684 - Seminar in Clinical Procedures II**

A continuation of the preparation of student clinicians for clinical practicum work with an emphasis on developing planning, instructional and interpersonal skills for speech-language assessments and therapy.

**Prerequisites & Notes**

CSD 683.

CSD graduate students only.

Credits: 1

**CSD 685 - Diagnostic Process in Speech-Language Pathology**

Practicum in the assessment and evaluation of speech and language disorders. Includes participation in Diagnostic Clinic.

**Prerequisites & Notes**

CSD 684 and 100 clock hours of graduate practicum.

CSD graduate students only.

Credits: 3

**CSD 686 - Clinical Practicum**

Supervised clinical experience with children and adults at campus and off-campus sites. May be repeated for a maximum of six credits.

**Prerequisites & Notes**

Permission of Clinical Director.

CSD graduate students only.

Credits: 1-2

### **CSD 687 - Swallowing Disorders**

Nature, assessment and clinical management of swallowing disorders.

#### **Prerequisites & Notes**

One course in anatomy and physiology of the speech mechanism.

CSD graduate students only.

Credits: 3

### **CSD 688 - Neurocognitive Disorders in Adults**

Evaluation and treatment of cognitive, linguistic and behavioral sequelae of adults with neurogenic impairments throughout successive stages of recovery.

#### **Prerequisites & Notes**

CSD graduate students only.

Credits: 3

### **CSD 689 - Motor Speech Disorders**

Nature, assessment and clinical management of motor speech disorders.

#### **Prerequisites & Notes**

One course in anatomy and physiology of the speech mechanism.

CSD graduate students only.

Credits: 3

### **CSD 690 - Directed Research I**

In-depth topical study under faculty supervision. May be repeated for credit.

#### **Prerequisites & Notes**

Permission of instructor.

CSD graduate students only.

Credits: 1-3

### **CSD 691 - Directed Research II**

Continued in-depth topical study under faculty supervision. May be repeated for credit.

**Prerequisites & Notes**

Permission of instructor.

CSD graduate students only.

Credits: 1-3

## **CSD 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

CSD graduate students only.

Credits: Ar

## **Computer Science**

### **COS 520 - Software Engineering I**

Specification, design, implementation, and maintenance of reliable software. Various methodologies will be explored with Ada as the implementation tool.

**Prerequisites & Notes**

COS 350 and COS 431.

Credits: 3

### **COS 530 - Introduction to Cybersecurity**

Topics include authentication, access control, cryptography, software and web security, security operations, risk and incident management, network security, legal, ethics and privacy issues and emerging technologies.

**Prerequisites & Notes**

COS 331 or permission by instructor.

Credits: 3

### **COS 535 - Information Privacy Engineering**

This course is an overview of the current privacy (and security) regulations across the world and the associated privacy (and security) challenges, methodologies and algorithms for applications ranging from Cyber-Physical Systems, the

Internet of Things, Android/iOS applications, and machine learning models.

**Prerequisites & Notes**

COS 420 or by permission.

Credits: 3

## **COS 542 - Cloud Computing**

The National Institute of Standards and Technology (NIST) defines cloud computing as "a model for enabling ubiquitous, conventional, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." This course will study the technologies underpinning the rapid expansion of this new computing paradigm, the new problem-solving capabilities enabled by the cloud, and provide the student with hands-on experience in utilizing cloud services for scientific research. It will focus on the virtualization of computation resources, cloud storage models, distributed computing in the cloud, and important applications areas such as big data analytics

**Prerequisites & Notes**

COS 331 or equivalent with a minimum grade of C-. COS 441 and COS 542 both cannot be taken for degree credit.

Credits: 3

## **COS 550 - Theoretical Computer Science I**

A survey of automata theory, formal languages, undecidability and computational complexity.

**Prerequisites & Notes**

COS 301 and COS 250.

Credits: 3

## **COS 554 - Algorithms**

Important algorithms and their application to solving problems.

**Prerequisites & Notes**

COS 350

Credits: 3

## **COS 565 - Data Visualization**

Introduction to the goals, techniques, implementation and evaluation of visual representations for large quantities of data. Students work with a team to produce a novel visualization solution for a client with application domain data and goals.

**Prerequisites & Notes**

COS 226, or SIE 508, or permission of instructor.

Credits: 3

## **COS 570 - Topics in Artificial Intelligence**

May be repeated.

### **Prerequisites & Notes**

Prerequisite: permission.

Credits: 3

## **COS 573 - Computer Vision**

Computer Vision is an accessible sub-field of computer science that is rising in importance and accelerating on the strengths of machine learning methods that have become 21st century model for artificial intelligence. We will explore the uses of tools and techniques to understand our world through computing using images as our data. The first half of the course will introduce machine learning and convolutional neural networks for object recognition and classification, photogrammetry and reconstruction, and multimodal and hyperspectral imaging. As the course progresses, we will delve into the topics of image acquisition, mathematical analysis, the Fourier transform and frequency space, statistical pattern recognition, and other foundations of the field. This course is a fast-paced, hands-on, practical exploration of computer vision. Students from the class are organized into teams to work on a computer vision project. COS 473 and COS 573 can not both be taken for degree credit.

### **Prerequisites & Notes**

COS 226 with a grade of C- or better or permission of the Instructor.

Credits: 3

## **COS 580 - Topics in Database Management Systems**

May be repeated.

Credits: 3

## **COS 598 - Advanced Topics in Computer Science**

Topics in computer science not regularly covered in other courses. May be repeated for credit.

### **Prerequisites & Notes**

permission.

Credits: 1-3

## **COS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **DSE 510 - Data Science and Engineering Practicum**

This course provides an introduction of tools and methods used to explore, visualize, and analyze data. It covers practical steps in preparing data for analysis including data cleaning, preprocessing, and data reduction, data structures for supporting efficient data exploration and analysis and visualization methods for gaining insights from data. Students will gain knowledge and experience through applying data science tools and methods to real world data sets. This course will be taught using Python ecosystem of tools that support data science including: NumPy, Pandas, Matplotlib, and SciPy, among others.

### **Prerequisites & Notes**

SIE 507 or instructors permission

Credits: 3

## **Disability Studies**

### **DIS 500 - Contemporary Disability Theory**

Critically examines historical and contemporary context of disability and analyzes the emergence of disability as a contemporary category of human diversity. Identification and analysis of the political, social, economic, intellectual, and technological trends relevant to disability rights. Analyzes universal principles as the next paradigmatic framework for the promotion of socially just community responses to diversity and difference.

### **Prerequisites & Notes**

DIS 400.

Credits: 3

### **DIS 520 - Disability: Advanced Interaction of Human Diversity and Global Environments**

Examination and analysis of the service, support, and community contexts in which people with disabilities live, work, and participate. Distinction between and analysis of the concepts of accommodation and universal design/access. Critical examination of service and community responses to diversity and difference. Collaborative leadership strategies to improve inclusion and social justice for all people including those with disabilities.

Credits: 3

### **DIS 530 - Disability Policy**

Analyze the historical context of current disability policy. Critically examine the major federal legislative policies that guide disability responses. Apply, compare, and contrast multiple models of policy analysis to the examination of policy and identification of needed policy change and policy advocacy.

Credits: 3

### **DIS 670 - Doctoral Interdisciplinary Project in Disability Studies**



This course provides the structure and process in which students will conduct a project requiring advanced study in a topic or problem in disability studies. The project may be carried out by an individual or small group of students supervised by disability studies faculty. Students may also work with both their disciplinary advisors and the course faculty to specify a project, format and product.

**Prerequisites & Notes**

Permission of instructor

Credits: 3-6

**DIS 680 - Independent Study in Disability Studies**

Individual work on a disability related topic or problem selected by the student and approved by a Center for Community Inclusion faculty member.

**Prerequisites & Notes**

permission.

Credits: 1-6

**Earth Sciences****ERS 501 - Paleoclimatology**

The ocean plays a central role in regulating climate and supporting life on our planet, and it has not always operated as it does today. Throughout Earth history the ocean has undergone dramatic changes in circulation, temperature, chemical composition, and more. In this course, students will explore our ocean's dynamic past, which provides insight into its present and future behavior. We will discuss key research techniques, major discoveries, and emerging frontier in the field of paleoclimatology. Students will read and discuss key research articles each week that complement lecture material. They will also work with both modern and paleo delegate to enhance their skills and deepen their understanding of how scientists infer paleocean conditions from geologic archives.

ERS 401 and ERS 501 cannot both be taken for credit.

This course will typically be offered in the Spring semester of odd years.

**Prerequisites & Notes**

None.

Credits: 3

**ERS 503 - Graduate Research Seminar in Earth and Climate Sciences**

Each week, 1 or 2 students will give a professional presentation on their current thesis or dissertation research. All other students will give feedback on the presentations. The semester will begin with a discussion on "How to Give a Professional Talk or Poster."

**Prerequisites & Notes**

Graduate student status

Students may enroll in ERS 503 a maximum of two times, once during the masters degree and once during PhD degree.

Credits: 1

**ERS 525 - How to Build a Habitable Planet**

This course will take a journey through the remarkable geologic and climatic events that led to the emergence of life, an oxygen-rich atmosphere, explosions and collapses of biodiversity, waxing and waning of continental ice sheets, and ultimately a planet on which *Homo sapiens* could thrive and develop civilizations unlike anything Earth has ever witnessed. We will explore the great and as-yet unsolved mysteries of Earth's evolution with an eye toward placing our existence into the context of what it takes to build, and sustain, a habitable world. We will consider internal and external forces that have shaped environmental evolution over the planet's history, including the role of humans in geochemical and climatic change. We will consider the geochemical proxies and isotopic geochronometers that have improved our understanding of past environments and climates. Our goals are to develop critical thinking and writing skills and a scientific approach to the complex array of feedbacks that govern the evolution of Earth's surface and climate, as well as an appreciation for how past Earth System change can inform current human and societal issues. ERS 425 and ERS 525 cannot both be taken for credit.

**Prerequisites & Notes**

ERS200 (Earth Systems) and ERS201 (Global Environmental Change), or instructor permission

Course Typically Offered: Fall

Credits: 3

**ERS 527 - Isotope Geology**

Theory of variations in the relative abundances of naturally occurring radioactive and stable isotopes. Applications will emphasize the use of isotopic tracers in studies of petrogenesis, geochronology, paleoceanography and paleoecology.

**Prerequisites & Notes**

ERS 333 or permission.

Credits: 3

**ERS 534 - Coastal Sedimentology**

Covers principles of sedimentary processes in the coastal zone and the resultant coastal geomorphology, three-dimensional sedimentary bodies, stratigraphic sequences and evolution of coastal systems through geologic history. Emphasis on modern coastal systems such as estuaries, beaches, barrier-lagoon complexes, and rocky coasts. Lec 3, Lab 2.

**Prerequisites & Notes**

ERS 315 or permission.

Credits: 4

## **ERS 541 - Glaciers and our Landscape**

Explores the nature of the ice ages, including the work of glaciers and how they shape the earth's surface. Emphasis is on understanding the processes that resulted in the landscape and sediments we see today. Required field trip. Note: ERS 441 and ERS 541 are identical courses and cannot both be taken for degree credit.

**Prerequisites & Notes**

Any 100-level ERS course or graduate standing.

Credits: 3

## **ERS 542 - Atmosphere, Ocean, Ice, and Climate Change**

Designed to introduce graduate students to the main components of Earth's climate system. Topics include: Heating of the earth by solar radiation, Radiation balance, Composition and circulation of the atmosphere and ocean. Geographic distribution and motion of ice. Feedbacks between components of the climate system. Past changes in the radiative forcing, atmosphere, ocean, and ice on Earth. Climate change on time scales ranging from years to millions of years.

**Prerequisites & Notes**

ERS 541 or permission.

Credits: 3

## **ERS 544 - Introduction to Glaciology**

Glaciers and Ice sheets cover a significant portion of the planet and have major impacts on surrounding Earth systems and human communities. Glaciers act as a consistent source of freshwater, sculpt the Earth's near surface geology and can influence tectonics, weather, climate, ocean and surrounding ecosystems. This course will study the life cycle of glaciers and Ice sheets, along with the physics which influence their structure, size, movement and interaction with surrounding environments. This course will also explore tools and methods used to study glaciers and Ice sheets through practical exercises and experiments. Methods we will explore include classical field glaciological techniques, geochemistry, geophysics, remote sensing and numerical modeling.

**Prerequisites & Notes**

ERS 444 and ERS 544 cannot both be taken for credit by individual students.

Credits: 4

## **ERS 553 - The Quaternary Stratigraphic Record**

Explores cutting-edge hypotheses for Quaternary climate change. Presents records used to develop and test these hypotheses.

**Prerequisites & Notes**

Permission or graduate major in Earth Sciences or Quaternary and Climate Studies.

Credits: 3

**ERS 555 - Microstructural Processes**

An examination of deformation mechanisms and resulting microstructures in rocks, use of prophyroblast-matrix relationships to determine timing relations between deformation and metamorphism and interpretation of kinematic indicators that form during rock deformation. Lec 2, Lab 2.

**Prerequisites & Notes**

GES 333, GES 416.

Credits: 3

**ERS 560 - Marine Geology**

Topics include current theories of the origin of the earth as a planet and the development of continents and ocean basins, morphology and structure of the sea floor, interpretation of geological and geophysical evidence relevant to the origin and evolution of major tectonic features of ocean regions. Students may not receive credit for both ERS 460 and ERS 560

**Prerequisites & Notes**

ERS 100, 101, 102, or 103 or ERS/SMS 108

**ERS 579 - Topics in Structure and Petrology**

Explores topics related to (1) fundamental concepts and modern applications of structural geology, rheology, microstructures, and/or igneous and metamorphic petrology and (2) developing skills at extracting from and synthesizing the literature. Topics vary from year to year. May be repeated for credit.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 1-3

**ERS 580 - Introduction to Hydrogeology**

The role of groundwater in geologic and water supply processes including: the hydrologic cycle, groundwater interaction with surface water, groundwater flow and transport equations, aquifer characterization, chemistry of groundwater, and groundwater as a geologic agent. ERS 480 and ERS 580 cannot both be taken for credit.

**Prerequisites & Notes**

ERS 101 or ERS 102, MAT 127.

Credits: 3

**ERS 581 - Proposal Writing**

A practical course to facilitate development of research proposals. After discussion of key components, students contribute and Peer edit selected proposal elements, with the culmination of a complete proposal at the end of the semester. Can be taken multiple times for credit.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 1

## **ERS 588 - Topics in Applied Hydrogeology**

Topics will vary and will include ground-water flow modeling, ground-water chemistry and modeling, and data analysis in hydrogeology. A discussion of the methods behind computational tools used in hydrogeology will be followed by the application of software. May be repeated for credit.

**Prerequisites & Notes**

COS 101, COS 102, COS 103, ERS 580 and MAT 127 or permission of instructor.

Credits: 3

## **ERS 602 - Selected Study in Geology II**

Tutorial course. Specific topics determined by the instructor's expertise.

**Prerequisites & Notes**

permission.

Credits: Ar

## **ERS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School ([www.umaine.edu/graduate/responsible-conduct-research](http://www.umaine.edu/graduate/responsible-conduct-research)) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Ecology and Environmental Sciences**

### **AVS 511 - Advanced Aquaculture**

This course will build upon the foundations of the Introduction to Aquaculture course (AVS/SMS 211). Students will be exposed to more advanced concepts including aquaculture engineering and system design; broodstock management, live feeds and algae production; economics and marketing' as well as biosecurity. Application of principles and concepts presented in this class will be emphasized. At the conclusion of this course students should have a firm grasp of critical concepts in aquaculture and be better prepared for careers in private, state, and federal organizations as

well as academia.

**Prerequisites & Notes**

AVS 211 or SMS 211, graduate standing or permission. A good understanding of biology, chemistry, marine science and fish biology is recommended but not required.

Credits: 3

**BIO 529 - Plant-Insect Interactions**

Herbivorous insects and their host plants represent a prime example of coevolution - the populations of interacting species acting as selective agents of adaption for one another. This course will discuss the many ways in which insects exploit woody and herbaceous plants and how these interaction can benefit or adversely affect plant growth, survival, and competition. In addition, the course reviews the mechanisms involved with plant-insect interactions, including those related to chemical defenses, behaviors, adaptations and management. BIO 429 and BIO 529 cannot both be taken for credit.

**Prerequisites & Notes**

Graduate standing

Credits: 3

**EES 590 - Special Topics in Ecology and Environmental Science**

Study of advanced topics in ecology and environmental science, with particular focus on interdisciplinary analysis of ecological interactions at the population, community, ecosystem and landscape levels.

**Prerequisites & Notes**

permission.

Credits: 1-3

**EES 595 - Professional Experience in Ecology & Environmental Science**

Professional experience with an individual or organization outside of the university focused on experiences directly relevant to a career path in ecology and environmental sciences. Students must submit a proposed internship plan for approval to the instructor of record and the sponsoring partner(s) prior to taking the course. Before completion of the course, each student must submit a final report to the instructor of record and fulfill any other reporting requirements of the instructor of the sponsoring partner(s) as spelled out in the internship plan.

**Prerequisites & Notes**

Permission required.

Grading- Pass/Fail

Credits: 1-3

**EES 598 - Special Seminar in Ecology and Environmental Sciences**

The conservation and management of natural resources entail dynamic social, economic, and scientific problems. Students investigate a natural resource topic of current national or International concern. Topics vary. Repeatable with

change in topic. Pass/fall.

**Prerequisites & Notes**

Department consent required

Credits: 1-3

**EES 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

**Economics**

**ECO 502 - Contemporary Issues in World Economy**

This course provides a higher level understanding of how the world economy actually works; its relation to economic growth, the distribution of wealth, sustainable development, culture, and political power. Because of overlap, ECO 502 and SPI 502 cannot both be taken for degree credit.

**Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

**ECO 503 - Experimental Economics**

Experimental research continues to demonstrate that the economic decisions of individuals and groups deviate, sometimes dramatically, from those predicted by standard economic theory's rational actor model. Experimental economics seeks to explain the economic decision-making of consumers and citizens, as psychologically complex, cognitively limited, emotional, social decision-makers. This course explores the foundations, methods and outcomes of experimental economics. Topics covered include experimental economics ethics, basics of experimental design in economics, opportunities, challenges and limitation of experimental methods, analysis of experimental data and key contributions to the economic literature. ECO 403 and 503 cannot both be taken for credit

**Prerequisites & Notes**

Graduate Standing in the School of Economics or permission

Credits: 3

**ECO 504 - Behavioral Economics**

Research continues to demonstrate that the economic decisions of individuals and groups deviate, sometimes dramatically, from those predicted by the standard economic theory's rational actor model. Behavioral economics seeks

to explain the economic decision making of consumers and citizens, as psychologically complex, cognitively limited, emotional, social decision makers. This course explores the foundations of behavioral economics and how this rapidly changing subfield informs the larger field of economics. Topics include bounded rationality, prospect theory, reference dependence, social preferences, framing, and priming, moral balancing, and applications of behavioral economics to public policy.

**Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

**ECO 505 - SL:Sustainable Energy and Policy**

This course examines tradeoffs associated with the technical, economic, environmental, and social implications of energy supply, distribution, and use in the context of transitioning toward a sustainable energy future. Students examine a variety of renewable and non-renewable energy options for electricity, heating and transportation. Students assess quantitative and qualitative indicators of sustainability related to greenhouse gas (GHG) emissions and climate change, air and water quality, human health and safety, energy security, wildlife and the environment, technological efficiency and availability. They examine the effect of policies(e.g. carbon prices, emissions targets, efficiency requirements, renewable portfolio standards, feed in tariffs) on these indicators and tradeoffs. The course provides brief introductions to environment life cycle assessment (LCA), social benefit cost analysis (SBCA) and multi-criteria decision analysis (MCDA), as they apply to energy issues. Students apply course concepts to a service-learning project in which they work with people from surrounding communities on local sustainable energy solutions. Field trips may be required.

**Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

**ECO 511 - Macroeconomic Theory**

An examination of the development of modern economic analysis with regard to employment, income distribution, and stabilization policies.

**Prerequisites & Notes**

Graduate or 4+1 standing in the School of Economics or permission

Credits: 3

**ECO 514 - Microeconomic Theory**

Examination of modern economic analysis with applications; topics include consumer, producer and market behavior.

**Prerequisites & Notes**

Graduate or 4+1 standing in the School of Economics or permission

Credits: 3

**ECO 515 - Advanced Microeconomics**



Examination of advanced topics in microeconomics, with special emphasis on game theory and applications of game theory to issues in Industrial organization, international trade, labor economics, and environmental economics. Detailed treatment of other topics including asymmetric information, market failure, signaling, principal-agent problems, and uncertainty.

**Prerequisites & Notes**

B or better in ECO 514 or permission of the instructor.

Credits: 3

## **ECO 516 - Evolutionary Economics**

Evolutionary Economics is a rigorous exploration of the dynamics of human economies and their social underpinnings, giving students the ability to use economic logic far beyond its usual confines. Students will learn how (and how not) to apply the Darwinian model of adaptive evolution (variation, selection and transmission) to market evolution, as well as human culture, behavior and institutional change. The course also integrates new literature on the evolution of cooperation and multilevel selection to provide a solid mechanistic model of the dynamics of institutions, economies and societies. The course covers historical and current evolutionary approaches to economics and students will learn how an evolutionary approach connects to the other social sciences. We study emergence of social and economics adaptations of individuals, governments, corporations and other organizations. Students build evolutionary accounts of economic systems, characterize evolutionary forces acting in economic systems, suggest interventions to improve outcomes. Students complete a major project on an evolving economic system of their choosing. Students will be introduced to the analytical tools of evolutionary game theory and agent-based modeling. ECO 416 and 516 cannot both be taken for credit.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **ECO 530 - Econometrics**

Quantitative analysis of structural economic models, forecasting and policy analysis: statistical inference and data analysis, general linear statistical model specification, estimation, and hypothesis testing, univariate time-series analysis, and estimation and use of simultaneous equation models. Practical application of econometric models through computer exercises.

**Prerequisites & Notes**

Graduate or 4+1 standing in the School of Economics or permission

Credits: 3

## **ECO 531 - Advanced Econometrics and Applications**

Econometric models and techniques used in applied research: spatial data; panel data; nonlinear estimation; qualitative dependent variables; and limited dependent variables. Second of a two course sequence.

**Prerequisites & Notes**

B or better in ECO 530 or permission.

Credits: 3

## **ECO 532 - Applied Time Series Econometrics**

This is a graduate course in applied time series econometrics. Theorems and proofs will not be emphasized in this course. Instead, we will work to develop both a significant understanding of the role of time series econometrics in empirical econometrics and a strong ability to execute applied time series econometrics in the development of economic models and in the analysis of economic policy. Identification, estimation, evaluation, hypothesis testing, forecasting, and simulation will be emphasized. Both univariate and multivariate time series processes will be covered and applications will include both microeconomic and macroeconomic models.

### **Prerequisites & Notes**

B or better in ECO 530 or permission

Credits: 3

## **ECO 550 - International Environmental Economics and Policy**

International environmental economics and policy uses an economic framework to examine the reasons behind, and methods to solve, conflicts between economic development and growth, trade, and the environment. It then explores the processes of international policy development; identifying problems, designing and negotiating solutions, and implementing policies to change national behavior.

### **Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

## **ECO 553 - Financial Economics**

This course examines the economics of financial markets, asset pricing, risks, and decision making in the face of uncertainty. Topics include the time value of money, the efficient market hypothesis, optimal portfolio allocation, and the capital asset pricing model.

### **Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

## **ECO 565 - Graduate Economics Practicum**

Presents material on conducting and presenting economic research, with an emphasis on application to economic policy. Requires completion and presentation of a substantial research project.

### **Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

## **ECO 581 - Agent-Based Modeling**

This skills-based course in the modeling of social-ecological systems, provides students the conceptual and computational tools they need to design, modify, test and build agent-based models of socio-ecological systems. It

draws inspiration and theoretical perspectives from research on common pool resource dynamics, human cooperation, evolutionary game theory, and complex adaptive systems. Students will use the free, cross-platform modeling system called NetLogo to explore the dynamics of models, critique these models, modify and extend them.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **ECO 590 - Advanced Topics in Economics**

Theoretical and empirical analysis of one or more major economic policy issues.

**Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

## **ECO 595 - Graduate Internship in Economics**

Limited to graduate students who choose the internship option. Internships in public or private institutions in situations requiring application of economic theories and methodologies. Written reports are required.

**Prerequisites & Notes**

Prior approval of student's graduate committee.

Credits: 3-6

## **ECO 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students must successfully complete a "Responsible Conduct of Research" course before, or concurrent with, their third credit of thesis/research.

Credits: Ar

## **SPI 550 - International Environmental Economics and Policy**

International environmental economics and policy uses an economic framework to examine the reasons behind, and methods to solve, conflicts between economic development and growth, trade, and the environment. It then explores the processes of international policy development: identifying problems, designing and negotiating solutions, and implementing policies to change national behavior.

**Prerequisites & Notes**

MAT 115, and C- or better in wither ECO 350 pr ECO 420, or equivalent with permission.

Credits: 3

## **Education-Administration**

## **EAD 510 - Educational Supervision**

Includes creative supervision, techniques of working with professional staff, improvement of curriculum, observational and evaluation techniques.

### **Prerequisites & Notes**

EDB 202, EDB 204 or equivalents.

Credits: 3

## **EAD 531 - School Law for Administrators**

The Constitutional framework, legal issues and state statutes affecting the practice of school administration. Special emphasis on the impact of recent court decisions.

Credits: 3

## **EAD 551 - Dynamic of Change in Schools**

Provides students an introduction to contemporary thinking about both the theoretical and practical processes of change and school improvement efforts.

Credits: 3

## **EAD 560 - Functions and Theories of Educational Leadership**

The philosophical foundations for schools and leadership; organizational theories underlying school management and leadership; and the inter- and intrapersonal dimensions of leadership.

### **Prerequisites & Notes**

permission.

Credits: 3-6

## **EAD 562 - Group Leadership and Decision-Making in Schools**

Introduction to and the application of group dynamics, group leadership and group decision-making in the many contexts encountered by school leaders.

### **Prerequisites & Notes**

EAD 560 and EAD 561 or permission.

Credits: 3

## **EAD 563 - Individual Leadership: Problems, Paradoxes and Possibilities**

Provides students a forum to examine interpersonal aspects of school leadership. Students research and prepare strategies in response to leadership dilemmas, then carry them out in simulated situations.

### **Prerequisites & Notes**

EAD 560, EAD 561 and EAD 562 and permission.

Credits: 3

### **EAD 565 - Inquiry and Evaluation in Schools I**

Examination and application of data based decision-making in schools to help educators find, use and develop dependable information about students, learning, teaching, and curriculum.

#### **Prerequisites & Notes**

EAD 560 or permission.

Credits: 3

### **EAD 566 - Inquiry and Evaluation in Schools II**

A continuation of EAD 565 focusing on the evaluation of practices and programs in the school as well as the exploration of ways to use the results of inquiry to improve practices and programs.

#### **Prerequisites & Notes**

EAD 565

Credits: 3

### **EAD 615 - The Principalship**

Organization, supervision, and leadership of school faculty, students, and curriculum, focusing on the role of the principal.

#### **Prerequisites & Notes**

EAD 560 (6 credits).

Credits: 3

### **EAD 616 - Resource Based Decision Making for School Leaders**

Provides understanding and insight into the school district budget process and the principal's role and responsibilities in that process and in administering and accounting for various types of non-budgetary school funds.

Credits: 3

### **EAD 630 - School Finance and Business Management**

Topics includes: school budget proposals, purchasing, accounting, administering the budget, legal requirements of budgetary practices. Emphasis on Maine School Finance Law and its application.

#### **Prerequisites & Notes**

master's degree with emphasis in school administration and permission.

Credits: 3

## **EAD 634 - School Personnel Management**

Covers recruitment, assignments, in-service training of teachers; job analysis and evaluation; leave, tenure and salary policies; staff participation in management.

### **Prerequisites & Notes**

master's degree with emphasis in school administration and permission.

Credits: 3

## **EAD 640 - Contract Negotiation and Management for Educational Administration**

The role of the administrator in the negotiation process and in contract management.

Credits: 3

## **EAD 650 - Leadership Studies**

Leadership research applied to the assessment of leadership styles, diagnosis of situational variables, and development of effective leadership styles for a variety of educational and human service settings.

### **Prerequisites & Notes**

Admission to EDL Program or permission of instructor.

Credits: 3

## **EAD 651 - Organizational Behavior in Education**

Sociological, social psychological, political and social constructionist models of organizational behavior in educational settings are examined in relation to decision-making, power, bureaucratic and professional authority and careers.

### **Prerequisites & Notes**

EAD 560 (6 credits).

Credits: 3

## **EAD 654 - Educational Policy Formulation and Analysis**

Explores the processes of educational policy formulation at local, state and national levels and the nature and role of policy analysis in those processes.

### **Prerequisites & Notes**

EAD 560 (6 credits).

Credits: 3

## **EAD 656 - Social and Ethical Foundations of Educational Leadership**

Examines the purposes of schools from a sociocultural perspective and the many choices and judgments required of educational leaders. Investigates the ethical reasoning required by these choices.

**Prerequisites & Notes**

Certificate of Advanced Study student.

Credits: 3

**EAD 660 - The Adult Learner in PK-12 Education**

Designed to expand students' thinking, knowledge and interpersonal skills about various theories and practices about motivating adult learners in PK-12 school buildings and districts. Emphasis will be place on preparing educational leadership students to use apply andragogy theories and frameworks as they consider their problem of practice and their eventual dissertation.

**Prerequisites & Notes**

Enrollment by permission.

Credits: 3

**EAD 661 - Advanced Educational Supervision**

Designed to expand students' thinking, knowledge and interpersonal skills about how to create supervisory feedback systems in PK-12 school buildings and districts. Emphasis will be placed on preparing educational leadership students to use supervision framework to inform how they mobilize others to follow as part of other dissertation which addresses a problem of practice.

**Prerequisites & Notes**

Enrolled by permission.

Credits: 3

**EAD 667 - Dissertation III**

This course is designed to serve EdD members in their dissertation writing phase. Cohort members can expect to put in significant additional time and energy in this course outside of class time. Focus will be primarily given to writing the discussion chapter, the conclusion and implications for practice chapter, and the reviewing, updating, and finalizing of the dissertation document as a whole. Cohort members can expect to begin to consider their creative application of their dissertation project as well as where they will submit to present their work by the end of this course.

**Prerequisites & Notes**

Completion of EAD 665 and enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

**EAD 668 - Dissertation IV**

This course is designed to serve EdD members in the final phase of their dissertation, specifically the important steps of creatively applying the knowledge gained for practitioner consumption, as well as verbally presenting findings at a state, regional, or national conference. Cohort members can expect to put in significant additional time and energy in this course outside of class time. Focus will be primarily given to verbally disseminated. Cohort members can expect to complete their EdD program is all aspects of the dissertation work are met by the end of this course.

**Prerequisites & Notes**

Completion of EAD 667 and enrollment in EdD in Educational Leadership program or by permission.

Corequisite of 1 credit of EHD 699

Credits: 2

### **EAD 690 - Principal Internship**

Provides students with a field-based opportunity to explore the role of the principal and assess themselves for work in such a role.

#### **Prerequisites & Notes**

Admission to EDL Program and permission of advisor.

Credits: 1-4

### **EAD 691 - Internship in Educational Leadership**

Provides students with a field-based opportunity to explore leadership roles (e.g. curriculum coordinator, teacher leader) and assess themselves for work in such a role.

#### **Prerequisites & Notes**

Admission to EDL Program and permission of advisor.

Credits: 1-4

### **EAD 692 - Superintendent Internship I**

First semester of an 11-month internship, usually taken to start the sequence of three two-credit courses: EAD 692, EAD 693 and EAD 696. Provides students with an opportunity to explore the role of the superintendent of schools and assess themselves for work in such a role. Jointly planned by student, advisor and internship supervisor.

#### **Prerequisites & Notes**

Masters degree with emphasis in administration and permission.

Credits: 1-3

### **EAD 698 - Special Topics in Educational Leadership**

Concentrated study of designated topics in educational leadership. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

#### **Prerequisites & Notes**

CAS or doctoral level student or permission.

Credits: 1-3

## **Education-Adult Education**



## **EAD 567 - Stakeholder Engagement**

Schools and communities exist in a symbiotic relationship. Developing positive relationships with stakeholders benefits students by ensuring equitable access to quality educational services that support success for all students, and benefits stakeholders by including them in school-centered decisions that support the community at large. Stakeholder engagement is an ongoing system that facilitates meaningful connection and communication between a school and various members of its community in support of positive educational outcomes for all students and healthy community development.

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **Education-Curriculum**

### **EHD 533 - Dynamics of the Curriculum**

Contextualizes and examines contemporary models of curriculum development common to all areas of K-12 instruction. Trends and philosophical frameworks underpinning development, planning, implementation, and evaluation are compared and evaluated for students to acquire skills applicable to current curriculum development processes.

Credits: 3

### **EHD 544 - Mentoring, Supervision, and Teacher Development**

This course seeks to help practicing teachers develop the skills necessary to support the development of their colleagues. The course examines processes and trajectories of teacher development, explores framework for understanding teacher knowledge and teacher capacity, and investigates approaches for supporting teacher development through mentoring and supervision. This course will help practicing teachers develop the knowledge and skills they need to be effective cooperating teachers, new teacher mentors, department chairs, or instructional coaches.

### **Prerequisites & Notes**

None

Credits: 3

### **EHD 595 - Leadership in Curriculum Design for Administrators/Supervisors**

Role function and practices for the curriculum leader.

### **Prerequisites & Notes**

EHD 533 or permission.

Credits: 3

## **Education-Early Literacy**

### **EEL 543 - Literacy Teaching and Learning Part I**

This course is the first of two consecutive courses designed to support classroom teachers in Maine Partnerships in Comprehensive Literacy schools who teach students in Grades PreK-12. Within this course participants will explore a Framework for Comprehensive Literacy that includes concepts of reading and writing theory, a cognitive apprenticeship approach to teaching and learning, components of a balanced literacy program, observation of student performance, assessment tools, classroom management, instructional materials, and a workshop model. Students who take this course should be employed in an MPCL school.

**Prerequisites & Notes**

Employment in a MPCL school.

Credits: 2

## **EEL 544 - Literacy Teaching and Learning Part II**

This course is the second of two consecutive courses designed to support classroom teachers in Maine Partnerships in Comprehensive Literacy schools who teach students in grades PreK-12. Within this course participants will explore a framework for Comprehensive Literacy that includes concepts of reading and writing theory, a cognitive apprenticeship approach to teaching and learning, components of a balanced literacy program, observation of student performance, assessment tools, classroom management, instructional materials, and a workshop model.

**Prerequisites & Notes**

EEL 543 and employment in a MPCL school

Credits: 1

## **EEL 552 - An Exploration of the Writer's Workshop in PreK-12 Classrooms**

This one semester course is designed for educators who teach students in elementary, middle and high school contexts within Maine Partnerships in Comprehensive Literacy (MPCL) schools. During the composing and comprehending of texts the writing process will be explored with links to the reciprocal processes of reading, speaking, listening and viewing. Within a cognitive apprenticeship approach, participants will become familiar with the Writer's Workshop framework that includes explicit instruction, observation of student learning, formative assessment of student competencies, workshop structures, classroom management, and instructional resources.

**Prerequisites & Notes**

EEL 543 and EEL 544 or EEL 535 and EEL 536 or EEL 537 and EEL 538 or EEL 539 and EEL 540 and Employment in a MPCL school

Credits: 3

## **EEL 554 - An Exploration of the Reader's Workshop in PreK-12 Classrooms**

This one semester course is designed for educators who teach students in elementary, middle and high school contexts within Maine Partnerships in Comprehensive Literacy (MPCL) schools. During the comprehending of texts the reading process will be explored with links to the reciprocal processes of writing, speaking, listening and viewing. Within a cognitive apprenticeship approach, participants will become familiar with the Reader's workshop framework that includes explicit instruction, observation of student learning, formative assessment of student competencies, workshop structures, classroom management, and instructional resources.

**Prerequisites & Notes**

EEL 543 and EEL 544 or EEL 535 and EEL 536 or EEL 537 and EEL 538 or EEL 539 and EEL 540 and Employment in a MPCL school

Credits: 3

## **EEL 556 - An Exploration of the Language Workshop in PreK-12 Classrooms**

This course is designed for educators who teach students in elementary, middle and high school contexts within Maine Partnerships in Comprehensive Literacy (MPCL) schools. During Language Workshop, interactive read alouds and rich discussion will be used to explore the listening and speaking standards and the reciprocal processes of reading, writing, listening, speaking and viewing. Within a cognitive apprenticeship approach, participants will become familiar with the Language Workshop framework that includes explicit instruction, observation of student learning, formative assessment of student competencies, workshop structures, classroom management, and instructional resources.

### **Prerequisites & Notes**

EEL 543 and EEL 544 or EEL 535 and EEL 536 or EEL 537 and EEL 538 or EEL 539 and EEL 540 and Employment in a MPCL school

Credits: 3

## **EEL 562 - Literacy Processing: Exploring How Students Learn to Read and Write Part II**

A continuation of EEL 561.

### **Prerequisites & Notes**

EEL 561

Credits: 3

## **EEL 581 - Theoretical Perspectives within MPCL Coaching Part II**

This is one of four courses in a program of study designed to prepare school based literacy coaches who work within defined grade spans across a Pre-K to grade 12 continuum. In this course, participants will actively engage in extending knowledge to enhance current understanding about effective literacy learning and teaching. Participants will expand upon an exploration of theory and research that underpin perspectives on literacy education and coaching in the context of literacy learning. Throughout the program of study, participants will have the opportunity to engage in shared inquiry around a range of topics. Participants will also explore the power of continuous reflection in extending their own learning and enhancing the learning of colleagues.

### **Prerequisites & Notes**

EEL 580 previous semester. Co-requisite EEL 583

Credits: 3

## **EEL 582 - Clinical Practices in MPCL Coaching Part I**

This is one of four courses in a program of study designed to prepare school based literacy coaches who work within defined grade spans across a Pre-K to grade 12 continuum. Coaches support classroom teachers in implementing optimal literacy learning practices. Participants will actively engage in teaching children within a workshop approach to teaching and learning. Throughout the program of study, participants will have the opportunity to engage in shared inquiry around a range of topics. Participants will also explore the power of reflection in extending their own learning and enhancing the learning of colleagues.

**Prerequisites & Notes**

Co-requisite of EEL 580.

Credits: 2

**EEL 583 - Clinical Practices in MPCL Coaching Part II**

This is one of four courses in a program of study designed to prepare Maine Partnerships in Comprehensive Literacy (MPCL) school based literacy coaches who work within defined grade spans across Pre-K to grade 12 continuum. Coaches support classroom teachers in implementing optimal literacy learning practices. Participants will engage in the coaching of teachers within a variety of workshop settings. Throughout the program of study participants will have the opportunity to engage in shared inquiry around a range of topics. Participants will also explore the power of reflection in extending their own learning and enhancing the learning of colleagues.

**Prerequisites & Notes**

EEL 582 in the previous semester. Co-requisite of EEL 581

Credits: 1

**EEL 596 - Literacy Lessons Teacher Training I**

This year-long course prepares educators and interventionists who work in school-based settings and teach students with literacy difficulties. The course is particularly appropriate for educators who work with diverse populations of students including special education, ELL, and classrooms implementing RTI. Throughout the course participants will explore the links between theory and practice, developing theoretical understandings of literacy processing at the acquisition stage, as well as skills in observing, recording, analyzing, and insightfully responding to students' literacy needs to promote accelerated progress. Participants are required to tutor two students daily.

**Prerequisites & Notes**

Department consent required.

Credits: 3

**EEL 597 - Literacy Lessons Teacher Training II**

Participants build on understandings and skills learned in EEL 547 as they continue to explore instructional implications for teaching students with literacy difficulties. Emphases include teaching for independent learning, fostering strategic activity, and acceleration of learning. Participants are required to tutor two students daily.

Credits: 3

**EEL 652 - Intervention Designs for Struggling Learners Part I**

This year-long course provides K-6 educators with the opportunity to gain in-depth knowledge and skill in designing and implementing small group interventions for students experiencing difficulty in literacy learning. The course will focus on differentiating reading and writing instruction within a range of settings, including classroom and supplemental contexts in accord with a Response to Intervention (RtI) framework. In order to help all educators respond to the unique needs of a diverse range of struggling learners, the course will include techniques for using intervention team meetings to select appropriate services, collaborating with teachers across intervention programs and using assessments to monitor student progress.

**Prerequisites & Notes**

Department Consent Required.

Credits: 3

**EEL 653 - Intervention Designs for Struggling Learners Part II**

A continuation of EEL 652.

**Prerequisites & Notes**

EEL 652

Credits: 3

**ERL 570 - Designing Online Learning Experiences**

This course will study online learning theory and design elements for application to an online, hybrid, or blended environment.

**Prerequisites & Notes**

Permission.

Credits: 3

**ERL 576 - Literacy in the Home, School, and Community**

By using socio-cultural and ecological perspectives, participants will examine the role that families and communities play in their children's development as well as home-school connections that promote literacy. Through readings, discussion and guest lectures, this course is designed to challenge conventional views of parent involvement and home-school relationships.

**Prerequisites & Notes**

None.

Credits: 3

**ERL 604 - Doctoral Proseminar in Literacy II**

The premise of this course is that an elemental part of doctoral study involves situating your own work within the broader landscape of current literacy research. Toward that end, this course is oriented toward common review of recent studies in literacy and individual pursuit of underlying and related research. Activities are directed at further skills that are central to reading the research of others and to completing and documenting one's own conceptual research.

**Prerequisites & Notes**

Admission to Ph.D. in Literacy Program

Credits: 3

## **Education-General (EDG)**

### **EAD 653 - Statistics for Scholarly Practitioners**

This course is designed to extend and refine students' thinking, experience, and knowledge about the planning for and executing of data collection for an education leadership research study. Emphasis will be placed on pursuing the collections of data for a dissertation study using quantitative methods. Students are expected to be able to critique the writing of others, as well as their own, and develop a greater understanding of how statistics are used to drive decision making and evaluate program effectiveness.

#### **Prerequisites & Notes**

EHD 690 Foundations of Inquiry or by permission

Credits: 3

### **EAD 655 - Qualitative Analysis for Scholarly Practitioners**

This course is designed to extend and refine students' thinking, experience, and knowledge about qualitative research and how this can be applied in practice to PK-12 settings. Emphasis will be placed on preparing educational leadership students to conduct a qualitative project an/or dissertation. Students are expected to be able to apply various theories of qualitative research to study and better understand educational settings.

#### **Prerequisites & Notes**

EHD 690 Foundations of Inquiry or by permission.

Credits: 3

### **EHD 575 - Educational Research**

Evaluates selected research in education in relation to the appropriateness of the design to the stated purpose of the study. Students select and present research problem with special attention to design and studies related to it.

#### **Prerequisites & Notes**

Graduate student or permission

Credits: 3

### **EHD 657 - Educational Practicum (Activity)**

Supervised practice in applying professional skills to administration, supervision, science education, social studies, special education and language instruction. Activity will be selected by the student and advisor.

#### **Prerequisites & Notes**

permission obtained well in advanced.

Credits: 1-6

### **EHD 691 - Graduate Apprenticeship**

Apprenticeship training in supervision, administration, social studies, special education, physical education, science education or another area of interest. Available only to full-time graduate students with permission well in advance of

class meeting.

**Prerequisites & Notes**

permission of graduate advisor.

Credits: 2-6

## **EHD 693 - Educational Internship**

Provides on-the-job experience through special arrangements with cooperating University departments, community agencies, or public schools.

**Prerequisites & Notes**

permission of instructor and advisor, obtained well in advanced.

Credits: 2-6

## **Education-General (EDU)**

### **EHD 504 - Teaching and Assessing for Student Learning in the Secondary School**

This course examines instructional planning, grouping of students, classroom space, and appropriate teaching materials, the theory and ethical practice of educational assessment. Emphasis will be given to how to incorporate data into backward planning for unit and lesson design.

Credits: 3

### **EHD 511 - Classroom-based prevention & Intervention: Supporting Positive Behavior and Academic Achievement**

This course examines the application of prevention and intervention theory and practice within classroom settings. Theoretical perspectives on risk and resilience as they pertain to the development of competent social behaviors, including those found to facilitate social relationships, serve as academic enablers, and promote self-determination will be addressed. Applied behavioral analysis, social learning theory, and the eco-behavioral framework will serve as the primary intellectual roots for this course. Particular emphasis will be given to creating a comprehensive classroom plan based on evidence-based practices and implemented within a cohesive system of behavioral and academic support and intervention. Contextual factors such as home community, race, culture and SES, within the broader domain of social justice will provide the ecological backdrop of our study.

**Prerequisites & Notes**

Admission to the MAT program or instructor permission

Credits: 3

### **EHD 586 - Seminar: Action Research in PreK-12 Schools**

Introduces action research principles and methods for PreK-12 schools, including reviewing professional literature on educational practice. Focus on collaboration among schools, families, and communities, and on professional learning and ethical practice. Begin development of an action research plan for a question of educational practice of the student's choice. Satisfies seminar requirement.

**Prerequisites & Notes**

EHD 519, EHD 521 and EHD 533, or instructor permission.

15 credits of graduate coursework in Education recommended.

Credits: 3

**EHD 587 - Practicum: Action Research in PreK-12 Schools**

Finish development of an action research plan for a question of educational practice of the student's choice. Implement plan in a school or other educational setting, and share progress of implementation via a blog. Present process and results to a professional audience. Satisfies Practicum requirement.

**Prerequisites & Notes**

EHD 586 or instructor permission.

Continuation of action research project begun in EHD 586.

Credits: 3

**EHD 590 - Topics in Education**

Concentrated study of designated topics in education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following.

**Prerequisites & Notes**

Graduate student or permission.

Credits: 1-3

**EHD 661 - The Sociology of Education**

Provides an introduction to the sociology of education as an academic discipline. Considers competing interpretations of the relationships between schools and society, the impact of race, class, and gender on education, and issues of continuity and change in policy and practice.

**Prerequisites & Notes**

Admission to Ph.D. in Education program or permission of instructor.

Credits: 3

**EHD 663 - Comparative and International Education**

Provides an introduction to the nature, methods and content of contemporary comparative education as an academic discipline. Examines a variety of different western and non-western approaches to the education of children.

**Prerequisites & Notes**

Admission to Ph.D. in Education program or permission of instructor.

Credits: 3

**EHD 664 - Philosophy of Education**



An in-depth examination of contemporary philosophy of education as an academic discipline.

**Prerequisites & Notes**

Admission to Ph.D. in Education program or permission of instructor.

Credits: 3

## **EHD 690 - Topics in Education**

Concentrated study of designated topics in education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following.

**Prerequisites & Notes**

Certificate of Advanced Study or doctoral student in Education and permission.

Credits: 1-3

## **EHD 698 - Independent Study in Education**

Provides graduate students with an opportunity to increase professional competence through independent readings and research. Students plan individual projects to gain competencies in such fields as administration, language arts, social studies, science education, special education, counselor education and other special topics.

**Prerequisites & Notes**

permission.

Credits: 1-6

## **Education-Higher Education**

### **EAD 600 - Educational Research for School Leaders**

This course is designed to help graduate students in educational leadership and related fields understand, interpret, and evaluate educational research. Drawing from a variety of research approaches, you will learn to identify both good and bad research, recognize the benefits and limitations of various research methodologies, and understand what conclusions can and cannot be drawn from various studies.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **EAD 647 - Organizational Learning and Development**

This course is designed to support doctoral students in the art of reading and understanding organizational life. It is based on the premise that theories of organization and management are based on implicit images or metaphors that lead us to understand and manage organizations in distinctive and, sometimes, complementary ways. A central goal of the course is to enable students to think critically about organizations by learning to use various theoretical models and lenses. The challenge of the course is to become skilled in the art of finding fresh ways of seeing the situations that we want to organize, manage and, hopefully, lead. Class readings and activities will provide the basis for the analysis of specific organizational issues within educational settings. Different theories of organizations will be applied using a

case study approach in schools and districts with an emphasis on the ramifications for school leadership and ultimately student learning.

**Prerequisites & Notes**

Enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

**EAD 665 - Dissertation II**

This course is designed to serve EdD members in their data analysis for their dissertation. Cohort members can expect to put in significant additional time and energy over this 8 week course outside of class time, particularly out of class time throughout July and August. Focus will be given to analyzing data based on methodological approach(es), updating the literature review, updating the methodology section, and developing a robust findings section. Cohort members can expect to begin primary discussion and impact on practice by the end of this course.

**Prerequisites & Notes**

Completion of EAD 664 and Enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

**EHD 545 - Educational Theory**

This course provides students an opportunity to engage with theories of education as they intersect with society, economy, and politics. The course will focus on a critical, socio-cultural, multicultural, progressive, democratic, social justice worldview and view of education. Students will have the opportunity to explore theory and how it informs, and enhance, their practice.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

**EHD 546 - Teacher Leadership in Schools and Communities**

This course provides teachers an opportunity for individual and group activities and experiences in the area of teacher leadership as viewed from a complex lens of research, practice, and technology. It draws upon literature from the field of teacher leadership as well as literatures on teacher preparation, implementation of digital technologies, equity and justice, policy studies, and socio-historical-political contexts of education. It is aimed at teachers who wish to remain in classrooms while enhancing their leadership knowledge and skills to influence education broadly, in schools and beyond.

**Prerequisites & Notes**

None

Credits: 3

**EHD 576 - Interviewing Methods in Qualitative Research**

This advanced graduate course on qualitative research methods builds on coursework in EHD 571 and EHD 572 to examine interviewing methods in more depth, including individual interviews and focus group interviews. Students will explore different approaches to interviewing that vary by research paradigm, methodology, theoretical perspective and

research goals. Students will have opportunities to develop interview protocols and conduct interviews in the field on a topic of the choice. Readings will focus on methods for interviewing and published qualitative research studies based on interviewing as a primary method of data collection. Some specific topics also covered will include: clinical interviews, discourse analysis, considering identity and the relationship of the interviewer and participants, participatory approaches in interviewing, and criteria for quality in interview studies. The course will promote development of students interviewing skills and reflection and growth as qualitative researchers.

**Prerequisites & Notes**

EHD 571 pr by permission of the instructor.

Credits: 3

**EHD 577 - Discourse Analysis**

This course is designed to provide an overview of some of the various theories of and approaches to the analysis of spoken and written discourse, e.g., speech act theory, conversation analysis, sociolinguistics, critical discourse analysis. These and other approaches are intended to serve as analytic tools and frameworks for students to examine different aspects of discourse through analytical projects using data provided by the instructor AND collected/provided by the student. These projects may focus on any aspect of language use, such as language and grammar, language and interaction, language and culture, language socialization. We will read classic and contemporary works in discourse studies from a range of perspectives and applied to a range of phenomena (some explicitly educational, some not).

**Prerequisites & Notes**

EHD 571 or instructor permission.

Credits: 3

**ESC 556 - Climate Change Education**

The purpose of this course is to provide students an overview of climate change science and develop skills, knowledge, and dispositions associated with teaching climate change in science learning settings to a wide range of learners. In support of this work, the course provides opportunities for students to draw from their teaching experiences to implement specific approaches to teaching climate change, including but not limited to honing teaching strategies to address alternative conceptions, engaging with education research on this topic, designing a lesson to align with current research on climate change education, and reflecting on their own learning about climate change education.

**Prerequisites & Notes**

Graduate standing required.

The course will include a few online synchronous meetings.

Credits: 3

**HED 523 - The American Community College**

Focuses on the history, organization, governance, constituencies, and educational programs of community and technical colleges in the United States.

Credits: 3

**HED 561 - Developmental Theory in Higher Education**

Developmental theory as a foundation for student affairs emphasizing the interdependence of theory and practice.

**Prerequisites & Notes**

permission.

Credits: 3

**HED 562 - Assessing Impact of College on Students**

Students will learn to read, interpret, and critique research and to design appropriate assessments in student affairs and higher education related to college impact. They will learn different approaches to individual and organizational assessment, including choice of appropriate research designs and methods.

**Prerequisites & Notes**

HED 561 or equivalent.

Credits: 3

**HED 580 - History of Higher Education in the United States**

Higher Education Leadership doctoral student or permission.

**Prerequisites & Notes**

Higher Education Leadership doctoral student or permission.

Credits: 3

**HED 598 - Special Topics in Higher Education**

Concentrated study of designated topics in higher education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

**Prerequisites & Notes**

Graduate student or permission.

Credits: 1-3

**HED 610 - Capstone Seminar in Student Affairs**

Focus on contemporary problems and issues in the field of Student Affairs.

**Prerequisites & Notes**

permission.

Credits: 3

**HED 620 - Seminar in Higher Education in the United States**

Examines the American system of higher education with emphasis on current issues.

**Prerequisites & Notes**

permission.

Credits: 3

### **HED 630 - Higher Education and the Law**

A seminar focusing on the impact of the law and legal processes on institutions of higher education, including such areas as employment, (including equal opportunity/affirmative action, dismissal, contracts and tenure), academic freedom, civil rights, due process, student rights and other issues of concern to higher education leaders.

#### **Prerequisites & Notes**

Higher education graduate students or permission.

Credits: 3

### **HED 640 - Issues in College Teaching**

This course is a graduate seminar for advanced graduate students preparing to teach in postsecondary institutions. The course introduces the formal scholarship in college teaching. Topics include: active learning, evaluation methods, classroom climate, instructional approaches, student behavior, and resources for teaching and learning.

Credits: 3

### **HED 650 - Social Context of Higher Education**

Seminar providing in-depth exploration of the role of race, ethnicity, social class, gender, sexuality and other identity differences in shaping the contemporary social context of postsecondary education in the United States.

#### **Prerequisites & Notes**

Higher Education Leadership doctoral student or permission.

Credits: 3

### **HED 654 - Higher Education Policy and Politics**

A seminar focusing on understanding and engaging with political contexts and policy processes affecting colleges and universities. Examines alternative perspectives of policy processes, including the role of policy analysis, in order to provide a basis to formulate effective strategies for impacting them.

#### **Prerequisites & Notes**

Higher Education Leadership doctoral student or permission.

Credits: 3

### **HED 676 - Doctoral Seminar in Higher Education**

Examines major theoretical perspectives and related research in the organization and functioning of colleges and universities. Considers the leadership implications for higher educational organizations and programs.

#### **Prerequisites & Notes**

Higher Education Leadership doctoral student or permission.

Credits: 3

### **HED 677 - Doctoral Seminar in Higher Education Research**

Examines major epistemological approaches to inquiry with respect to the field of Higher Educational Leadership. Seminar participants will examine theories of knowledge formation and distribution while considering the implications for postsecondary institutions and their own approaches to scholarly inquiry.

#### **Prerequisites & Notes**

Higher Education Leadership doctoral student or permission.

Credits: 3

### **HED 690 - Higher Education Internship**

Integrating theory and practice in a wide variety of higher education settings.

#### **Prerequisites & Notes**

Advance application and permission.

Credits: 1-6

### **HED 697 - Independent Study in Higher Education**

Provides graduate students with an opportunity to increase professional competence through independent readings and research. Students plan individual projects to gain competencies in higher education.

#### **Prerequisites & Notes**

Permission.

Credits: 1-6

### **SED 625 - Sp Education Internship for Maine's Alternative Certification and Mentoring**

This course orients conditionally certified special educators to the practice of special education during their first year teaching. It provides practical, applicable information and experiences encountered by special educators during the course of a school year.

#### **Prerequisites & Notes**

Permission of instructor.

Course may have bi-monthly synchronous meetings.

Credits: 3

## **Education-History and Philosophy (EDH)**

### **EHD 500 - Social Context of Education**

Considers competing interpretations of the relationships between schools and society, the impact of race, class, and gender on education, and issues of continuity and change in policy and practice.

Credits: 3

## **EHD 501 - Social Context of Education**

Provides a theoretical framework for analyzing the influences of schools, families, communities, government policies, society and culture on student learning and classroom interactions, along with exploration of specific illustrative examples of importance to beginning teachers.

### **Prerequisites & Notes**

Admission to the Master of Arts in Teaching Program.

Credits: 3

## **EHD 519 - Formative Assessments: Research, Practice and Policy**

Provides students an opportunity to develop insights on different forms of formative assessments; to practice development and implementation of formative assessment probes in educational settings and to analyze related research and policy documents on formative assessments.

Credits: 3

## **EHD 541 - Prevention and Intervention in School Settings: Social Emotional Learning**

Examines the conceptualization and application of prevention and intervention within school settings. Assumes that students have a theoretical understanding and classroom experience with core educational approaches related to proactive classroom management, effective instruction, curriculum development, and classroom assessment. From this foundation, students enrolled in EHD 541 examine theoretical perspectives on risk and resilience as they pertain to the development of competent social behaviors and self regulation skills, including those found to facilitate social relationships, serve as academic enablers, and promote self-determination. Social learning theory and the developmental-ecological framework will serve as the primary theoretical and conceptual roots for this course. Emphasis is given to behavioral and academic prevention and intervention implemented within coherent classroom and schoolwide systems of support. Contextual factors (e.g., home, community, SES and the broader domain of social justice) provide the ecological backdrop of our study.

Credits: 3

## **EHD 660 - History of American Education**

Examination of the development of public schooling in the United States, focusing on different major historical eras in the country's history. Emphasis will include the role of the school in social reproduction, the evolution of teaching as a profession, and the educational response to different marginalized groups in American society.

### **Prerequisites & Notes**

Admission to Ph.D. in Education program or permission of instructor.

Credits: 3

## **Education-Literacy**

### **EEL 578 - Scaffolding Student Learning Through Differentiation and Contingent Teaching I**

This course is the first of a two-part training that provides participants with the opportunity to gain in depth knowledge and skill in designing and implementing instruction for students experiencing difficulty in literacy learning. The course will focus on differentiating reading and writing instruction in the classroom setting. In order to help classroom teachers respond to the unique needs of a diverse range of struggling learners, the course will include techniques for identifying struggling literacy learners, using assessments to identify students' needs and monitor their progress, forming and working with small groups effectively and using a range of teaching strategies to best meet the needs of these learners.

#### **Prerequisites & Notes**

Successful completion of EEL 561/562 Literacy Processing (or equivalent).

Credits: 3

### **EEL 585 - Reflective Practice within MPCL Coaching**

This one semester hybrid course is designed to prepare school based coaches who work within defined grade spans across a Pre-K to grade 12 continuum within Maine Partnerships in Comprehensive Literacy (MPCL) schools. In this seminar and field based course, participants will actively engage in investigating reflective practice to enhance current understandings about effective literacy learning and teaching at the school and classroom level. Participants will use MPCL theoretical perspectives and clinical practice to expand their understanding of reflective practice, action research and coaching in the context of the literacy learning. Throughout the course participants will have the opportunity to engage in shared inquiry around a range of topics. Participants will also explore the power of reflection in extending their own learning and enhancing the learning of colleagues.

#### **Prerequisites & Notes**

EEL 580 & 581 Theoretical Perspectives within MPCL Coaching- Part I & II and EEL 582 & 583 Clinical Practices in MPCL Coaching- Part I & II or permission.

Credits: 3

### **EEL 646 - Dyslexia Studies within a Literacy Processing Framework I**

This course is the first in a two-part training designed for educators and support personnel who are familiar with a theory of literacy processing and who want to extend their knowledge of the development of effective reading and writing processes, deepening their expertise in supporting students with literacy learning difficulties in various instructional settings. The course offers a combination of seminar and clinical experience, to facilitate application of theory to practice.

#### **Prerequisites & Notes**

Completion of at least one of the following courses:

EEL 596 and 597 or EEL 598 and EEL 599 or EEL 561 and EEL 562 or equivalent and EEL 652 and EEL 653 or equivalent

Credits: 3

### **EEL 647 - Dyslexia Studies within a Literacy Processing Framework II**



This course is the second in a two-part training designed for educators and support personnel who are familiar with a theory of literacy processing and who want to extend their knowledge of the development of effective reading and writing processes, deepening their expertise in supporting students with literacy learning difficulties in various instructional settings. The course offers a combination of seminar and clinical experience, to facilitate application of theory to practice.

**Prerequisites & Notes**

EEL 646 Dyslexia Studies within a Literacy Processing Framework I.

Credits: 3

**ERL 516 - Visual Literacy-Exploring Meaning in the Art of Picturebooks**

This course is designed to provide PreK-12 educators with an understanding of, and an appreciation for, the synergy created between picturebook text and image.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

**ERL 517 - Literature for Children**

A continuation of ERL 317 including a study of the historical development of children's literature; principles, techniques and curriculum planning for the guidance of children's reading; book selection for elementary schools and public libraries. Extensive reading and evaluation of children's books.

**Prerequisites & Notes**

ERL 317 or its equivalent.

Credits: 3

**ERL 518 - Literature for Young Adults**

Study of the development of literature for adolescents and young adults as it is used in the junior high, secondary school, and public library. Emphasis on recently published books of this nature and the important contributions of the past.

Credits: 3

**ERL 534 - Literacy and Language Development**

Examines how oral and written language are acquired; sociocultural linguistic variations, connections between language acquisition and print awareness and classroom practices that promote language development. (ERL 534 and SED 524 are identical courses.)

Credits: 3

**ERL 537 - Literacy Across the Curriculum**

Examines reading, writing, studying and thinking as elements of content discipline instruction.

Credits: 3

### **ERL 538 - Current Practices in Vocabulary Teaching and Learning, PreK-12**

This course will focus on current vocabulary research and practice with an emphasis upon content area learning, learning through literature and oral language, and building a vocabulary-rich PreK-12 classroom.

#### **Prerequisites & Notes**

ERL 534.

Credits: 3

### **ERL 540 - Writing in Schools & Colleges**

For teachers in PreK-12 schools and colleges, the course introduces current research and practices in the teaching of writing.

#### **Prerequisites & Notes**

Permission of instructor.

Credits: 3

### **ERL 541 - Methods of Teaching English in the Secondary School**

In this teaching methods course, students will learn, practice, and reflect on the specific pedagogical knowledge needed to teach English/Language Arts to students in grades 7-12. We explore a variety of teaching strategies for organizing a secondary English/Language Arts curriculum, utilizing the national standards of the Common Core. Students discuss, plan, implement, and assess appropriate instruction using current best practices for the effective teaching of English/Language Arts. This course addresses various curricular areas of English/Language Arts, including the teaching of writing, reading comprehension and literature, language applications, grammar, speaking applications and visual media, and how these can be effectively integrated into daily lesson planning while meeting Common Core Standards. Additionally, students will learn how to be reflective practitioners who regularly engage in classroom action research to improve their teaching. All students enrolled in ERL 541 will be required to participate in a field placement in an English/Language Arts Classroom in a local school district.

#### **Prerequisites & Notes**

Admission to MAT Program in Secondary English Education

Credits: 3

### **ERL 542 - Writing and the Young Child: Birth to 8**

An investigation of the foundations of young children's acquisition of writing skills, including discussion of links to oral language development, grapho-phonemic connections, the developmental continuum of writing, and research-based pedagogy to support the development.

Credits: 3

## **ERL 544 - Digital Writing in the Classroom**

Compose hypertext, blogs, wikis, and multimedia, and explore classroom applications.

### **Prerequisites & Notes**

Graduate Student or Permission.

Credits: 3

## **ERL 545 - Introduction to the National Writing Project**

Explores the role of writing in teachers' personal and professional lives. Examines effective practices for teaching writing.

### **Prerequisites & Notes**

Permission.

Credits: 3

## **ERL 547 - National Writing Project Seminar in Mentoring**

Examines effective practices for assisting colleagues in writing and teaching writing. Students mentor those enrolled in ERL 545.

### **Prerequisites & Notes**

ERL 545 and ERL 546. Instructor permission required.

Credits: 3

## **ERL 548 - National Writing Project Advanced Institute in Teacher Leadership**

Examines teachers' role as change agents. Includes mentoring students in ERL 546.

### **Prerequisites & Notes**

ERL 545 and ERL 546. Instructor permission required.

Credits: 3

## **ERL 552 - Seminar in Teacher Research**

History of the teacher as researcher movement. Presents basic research strategies for classroom teachers. Students will test research techniques in classrooms and design a research study.

### **Prerequisites & Notes**

ERL 534, ERL 535, ERL 536 or a minimum of 15 hours completed in literacy graduate program.

Credits: 3

## **ERL 553 - Literacy Assessment**

Discussion of both literacy process and product assessment measures and factors affecting these areas. Exploration of past, present and current issues in literacy assessment.

**Prerequisites & Notes**

ERL 535 and ERL 540 or equivalents or permission.

Credits: 3

**ERL 569 - Clinical Practices-Teaching Children**

Internship on clinical practices, in small groups and tutoring contexts, for children (K-8) experiencing difficulties in literacy. Emphasis on assessment, interventions and case study reports.

**Prerequisites & Notes**

ERL 553 or permission.

Credits: 6

**ERL 590 - Special Topics in English Language Arts and Related Fields**

Offered as need, interest, and research require. Specific topics might include: word processor and writing instruction, comprehension and cohesion, reading and writing in the content areas, vocabulary development, reading and cognition, ethnographic research in the language arts, and teacher as researcher. May be repeated for credit.

**Prerequisites & Notes**

permission.

Credits: 1-3

**ERL 601 - Seminar in Reading**

Students will read, discuss and present research on historical and current issues in reading and reading instruction.

**Prerequisites & Notes**

ERL 535 and a minimum of 15 credit hours completed in Literacy.

Credits: 3

**ERL 603 - Proseminar in Literacy I**

An introduction to doctoral study in literacy, this course grounds students in the historical context of literacy and instruction that informs current trends and issues in literacy instruction and research.

Credits: 3

**ERL 697 - Independent Study in Literacy**

Provides graduate students with an opportunity to increase professional competence through independent readings and research. Students plan individual projects to gain competencies in literacy education.

**Prerequisites & Notes**

Permission.

Credits: 1-6

## **ERL 698 - Special Topics in Literacy**

Concentrated study of designated topics in literacy education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

### **Prerequisites & Notes**

CAS or doctoral level student or permission.

Credits: 1-3

## **Education-Mathematics**

### **EMA 505 - Mathematics Methods for Secondary Teachers**

This is a three (3) credit-hour course for prospective secondary mathematics teachers. We will investigate the teaching of secondary mathematics from mathematical, philosophical, and practical perspectives. EMA 405 and EMA 505 can not both be taken for credit.

### **Prerequisites & Notes**

EHD 504 or instructor permission

Credits: 3

### **EMA 551 - Newer Practices in Mathematics Education**

Covers objectives, materials and procedures for improvement of teaching fundamentals of arithmetic and a mathematics readiness program, a sensible drill load, and development of meaningful problem units.

### **Prerequisites & Notes**

EMA 314 or equivalent.

Credits: 3

### **EMA 598 - Special Topics in Mathematics Education**

Concentrated study of designated topics in mathematics education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

### **Prerequisites & Notes**

Graduate student or permission.

Credits: 1-3

## **Education-Measurement and Testing**

### **EHD 521 - Classroom Practice to Improve Learning**

Evidence based classroom practice and the skills to construct and sustain challenging instruction and a healthy learning environment. Individual and group reflection on research findings from educational psychology, brain development and learning, universal design, effective schools, effective teaching, student diversity, social foundations, and educational assessment.

Credits: 3

## **Education-Reading Recovery**

### **EEL 598 - Reading Recovery Teacher Training I**

Prepares teachers through school-based outreach centers to implement Reading Recovery procedures with first grade children with reading difficulties: tutoring four children daily; tutoring a child behind the one-way mirror one or two times per semester.

#### **Prerequisites & Notes**

Prior acceptance into Reading Recovery Teacher certification program.

Credits: 3

### **EEL 599 - Reading Recovery Teacher Training II**

A continuation of ERR 535.

#### **Prerequisites & Notes**

ERR 535.

Credits: 3

### **EEL 655 - Seminar: Issues Related to Reading Recovery Theory and Practice I**

Examines the principles of Reading Recovery theory and to compare and contrast divergent theoretical perspectives.

#### **Prerequisites & Notes**

Prior acceptance into the certification program for Reading Recovery Teacher Leaders.

Credits: 3

### **EEL 656 - Seminar: Issues Related to Reading Recovery Theory and Practice II**

A continuation of ERR 631.

#### **Prerequisites & Notes**

ERR 631.

Credits: 3

### **EEL 657 - Reading Recovery Internship I**

This course presents theories and models of professional development and clinical supervision of Reading Recovery teachers and develops skills for the administration, implementation and evaluation for district or regional Reading Recovery Teacher Training sites.

**Prerequisites & Notes**

Prior acceptance into the certification program for Reading Recovery Teacher Leaders.

Credits: 3

**EEL 658 - Reading Recovery Internship II**

A continuation of ERR 633.

**Prerequisites & Notes**

ERR 633.

Credits: 3

**EEL 659 - Reading Recovery Practicum I**

Designed to prepare Teacher Leaders-in-Training to implement Reading Recovery procedures with first grade children with reading difficulties: tutoring four children daily; tutoring a child behind the one-way mirror two or three times per semester.

**Prerequisites & Notes**

Prior acceptance into the certification program for Reading Recovery Teacher Leaders.

Credits: 3

**EEL 660 - Reading Recovery Practicum II**

A continuation of ERR 635.

**Prerequisites & Notes**

ERR 635.

Credits: 3

**Education-Research**

**EAD 648 - Responsible Conduct of Research in Education**

EAD 648 is designed to help doctoral students learn how to conduct ethical and responsible research through exploration of research design and the implementation process. The course will involve development of a preliminary problem and research goal, exploration of various research methodologies and empirical studies relevant to your identified research questions, and finally, data collection possibilities with attention to issues of trustworthiness and ethics in research. A secondary purpose of the course is to continue to develop doctoral students' scholarly "habitus", or the quotidian practices that support the production of rigorous and relevant practitioner research responsive to peer review.

**Prerequisites & Notes**

Enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

## **EAD 663 - Dissertation Proposal**

This course is designed to serve as the entry point into candidacy. EdD members will submit a finalized and written product in the form of a portfolio during the first two weeks of the course, followed by two weeks of oral defenses. The last four weeks of the course will be dedicated to creating and drafting an IRB proposal based on the success and feedback of the written and oral defense. The IRB proposal will consider a succinct literature review, sampling and participant selection, data collection and analysis procedures, and researcher role and biases. Competencies include making an argument about a problem of practice, connecting it to a developed review of the existing literature, sketch out a conceptual framework, and then use that framework to develop a methodological approach that will help answer the problem of practice. EdD members will also be expected to target a conference for later submission as a conference presentation.

### **Prerequisites & Notes**

Enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

## **EAD 664 - Dissertation I**

Dissertation I (EAD 664) is designed to serve EdD members in their data collection for their dissertation. Cohort members can expect to put in significant additional time and energy over this 15 week course outside of class time. Focus will be given to instrument implementation, targeted return rates, interview saturation, document collection, and additional data collection to help triangulate methodological approaches. Cohort members can expect to begin primary data analysis by the end of this course.

### **Prerequisites & Notes**

Completion of EAD 663 and enrollment in EdD in Educational Leadership program or by permission.

Credits: 3

## **EHD 510 - Introduction to Educational Research**

For graduate students in education and related fields. Topics include: locating educational research reports, abstracting and evaluating sources, understanding statistical symbols, examining inquiry methodology and communicating about research. Designed for consumers of research.

### **Prerequisites & Notes**

permission.

Credits: 3

## **EHD 569 - Seminar in Educational Leadership**

Discussion and reports structured around a series of topics on organizational theory, educational leadership practice and a list of readings.

Credits: 3



## **EHD 571 - Qualitative Research: Theory, Design and Practice**

The purpose of this course is to introduce graduate students to qualitative research methods in the social sciences and other disciplinary contexts. We will explore theoretical foundations, methodologies, research design, interviewing and observation methods, data analysis and interpretation of findings. The course requires fieldwork in addition to the regularly scheduled class time.

### **Prerequisites & Notes**

EHD 510 or EHD 575 and permission.

Credits: 3

## **EHD 572 - Advanced Qualitative Research**

This course is designed to help graduate students further their understanding and skill in qualitative research, related to its use in the social sciences and other disciplinary contexts. The course will extend the concepts and skill learned in the introductory course EHD 571. Students will gain in-depth experience with: qualitative research design, selection of appropriate qualitative methods for inquiry, fieldwork emphasizing interviewing methods, use of software and other tools to analyze qualitative data, and ways to communicate about qualitative research and findings.

### **Prerequisites & Notes**

EHD 571 or equivalent course.

Credits: 3

## **EHD 573 - Statistical Methods in Education I**

Introduction to descriptive and inferential statistics as applied to education and human behavior. Emphasis on parametric statistics.

Credits: 3

## **EHD 574 - Statistical Methods in Education II**

Builds on the statistical foundation provided in EDS 521. Topics include power analysis, factorial and repeated-measures analysis of variance, multiple regression and factor analysis. Students use statistical software for data analysis.

### **Prerequisites & Notes**

EHD 573 or equivalent.

Credits: 3

## **EHD 602 - Directed Readings (area)**

Opportunity to read in a particular area of education under faculty direction.

### **Prerequisites & Notes**

Doctoral Students in Education and permission.

Credits: 1-6

## **EHD 642 - Seminar in School Leadership**

Considers problems related to the leadership of individual schools.

### **Prerequisites & Notes**

Admission to EDL Program or permission of instructor.

Credits: 3

## **EHD 643 - Seminar in School District Leadership**

Considers specific problems related to curriculum coordination, special education and superintendency.

### **Prerequisites & Notes**

Admission to EDL Program or permission of instructor.

Credits: 3

## **EHD 676 - Doctoral Seminar in Educational Leadership**

Examines major theoretical perspectives on the organization of education systems. Students develop research questions and a writing style appropriate for doctoral level work. Required for doctoral students in educational administration.

### **Prerequisites & Notes**

permission.

Credits: 3

## **EHD 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Education-Science**

### **ESC 552 - Teaching Science in Secondary Schools**

Instructional Strategies and general approaches to teaching science in grades 7-12. Emphasis on professional literature, curriculum development, teaching and learning styles and reflective teaching. ESC 452 and ESC 552 can not both be taken for credit

### **Prerequisites & Notes**

EHD 504 or instructor permission

Credits: 3

### **ESC 555 - Engineering Design Process for K-12 Educators**

This course will provide students an opportunity to learn insights about engineering concepts and practices while focusing on their implications for K-12 learning settings. These learning settings can be formal classrooms and informal learning environments such as museums, science, technology, or innovation centers. While deepening our understanding of integrating engineering to K-12 learning settings, we will utilize successful engineering activities to look at how teachers and students can engage in Engineering Design Process (EDP). We will question how teachers and K-12 students conceptualize engineering and the role of engineers and how K-12 students construct engineering identities while engaged in EDP. Finally, this course will draw from nations policy documents to discuss how understanding of EDP can enhance K-12 students' learning of other STEM subject areas of science, mathematics, and technology.

#### **Prerequisites & Notes**

Permission of instructor

Credits: 3

## **Education-Social Studies**

### **ESS 551 - Teaching Social Studies at the Secondary School**

Covers current practices in teaching social studies, selection and use of instructional materials, modern trends in curriculum construction for social studies in the secondary school.

#### **Prerequisites & Notes**

EHD 504 or instructor permission

Credits: 3

## **Education-Special Education**

### **SED 500 - Adapting Instruction for Students with Disabilities**

Provides an overview of the philosophies, legislation and litigation, and methods that serve as the foundation of special education services.

Credits: 3

### **SED 520 - Law and Policy Affecting Individuals with Disabilities**

Examines state and federal laws and policies that affect individuals with disabilities in both school and the community.

#### **Prerequisites & Notes**

SED student, or permission.

Credits: 3

## **SED 522 - Supporting Play and Social-Emotional Development of Infants and Young Children**

Methods of supporting emotional competence and self-regulation, attachments and parent-infant relationships, play, peer interaction and friendships of infants and young children including children with disabilities.

### **Prerequisites & Notes**

SEI 501 or permission.

Credits: 3

## **SED 523 - Home-based Practicum and Seminar in Early Intervention**

This practicum course focuses on the application of methods for providing early intervention services to infants and toddlers with disabilities or who are at-risk for developmental problems and their families in home-based settings. An important emphasis of the field experience is the design and adaptation of curricular goals and objects, instructional strategies, environments, materials, and activities to promote active learning and full participation by infants and young children with developmental delays and disabilities in home-based settings.

### **Prerequisites & Notes**

SED 505 and SED 517 or permission of the instructor.

Credits: 3

## **SED 524 - Literacy and Language Development**

Examines how oral and written language are acquired; sociocultural linguistic variations, connections between language acquisition and print awareness and classroom practices that promote language development. (ERL 534 and SED 524 are identical courses.)

Credits: 3

## **SED 528 - Educational Methods for Students with Autism**

Provides an overview of diagnostic, clinical, and educational approaches for students with autism. Topics include definitions and characteristics under the autism spectrum, historical perspectives on etiology and treatment, curriculum and instructional strategies, and bio-medical interventions. Specific research-based intervention procedures in language development, social behavior, sensory implications, pivotal responses, and the development of academic and functional skills are examined. Emphasis placed upon educational and behavioral methods used in school and family settings.

### **Prerequisites & Notes**

Permission of instructor.

Credits: 3

## **SED 532 - Behavior Management and Intervention**

Approaches to behavior management and behavior change in educational settings. Examines principles of cognitive behavior modification, social skills training and crisis intervention.

**Prerequisites & Notes**

SED student, or permission.

Credits: 3

**SED 536 - Educational Strategies For Students with Severe Disabilities**

Examines instructional strategies that have been effective in the education of students with severe disabilities. Emphasis on models of inclusive education; nonverbal communication strategies; and behavioral supports.

**Prerequisites & Notes**

SED 401.

Credits: 3

**SED 543 - Program Planning and Curriculum Access**

Comprehensive introduction to the field of special education, program planning for inclusive settings from theory to practice, and classroom application for accessing the curriculum most suited to the student's needs.

**Prerequisites & Notes**

SED 302, SED 402, or SED 500.

Credits: 3

**SED 544 - Mathematical Methods in Special Education**

Examines educational principles and strategies for teaching students with math difficulties.

**Prerequisites & Notes**

SED student, or permission.

Credits: 3

**SED 545 - Intervention for Reading Difficulties**

Explores strategies for adapting reading instruction for students with reading difficulties. Topics include theoretical explanations of reading difficulties, multi-tiered systems of support, research-based approaches to intervention, and procedures for evaluating response to interventions. Addresses the needs of students with high- and low-incidence disabilities as well as students at risk.

**Prerequisites & Notes**

SED student, or permission.

Credits: 3

**SED 553 - Assessment in Special Education I**

Develops knowledge of basic measurement concepts and principles and provides introductory experiences with procedures used to assess the educational performance of students with mild/moderate disabilities.

**Prerequisites & Notes**

SED student, or permission.

Credits: 3

**SED 556 - Assessment of Students with Autism Spectrum Disorders and Severe Disabilities**

Provides training in assessing individual learning needs of students with autism spectrum disorders and severe disabilities, emphasizing curriculum-based assessment, diagnostic criteria, ecological inventories, adaptive behavior scales, person-centered planning, and quality of life indicators.

**Prerequisites & Notes**

SED student, or permission.

Credits: 3

**SED 563 - Positive Behavior Support for Students with Autism Spectrum Disorders**

Provides training in behavioral assessment, support, and intervention for students with Autism Spectrum Disorders. Emphasizes evidence-based practices including functional behavioral assessment and communication training, social skills instruction, self-management, and antecedent and broader environmental interventions.

**Prerequisites & Notes**

SED 528 or permission.

Credits: 3

**SED 564 - Assistive Technology and Universal Design for Learning in PreK-12 Classrooms**

This course will acquaint PreK-12 educators with principles, theories, research, and policies related to Universal Design for Learning (UDL) as Assistive Technology (AT). The course will examine the historical roots and policies related to UDL and AT, core requirements of UDL and AT, application of UDL and AT withing various content areas (e.g., reading, mathematics, social studies, science), and systems issues related to meeting the diverse needs of students.

**Prerequisites & Notes**

None.

Credits: 3

**SED 581 - Response to Intervention for Behavior: School-Wide Prevention**

Critical components of universal positive behavioral interventions and supports. Focus on a continuum of research-based behavioral practices integrated into a system for all students, and using data to evaluate student outcomes and program fidelity.

Credits: 3

## **SED 582 - Response to Intervention for Behavior: Targeted Interventions**

Based on the Positive Behavioral Interventions and Supports model, addresses effective implementation of secondary behavioral systems and practices. Emphasizes behavioral interventions, outcome data tools, and fidelity measures for targeted groups of students who require behavioral support and intervention beyond Tier 1 to succeed in school settings. Includes check-in/check-out and group social skills programs.

### **Prerequisites & Notes**

SED 581

Credits: 3

## **SED 583 - Response to Intervention for Behavior: Individualized Interventions**

Based on the Positive Behavior Interventions and Supports model, addresses effective implementation of Tier III behavioral systems and practices. Focus on comprehensive, multi-component behavioral interventions, outcome data tools, and fidelity measures for individual students who require intensive behavioral support and interventions beyond Tier I and II to succeed in school settings.

### **Prerequisites & Notes**

SED 581 and SED 582

Credits: 3

## **SED 585 - Autism and Social Communication**

This course examines communication, including an overview of typical social communication and atypical social communication development in autism, assessments of communication, augmentative communication supports, visual supports and the interrelationships between communication and socialization. Students develop the awareness and the necessary skills to conduct informal observations of social communication abilities to identify supports that match the individual's learning needs. Students learn strategies to collaborate with teachers, family members and related professionals to increase social skills and social communication. Using a combination of observation, practice sessions, lecture and project-based learning, students apply their knowledge of social communication and supports across the autism spectrum.

### **Prerequisites & Notes**

SED 528

Credits: 3

## **SED 598 - Special Topics in Special Education**

Concentrated study of designated topics in special education. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

### **Prerequisites & Notes**

Permission.

Credits: 1-3

## **SED 605 - Seminar in Special Education**

Study current

issues, problems, and controversies in special education with a focus on professional writing. Typically taken as the first or second course in the master's program in special education.

**Prerequisites & Notes**

Graduate standing.

Credits: 3

## **SED 610 - Internship in Special Education Teaching**

Supervised student teaching experience in special education. May be repeated for a total of 6 credits.

**Prerequisites & Notes**

M.Ed. student in special education and permission.

Credits: 1-6

## **SED 620 - Critical and Creative Thinking and Panel Review**

Explores critical and creative thinking, and how teachers can bring critical and creative thinking to the center of their curriculum and instruction. Approaches critical and creative thinking as skills that can improve through practice but remains mindful of the relationship between thinking skills and specific academic content. Contains both a portfolio requirement and a panel review. The portfolio that is submitted includes work products demonstrating the competencies specified in the Professional Standards for Teachers. The review panel is composed of School of Education faculty member, a partner-school special educator/administrator, and course instructor.

**Prerequisites & Notes**

Graduate standing or permission by instructor.

Credits: 3

## **SED 630 - Internship in Special Education Administration**

Supervised school-based practice in special education administration. Requires mentoring by a certified special education administrator. May be repeated for credit.

**Prerequisites & Notes**

M.Ed. or C.A.S. student in special education, Maine teacher certification in special education or related services, three years teaching experience, and permission.

Credits: 3

## **SED 697 - Independent Study in Special Education**

Provides graduate students with an opportunity to increase professional competence through independent readings and research. Students plan individual projects to gain competencies in special education.

**Prerequisites & Notes**

Permission.

Credits: 1-6



# **Education-Technology**

## **EDT 515 - Dynamic PK-12 Library Management**

The course covers principles and processes underlying the successful administration of a school library including management, program development, and evaluation of contemporary school libraries. The course explores the changing roles and responsibilities of an effective and proactive school librarian. This course will explore the role of educational technology in the effective management of the PK-12 library.

### **Prerequisites & Notes**

EDT 520 or Permission.

Credits: 3

## **EDT 516 - Reference and Research for Digital Age Teaching, Learning and Libraries**

The modern library is a rich hub of information sources, and librarians need excellent skill to promote inquiry, inclusiveness and collaboration with students and educators. This course will provide an overview of the field of reference and research instruction in order to prepare graduate students to work with students in grades PK-12. Graduate students will critically evaluate the most important print and electronic resources, and reference interview, bibliographic instruction, and readers' advisory. In addition, students will practice their leadership skills with reference and research as they seek to promote the library as a learning commons, and information literacy as essential to teaching and learning in the digital age.

### **Prerequisites & Notes**

EDT 515 or permission

Credits: 3

## **EDT 520 - Digital Age Teaching and Learning Methods**

In this foundational course students will explore how digital tools allow for new models of teaching and learning in diverse learning environments such as the traditional classroom setting, libraries, coaching models, and industry training. Students will engage in a critical review of how technology has been used, and explore current trends in educational settings. Students will discuss relevant theories of cognition, explore issues of access and equity, and consider how curriculum, instruction, and assessment might be designed with the support of technology. The learning environment for the course will model different engagement, instructional, and assessment strategies including readings, multiple modes of discussion and reflection, practical applications, design projects, and social networks.

### **Prerequisites & Notes**

None

Credits: 3

## **EDT 528 - Designing Technology Systems to Optimize Learning**

In order to create and support sustainable, effective, and integrated technology systems, leaders must be well versed in technical systems design, planning and evaluation processes. This course is designed for students who seek to be leaders in approaching these technical concepts through a vision of aligning solutions and systems that are consistent with a learner-centered perspective on educational practices. Students will learn strategies to engage stakeholders,

develop budgets, and plan for evaluation of technology investments.

**Prerequisites & Notes**

EDT 520 or permission of instructor.

Credits: 3

## **EDT 531 - Studio in Computing for Learning**

Maker spaces have proliferated in our schools, libraries, and elsewhere in our communities. Similarly, toys and kits for children now include programming, circuits, single-board computers, sensor kits, robotics, drones, and more. This course serves as an introduction to computational thinking and computer science as both a delivery mechanism and a 21st century skill within the context of educational practice including classrooms, libraries, and additional diverse learning environments. This course will help students develop approaches and strategies for utilizing what have become consumer-level electronic and computational tools in problem- and project-based learning scenarios. Students will learn to help others engage with technology in the learning process as creators. In so doing, they will heighten their awareness of programming and the capacities of computer hardware.

**Prerequisites & Notes**

EDT 520 and matriculation in MED in IT, EdS, or Instructional Technology Graduate Certificate Programs, or permission of instructor.

Credits: 3

## **EDT 532 - Creative and Connected Learning Environments**

This course is designed for pK-12 educators who are ready to move from learner engagement to learner empowerment. Participants will understand the vital role that creativity plays in problem solving, collaboration, and learning. The course will provide foundational knowledge on strategies to harness educational technology to teach and assess creativity across content areas. Participants will work in depth with technology standards and plan new learning experiences that focus on benefits of creativity and using digital tools connected beyond the traditional boundaries of classroom walls.

**Prerequisites & Notes**

None.

Credits: 3

## **EDT 537 - Introduction to Flipped, Blended, and Online Learning**

Advancements in technology have led to exponential growth in opportunities for innovative education for all learners. Participants will explore what it means to create a flipped, blended, or online learning environment. These philosophies and strategies can be applied in K-12 classrooms, higher education contexts, and workplace settings. Participants will consider how format, technologies, and modalities may impact the learner and learning community. Participants will explore historical context of adopting technologies to enhance and expand learning opportunities, and how best practices are determined. Participants will conduct research on various aspects of flipped, blended, and online learning and be actively engaged in the application of effective methods for designing and delivering learning experiences online.

**Prerequisites & Notes**

None

Credits: 3

### **EDT 540 - Instructional Design and Project Management**

In this hands-on, project-based course, students will design and develop an authentic technology-based learning experience based in sound instructional design principles. Students will present several iterations of their designs to the class, participate in peer critiques, and continually improve their projects over the semester. As instructional designers work in a team, each student contributes to, and benefits from consulting with peers. They use their skills to help others and improve their own projects. Students will also explore additional instructional design frameworks and learning theories to improve fluency and flexible thinking while managing instructional design projects. This is a class that embraces creativity, active learning, social learning, and design thinking.

#### **Prerequisites & Notes**

EDT 520.

Credits: 3

### **EDT 541 - Advanced Instructional Design**

This advanced course extends students' knowledge of the theory and practice of instructional design as well as introduces students to the practice of research in instructional design. Students will design original 2D and 3D models of physical spaces as well as plan types of instruction and learning that their designs would facilitate. Students will also work with technology mediated approaches to instruction and plan curricula that helps students master content and skills appropriate for the 21st Century information culture. Throughout, students will critically assess the efficacy of their own and each other's designs to meet learning objectives. The course will have synchronous and asynchronous elements. Students will also work independently as well as in small groups on projects.

#### **Prerequisites & Notes**

EDT 540 or Permission of Instructor

Credits: 3

### **EDT 542 - Supporting Technology Integration through Professional Development and Coaching**

Mentoring, coaching, and collaboration are all parts of a helpful and supportive approach to improving instructional practices. According to Carr, Herman & Harris (2005), "When these interactions are embedded in school culture, a new synergy evolves and a shift occurs- a shift to the forward momentum of collaborative school improvement" (p.11). In this course, learners will integrate theories and models of professional development to create plans and activities that are aligned to the needs of their community as well as professional teaching standards. Learners will apply best practices in professional development design, incorporating the elements of teacher evaluation models, adult learning theory, professional learning communities, and instructional coaching.

#### **Prerequisites & Notes**

EDT 520 or 540

Credits: 3

### **EDT 543 - Practicum in Instructional Design**

This capstone course is designed to allow participants focusing on instructional design to engage in the full life-cycle of such a design project. The work will include analysis, design, development, implementation, and evaluation to create an original instructional project. Participants will work in one or more of the principle program domains: Learning Environments, Teaching/Learning Strategies & Assessments, Digital Citizenship, Professional Practice, and Leadership. Students will work collaboratively with peers, field experts, and faculty members. As appropriate for the content and approach of projects, mentors and/or the practicum supervisor may recommend a research review for areas ranging from pedagogical approach, appropriateness for settings, and technical feasibility. Student teams will present their projects at the end of the term.

**Prerequisites & Notes**

Permission

Credits: 3

**EDT 545 - Legal, Ethical and Security Issues in Educational Technology**

This course is designed to give educators, and emerging technology leaders a foundation with the following domains of digital citizenship: law, risks and responsibilities, and security. Students will engage in readings on existing frameworks, conduct analysis of policies, review case studies to learn more about the importance of legal, social and ethical concerns of standards and policy development in the classrooms of today and tomorrow. In addition, students will plan for collaboration with stakeholders in their organization to work towards legal, secure, safe, and ethical implementation of educational technology.

**Prerequisites & Notes**

EDT 520 or permission of the instructor.

Credits: 3

**EDT 559 - Essentials for Educational Technology Leaders**

Technology is reshaping how organizations work and how learning takes place. Individuals with expertise in instructional technology are relied upon to take leadership positions with technology use, planning and evaluation. However, these individuals seldom have expertise in how to be leaders and agents for change at the organizational level. Every situation is different, but knowing the right questions to ask can mean the difference between effective leadership and frustration. This course examines such challenges in the context of technology leadership for a variety of instructional settings.

**Prerequisites & Notes**

9 credits of EDT coursework , or permission of instructor

Credits: 3

**EDT 560 - Assessment in the 21st Century Classroom**

Students will first explore the traditional vocabulary used for assessment and learning. Students will then evaluate, discuss, reflect upon, and consider the implications of integrating technology and digital assessment tools in the pk12 classroom to support knowledge acquisition and creation of new knowledge. Students will look through a variety of lenses for students understand and assessment including ISTE, SAMR, and Bloom's among others.

**Prerequisites & Notes**

EDT 520 or permission of instructor.

Credits: 3

## **EDT 561 - Technology Supported Inquiry-Based Teaching and Learning**

This course examines the role of technology in active, inquiry-based teaching and learning in diverse learning environments such as the traditional classroom setting, libraries, coaching models, and industry training. Participants will explore self-directed questions and problems engaging in inquiry-based instructional methods supported by technology resources and tools. An integral component of this course will be the development of an inquiry-based facilitation plan that fosters and promotes active student questioning, critical thinking, and complex problem solving for implementation in classroom environments. Emphasis is placed on student-centeredness, constructivist learning theories, and problem based teaching and learning approaches.

### **Prerequisites & Notes**

Graduate Standing or Permission

Credits: 3

## **EDT 562 - Technology for Young Learners**

This course is designed to provide students with the ability to integrate developmentally appropriate technology into the early childhood classroom, birth to age eight. Students will gain the skills to apply technology-mediated family engagement strategies. Emphasis will be placed on how computer technologies, mobile devices, and Internet resources can enhance play-based pedagogy learning. This course develops students understanding in evaluating and integrating technology into curriculum, instruction, and assessment in order to create learning environments that address the needs of the diverse young learners.

### **Prerequisites & Notes**

EDT 520 or permission of instructor.

Credits: 3

## **EDT 563 - Future Ready: Embedding DesignThinking in The Learning Process**

As modern education grows complex, educators need strategies to inspire authentic learning experiences, to motivate colleagues and students, and spark innovative solutions, Empathy fueled, human centered problem solving--design thinking -- provides the mindset and framework for developing innovations at any scale and managing project based learning in any environment. This course provides a critical investigation into the principles of design thinking and how to apply them to your professional life. Participants will engage in iterative cycles of a design process and explore how both high and low technologies can support the outcomes of design thinking.

Credits: 3

## **EDT 570 - Leveraging Crowd-Based Knowledge in K-12 Classrooms**

This course is an inquiry into crowd-based knowledge and the affordances and challenges of such knowledge for K-12 teachers. We will consider different interfaces (e.g., wiki, question and answer, discussion forum) that manage interactions between large groups of users and examine questions of reliability, access, and participation. The course will be project and discussion oriented.

### **Prerequisites & Notes**

None.

Credits: 3

## **EDT 571 - Methods of Integrating Computational Thinking for Diverse Learners**

Computational thinking is a problem-solving process that draws on the principles and practices central to computing education. This course provides a foundation in the big ideas in computational thinking—abstraction, data and information, algorithms, and programming and the application of these practices to domain-based context in educational environments. Participants will explore pedagogical approaches to promoting computational thinking with a focus on including those groups who are historically underrepresented in the field. Students will use a range of curriculum standards to plan, design instruction, and use assessment strategies that integrate computational thinking competencies.

### **Prerequisites & Notes**

None

Credits: 3

## **EDT 572 - Teaching Programming in Multiple Paradigms**

The audience for computer science education is larger and more diverse than ever, but educators are often tasked with teaching the subject without any formal exposure to the fundamentals of programming, particularly as it relates to their students. Embracing the wide variety of needs and abilities of different age groups, this course is an introduction to different coding paradigms and some of the programming languages that are appropriate for all levels of K12 and beyond. These paradigms include but are not limited to block-bases, imperative, and object-oriented, and students will use different development environments to explore different application domains. There will be an emphasis on computational problem solving and the key aspects of algorithm development. Students will create unit progressions that allow their learners to work collaboratively and inclusively.

### **Prerequisites & Notes**

EDT 571 or permissions of instructor

Credits: 3

## **EDT 574 - Computational Thinking for Early Childhood and Elementary**

This course is designed for students to understand and apply theoretical concepts of computational thinking (CT) for technology integration into early learning and elementary classrooms. The course begins with pre-computational thinking concepts and how to introduce them to early learners. Students will progress to computational thinking concepts as they build an understanding from early learners to elementary aged learners. This course develops students' understanding in evaluating and integrating CT using technology into early learning and elementary curriculum, instruction, and assessment with an emphasis on low to high education technology tools.

### **Prerequisites & Notes**

Graduate standing or permission of the instructor

Credits: 3

## **EDT 575 - Integrating Computational Thinking for Middle and High School**

This course is designed for students to understand and apply theoretical concepts of computational thinking (CT) for technology integration into middle school and high school classrooms. The course begins with computational thinking concepts and how to introduce them to middle school and high school aged learners. This will include the developmental, disciplinary, and instructional pedagogical needs of the two different groups of learners. This course develops students understanding in evaluating and integrating CT using technology into middle school and high school curriculum, instruction, and assessment with an emphasis on low to high education technology tools.

**Prerequisites & Notes**

Graduate Standing or permission of the instructor

Credits: 3

**EDT 580 - Instructional Technology Institute**

This course is for educators seeking to enhance their knowledge and skills with using educational technology to support teaching and learning. Students will engage in on line study, and complete an in-person residence. Course will include strands to allow for focused study of literature, research, and practices with regards to educational technology. Students will participate in both individual and collaborative projects. The focus will be pedagogically driven practices for technology in virtual, blended, and in-person environments. The course is designed for a wide variety of educators and educational technology skill levels.

**Prerequisites & Notes**

No Prerequisites. This course is repeatable up to 3 times for a total of 9 credits.

Credits: 3

**EDT 598 - Special Topics in Instructional Technology**

Concentrated study of designated topics in instructional technology. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following:

**Prerequisites & Notes**

Graduate student or permission.

Credits: 1-3

**EDT 616 - New Directions for Educational Technology**

This is a discussion and project-based seminar that explores how emerging technologies create new opportunities for learning and teaching. How do emerging technologies become instructional technologies that can aid learning and teaching, broadly defined? This course will explore the history of emerging technologies in education, from the advent of radio in the 1920s to the emergence of the world wide web, and use that history to examine the frontier of instructional technology. We will assess trends in displaying, representing, and interacting with information, and imagine how emerging technologies will create new opportunities for learning and teaching.

**Prerequisites & Notes**

EDT 520 or permission.

Credits: 3

**EDT 657 - Practicum**

This course is the capstone experience for students in the Instructional Technology master's degree and educational specialist programs. Students will identify a problem of practice, conduct research and a literature review to develop and implement an approved project to include the following components: action research; application of research to practice; reflection; and presentation.

**Prerequisites & Notes**

Approval of Practicum Supervisor.

Credits: 1-6

## **EDT 693 - Educational Internship**

This course provides an internship experience for students in the Instructional Technology M.Ed. program who are certified PK-12 teachers and are seeking the Maine Department of Education 680 endorsement. Students will complete an approved internship aligned with performance-based standards identified by the International Society for Technology in Education (ISTE) as well as the College of Education and Human Development's NCATE proficiencies.

**Prerequisites & Notes**

Permission

Credits: 3-6

## **EDT 697 - Independent Study in Instructional Technology**

Provides graduate students with an opportunity to increase professional competence through independent readings and research. Students plan individual projects to gain competencies in instructional technology.

**Prerequisites & Notes**

Permission.

Credits: 1-6

## **Electrical and Computer Engineering**

### **ECE 515 - Random Variables and Stochastic Processes**

Engineering applications of probability theory. Analysis of random variables, random processes and stochastic models. Introduction to the analysis and optimization of linear systems with random inputs. Lec 3. (Fall.)

**Prerequisites & Notes**

ECE 316 or instructor's permission.

Credits: 3

### **ECE 523 - Mathematical Methods in Electrical Engineering**

Application of mathematical and numerical methods to Electrical Engineering problems. Topics include: systems of linear equations, sparse matrices, nonlinear equations, optimization, interpolation, numerical integration and differentiation, ordinary differential equations, error analysis, application to linear and nonlinear circuit analysis.

**Prerequisites & Notes**



Senior or graduate standing in ECE.

Credits: 3

### **ECE 533 - Advanced Robotics**

Introduces intelligent robot control system and programming. Robot dynamical equations, path planning and trajectory generation, control system, off-line simulations, robot languages and vision integration in robot applications will be discussed. Lec 2, Lab 3. (Spring.)

#### **Prerequisites & Notes**

ECE 417.

Credits: 3

### **ECE 543 - Microelectronic Devices I**

Physics, engineering and design of deep-submicron Si devices used in microelectronic circuits; non-Si devices used for Photonics; and novel quantum-mechanical single-electron devices. (Fall.)

#### **Prerequisites & Notes**

ECE 343.

Credits: 3

### **ECE 548 - VLSI Test/Characterization**

Laboratory course covering the testing and characterization of integrated circuits designed in ECE 547 and fabricated externally. (Pass/Fail Grade Only.) (Spring.)

#### **Prerequisites & Notes**

ECE 547.

Credits: 1

### **ECE 550 - Electromagnetic Theory**

Reviews of Maxwell's Equations and waves in dielectric and lossy unbounded and layered media. Covers plane cylindrical and spherical wave functions; reflection and transmission properties of layered media, electromagnetic radiation and antenna theory. Lec 3. (Spring.)

#### **Prerequisites & Notes**

ECE 351 or equivalent.

Credits: 3

### **ECE 552 - Wave Propagation**

Theory of the propagation of electromagnetic and sound waves in unbounded and layered isotropic and anisotropic solids and liquids. Specific applications to wave propagation in the ocean and crystals are also presented. Lec 3. (Summer.)

**Prerequisites & Notes**

ECE 453 or permission.

Credits: 3

**ECE 565 - Solid State Device Theory I**

A study of physical principles underlying solid state devices. Topics include: crystalline structure, x-ray diffraction, reciprocal space, lattice vibrations, phonons, specific heat and introduction to quantum mechanics. Lec 3. (Fall.)

**Prerequisites & Notes**

permission.

Credits: 3

**ECE 571 - Advanced Microprocessor-Based Design**

Includes techniques for developing software and hardware for microprocessor-based systems, computer aided design using a multistation logic development system, use of components commonly found in microprocessor-based systems. Lec 2, Lab 3. (Spring.)

**Prerequisites & Notes**

ECE 471 or permission.

Credits: 3

**ECE 573 - Microprogramming**

Fundamentals of microcoding and the design of microcoded systems including bit slice design. Lec 2, Lab 3. (Fall.)

**Prerequisites & Notes**

ECE 471, ECE 475.

Credits: 3

**ECE 574 - Cluster Computing**

Advances in high-end computational technology continue to bring the digital revolution into academic, industrial and commercial areas. A popular approach for achieving high performance for these application domains is to use parallel computers. Introduces the primary parallel computer architectures, as well as the programming techniques applicable to concurrent, parallel and distributed computations. Students will gain experience in developing parallel computing solutions for challenging problems. Lec 3. (Offered one every two years - Spring.)

**Prerequisites & Notes**

At least a C- in ECE 177 or permission.

Credits: 3

**ECE 577 - Fuzzy Logic**

This course covers the fundamentals of fuzzy logic and its application in control, model identification, information systems, and pattern recognition, as well as in conjunction with artificial neural networks and genetic algorithms.

**Prerequisites & Notes**

ECE 477 or permission.

Credits: 3

## **ECE 581 - Estimation and Detection Theory**

Mathematical fundamentals of optimal signal-processing strategies. Neyman-Pearson and Bayes Detectors applied to radar and sonar systems. Maximum Likelihood and Bayes Estimators and applications. (Spring.)

**Prerequisites & Notes**

ECE 515.

Credits: 3

## **ECE 583 - Coding Theory**

In this course students will learn how to compute the maximum rate of reliable transmission and design, evaluate, and implement codes that achieve capacity with reasonable decoding complexity.

**Prerequisites & Notes**

ECE 515 or permission.

Credits: 3

## **ECE 585 - Fundamentals of Wireless Communication**

Aims to present the modern wireless communication concepts in a coherent and unified manner and to illustrate the concepts in the broader context of the wireless systems on which they have been applied. Recent wireless standards will be studied in depth and emphasized through a course project.

**Prerequisites & Notes**

ECE 484 or instructor's permission.

Credits: 3

## **ECE 590 - Neural Networks**

Introduces artificial neural networks. Provides supervised and unsupervised learning in single and multi-layer networks, software implementation, hardware overview. Applications in pattern recognition and image analysis. (Fall.)

**Prerequisites & Notes**

permission.

Credits: 3

## **ECE 591 - Deep Learning**

This course is an introduction to deep learning, a branch of machine learning concerned with the development and application of deep artificial neural networks. Topics include convolutions neural networks, recurrent neural networks, and their applications for various engineering and scientific problems. Students should know at least one high-level programming language. This course will use Python and give tutorials on Python programming. Students will gain hands on experiences of developing, training, and evaluating deep learning models to solve sophisticated problems.

**Prerequisites & Notes**

ECE 177 or COS 220 or CIE 115 or MEE 125 or permission.

ECE 491 and ECE 591 can not both be taken for credit.

Credits: 3

**ECE 598 - Selected Advanced Topics in Electrical and Computer Engineering**

Advanced topics not regularly covered in other courses. Content varies. May be repeated for credit. (Fall and Spring.)

**Prerequisites & Notes**

permission.

Credits: 1-3

**ECE 599 - Selected Study in Electrical and Computer Engineering**

Advanced independent study for qualified students who present suitable projects for intensive investigation in the area of faculty interest. (Fall/Spring.)

**Prerequisites & Notes**

permission.

Credits: 1-3

**ECE 663 - Design and Fabrication of Surface Wave Devices**

Covers the design, fabrication and measurement of surface acoustic wave (SAW) devices, e.g. delay lines, filters, resonators, oscillators, convolvers and sensors. Topics include: planar fabrication techniques, surface properties of piezoelectric crystals, photolithography, vacuum technologies for thin film deposition, electronic systems for the measurements of impulse and frequency response, phase and group velocity, insertion loss, distortions and spurious effects. Lec 2, Lab 3. (Spring.)

**Prerequisites & Notes**

ECE 550, ECE 662 or permission.

Credits: 3

**ECE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research

and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **EET 514 - zzprinted Circuit Boeard Design**

This online course will focus on printed circuit board (PCB) technology, layout, and construction. Emphasis is placed on troubleshooting PCBs and the physical realization of electronic circuits. Background topics include PCB manufacturing and assembly (focusing on cutting-edge manufacturing capabilities and designing for pick-and-place auto assembly) Emphasis will also be placed on schematic capture and circuit board layout and advanced layout techniques using Altium Designer (including 8-10 layer design, 3-D PCB design, flex-PCB design, and PCB miniaturization techniques). Students will be required to use Altium Designer to design and layout their own custom circuit board as a final project.

### **Prerequisites & Notes**

EET 241 or EET 330 or ECE 209 or ECE 210, or instructor permission.

There is no textbook and the software is free for University students. This course is offered fall and spring semesters.

Credits: 3

## **EET 515 - Automation and Integration**

Intoduction to Systems Integration will cover many aspects of the integration field that an engineer would expect to encounter. This includes basic newworking, hardware types, communication standards and protocols, and troubleshooting skills. This course intends to set the groundwork for student intending on pursuing a controls or integration engineering expertise, or to give valuable background to a professional who will work closely with these expers. Almost every engineering descipline now works closely with smart devices and automated equipment, so these skills are useful to a wide rance of professionals.

### **Prerequisites & Notes**

Junior standing in the EET major or permission.

If this couse was taken as a topics course in EET 498, it cannot be repeated for credit/

Credits: 3

## **EET 560 - Renewable Energy and Electricity Production**

An overview of renewable energy resources, energy conversion and storage for stationary and transportation applications. Topics include: Basics of electrical energy and power generation, load specification, history of electric utilities, distributed generation, the economics of energy, biomass duels, wind and solar power and fossil fuel limits, and battery storage.

### **Prerequisites & Notes**

PHY 108, PHY 112, PHY 122; MAT 117 or MAT 126, graduate standing or permission.

Credits: 3

## **EET 584 - Engineering Economics**

A study of economic theory and applications in engineering and industrial organizations including capitalization, amortization, time value of money, cost comparison analysis, break even value, and the ethics of engineering economic decision making. Also included are personal finance topics as applies to engineering situations and case study.

### **Prerequisites & Notes**

Senior standing in the School of Engineering Technology; graduate standing or instructor permission.

EET 484 and EET 584 can not both be taken for credit.

Credits: 3

## **SFR 548 - Quantitative Social Science for Natural Resource Management**

Theory and application of methods for quantifying socio-economics dimensions of natural resource management. Contribution of social science, human dimensions, and resource management at multiple scales. Integration of natural and social sciences to quantify and assess trade offs for the complex dimensions of resource management.

### **Prerequisites & Notes**

None

Credits: 3

## **SFR 589 - Tools for Consulting Foresters**

Hands-on experience with software applications and field techniques useful for creating small woodlot forest management plans including: mapping, forest inventories, resources evaluation and assessments, growth and yield programs, spreadsheets and other office software.

### **Prerequisites & Notes**

None

SFR 489 and SFR 589 cannot both be taken for credit.

Credits: 1

## **SPA 519 - Rebels and Realists in 19C Literature**

This course analyzes a broad selection of literary text from the 19th century, a period of revolutions, rapid industrialization, and radical politics. A particular emphasis is placed on Romanticism and Realism and their legacies in contemporary culture.

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **Engineering (PSM)**

## **ENM 586 - Advanced Project Management**

This course covers a wide range of projects management topics including project planning, controlling, scheduling, and risk analysis. Through lecture and case studies, students will be prepared to become project management professionals and will learn to bring projects to successful completion. The course also emphasizes the human relations aspects of project management such as team theory and personnel conflict.

### **Prerequisites & Notes**

Senior standing, graduate standing, or permission of instructor

Credits: 3

## **GEE 694 - Professional Science Masters in Engineering and Business Internship**

Internship with a business, non-profit or federal, state or local government that integrates advanced engineering and business skills. Open only to students in Professional Science Masters in Engineering and Business program.

### **Prerequisites & Notes**

Permission

Credits: 1-6 pass/fail only

## **English**

### **ENG 507 - Graduate Fiction Workshop**

A graduate seminar for students concentrating in creative writing, which focuses on workshopping in-progress writing by peers, analyzing published creative works, reading and discussing essays on narrative theory and writing as a craft. May be repeated once for credit.

### **Prerequisites & Notes**

English M.A. candidate, writing sample, faculty permission.

Credits: 3

### **ENG 508 - Writing Workshop in Poetry and Poetics**

An innovative approach to the traditional workshop for poets and those who think and write about poetry from a scholarly perspective, this course facilitates creative approaches to the writing of both poetry and poetics. Due consideration will be given to historical models, as well as to critical and theoretical writings. The principle object will be the students own writing as it unfolds across the semester. Required to complete the concentration in Poetry and Poetics.

### **Prerequisites & Notes**

English M.A. candidate, writing sample, faculty permission.

Credits: 3

### **ENG 515 - Approaches to Collaborative Writing**

This course focuses on theoretical and practical approaches to writing collaboratively in academic, professional, and community-based settings. Students will learn how to be the lead writer/project manager on documents such as reports, proposals, and grants that are often written as part of a team. This course is appropriate for graduate students who want to improve their own written work and for students who want to learn how to manage collaborative writing projects.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **ENG 516 - Perspectives on Information Design**

This course focuses on theoretical and practical approaches to information design through topics such as visual rhetoric, usability, technical editing, social justice, ethics, digital rhetoric, and information literacy. Projects may include working with a client to design or edit a document and building a personal portfolio of professional and technical writing. This course is appropriate for graduate students who want to expand their skills in communicating information effectively and ethically to various audiences.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **ENG 518 - Topics in Professional and Technical Writing**

Topics vary according to changes in the field, expertise of the faculty, and needs of the students. Possible topics include scientific communication, rhetoric of health and medicine, organizational communication, digital rhetoric, usability, and social justice. May be repeated for credit when topic varies.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **ENG 529 - Studies in Language, Literature, and Writing**

Intended to supplement and allow experiments within the existing curriculum at the 500 level.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 536 - Studies in Canadian Literature**

In-depth study of Canadian literature, focusing on a particular period, group, movement, issue or major author: e.g. pre-Confederation literature, the TISH poets, the McGill Movement, novels by writer of color, Margaret Atwood and Michael Ondaatje.

**Prerequisites & Notes**

graduate standing in English or permission.



Credits: 3

### **ENG 541 - Colonial and Early National American Literature**

A graduate seminar in literatures from the beginnings of European exploration and colonization of North America through early attempts to define and create American literature in the early Republic

#### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

### **ENG 542 - Studies in North American Literatures**

In-depth study of works by American writers focusing on a particular period, cultural group, movement, issue or individual(s); e.g. Contemporary Native American Writers, African American Literary Tradition and Theory, Literature of Mixed Blood Experience, Jewish American Literature, or Maine Literary History Franco-American and Wabanaki.

#### **Prerequisites & Notes**

Graduate standing in English or permission of instructor.

Credits: 3

### **ENG 545 - American Literature at the fin-de-siecle**

Readings will be drawn from the period encompassing Reconstruction and the First World War. During this period of rapid nationalist expansion, the New England dominance of American letters was challenged by writers from many other places and ethnicities. The seminar will examine tensions central to the period, such as modernism vs. anti-modernism, civilization vs. nature, and nostalgia for the rural past in the face of the new mass urban culture.

#### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

### **ENG 546 - Modernisms**

Seminar examining the transnational movements known as modernism from a variety of perspectives and through a range of texts-both in original English and translation-and artworks. Specific focus will vary depending on the instructor.

#### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

### **ENG 549 - Studies in Gender and Literature**

Intensive study of the workings of gender in language and literature. Topics will vary widely, and may include studies of women writer and/or of specific literary periods or schools, as well as studies of specific theoretical questions such

as the gendered nature of language, modern and contemporary feminist theory, gender theory, queer theory, and identity studies. May be repeated for credit.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 551 - Medieval Literature**

This class examines the literature and language of the medieval period. Readings vary but may include selections from the British, Continental, and/or Global Middle Ages.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 553 - Early Modern Drama**

A seminar that considers the dynamic role of theatrical performance in the changing political, religious, and cultural landscapes of sixteenth and seventeenth-century England. Readings represent a cross-section of dramatic writers, forms, genres, and conditions. The course's primary thematic focus will vary from year to year.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 554 - Early Modern Prose and Poetry**

Explores innovations in sixteenth and seventeenth century Anglophone poetry and prose, with attention to cultural, political, and global contexts. Readings will draw from cononical and lesser-known texts, and will represent the works of female and male writers. The course may be organized around a specific theme.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 555 - Restoration and Eighteenth-Century British Literature**

The Restoration and Eighteenth Century is a watershed period that marks the transition from Renaissance to Modern. This seminar considers literature against the background of this historical change and focuses on gender, culture, genre, individualism, representation, and post colonialism. May include works by Pope, Behn, Cavendish, Finch, Congreve, Dryden, Swift, Defoe, Richardson, Johnson, and Radcliffe, among others.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 556 - British Romanticism**

An exploration of both poetry and prose of the Romantic period, by male and female writers, canonical and lesser known. Particular attention is paid to questions of gender and genre as an influence on canonical Romantic poetics.

### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 558 - British Modernist Literature**

Readings in British Modernist literature, including poetry, prose, fiction, and drama. Time frame may vary, with a focus on either early or late modernism (1890s to 1920s-1940s or 1930-1960s)

### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 570 - Critical Theory**

Readings in the theoretical traditions that have determined the possibilities for scholarship and interpretation in literary criticism, and a consideration of significant contemporary experiments that have redefined these possibilities.

### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 579 - Theorizing and Researching Composing**

Equips students with an overview of dominant theoretical frameworks for conceptualizing writing as both an activity and as a product of that activity. The course introduces several empirical methods for testing hypothesis about composing processes and composed artifacts. (This course is identical to COM 579)

### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 580 - Topics in Poetry and Poetics**

Intensive study of literary language and practice focusing primarily but not exclusively on poetry. Topics will vary widely but fit one or more of the following general areas of emphasis: theories of poetry and poetic production; surveys focusing on work from more than one historical period or national literature; studies of the critical and other prose writings of poets; courses on critical theory in which poetry plays a key role; narratology and genre theory. May be repeated for credit.

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **ENG 581 - Twentieth-Century Poetry**

A focused study of significant figures and/or movements in twentieth-century poetry. Specific topics will vary depending on the instructor.

#### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

### **ENG 596 - Graduate Internship**

Supervised professional work applying skills cultivated in the MA in English program. Graduate students may work with businesses, professionals, or organizations approved by the department. Work may include editing, developing content, reporting, indexing, researching, analyzing, designing communication, and professional/technical writing, among other activities related to students' professional goals. Students must apply for this course before the semester of enrollment. Students are expected to work approximately 12 to 15 hours per week per 3 hours credit. May be repeated for credit up to 6 credit hours.

#### **Prerequisites & Notes**

Permission required; ENG 515 or ENG 516 or by recommendation of faculty.

Credits: 1-6

### **ENG 600 - Introduction to Graduate Studies in English**

This course offers an overview of graduate studies in English. It introduces students to the scholarly resources, graduate faculty, and academic writing and publishing, ethics and professional development in academia, and the responsible conduct of research.

#### **Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 1

### **ENG 606 - Rhetorical Theory: Critical Tradition**

Survey of basic issues in and the contributions of major theorists in the critical tradition of the philosophy of rhetoric. (This course is identical to CMJ 606.)

#### **Prerequisites & Notes**

Permission.

Credits: 3

### **ENG 693 - Principled Practices in the Teaching of Writing**

A study of empirical research, theoretical insights, and ethical issues about the teaching of language and writing to students at the University of Maine. Students will develop a theoretically-informed, empirically grounded assignment sequence for the future teaching of English 101: College Composition, as well as conduct action research, participate in department culture, and prepare a proposal for conference presentation or publication. Required of all teaching assistants in the department of English during their first teaching semester.

**Prerequisites & Notes**

Graduate standing in English or permission.

Credits: 3

## **ENG 697 - Independent Reading/Writing**

By arrangement.

**Prerequisites & Notes**

6 hours of graduate study in English and permission of the graduate coordinator.

Credits: 1-3

## **ENG 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **English as a Second Language**

### **ELL 570 - Methods of Teaching English as a Second Language**

Basic principles underlying ESL pedagogy and current techniques for second language teaching. Students review materials, develop activities, plan lessons and compile a teaching portfolio. For content-area teachers seeking Maine's ESL endorsement or individuals planning to teach EFL overseas.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **ELL 591 - Multiculturalism and Diversity for English as a Second Language (ESL) Contexts**

Diversity training and personal reflection to raise awareness of and to challenge biases about difference. Focus on attitudes toward language, dialect, or accent difference. Issues related to cultural diversity in communication styles, values systems, instructional role expectations, and paths to identity formation. For practicing teachers seeking Maine's

ESL endorsement or individuals planning to teach EFL overseas. Also suitable for those preparing to teach a second language other than English.

**Prerequisites & Notes**

Graduate standing or permission of instructor.

Credits: 3

## **Food Science and Nutrition**

### **FSN 501 - Advanced Human Nutrition**

Basic nutrition science with an emphasis on carbohydrate, lipid, protein, vitamin, mineral functions and metabolism. Genetic influences on nutrient needs and metabolism.

**Prerequisites & Notes**

Graduate Standing of instructor permission

Credits: 3

### **FSN 502 - Food Preservation**

Chemicals and processes (freezing, dehydration, canning, irradiation, extrusion) used to extend food quality and safety.

**Prerequisites & Notes**

Permission.

Credits: 3

### **FSN 506 - Nutritional Assessment**

Covers methods of evaluating the nutritional status of individuals or groups of people by dietary assessment and nutrition-related health indicators.

**Prerequisites & Notes**

Graduate level standing in FSN or permission

Credits: 3

### **FSN 508 - Nutrition and Aging**

Roles of nutrients, foods and supplements in maintaining health during aging. Online class with some live discussions. FSN 501 recommended.

**Prerequisites & Notes**

Graduate standing or instructor permission

Credits: 3

### **FSN 510 - Trace Mineral Nutrition, Metabolism and Clinical Applications**

Presents a global approach of the role of trace elements in the human body, food and the environment. Examines their function as nutrients (deficiency and toxicity) and how they impact human health and chronic disease and their applications in a clinical setting. Addresses their role on gene expression in relation to health and disease. The impact of environmental changes on trace elements in the food chain and ultimately human and animal health is explored.

**Prerequisites & Notes**

FSN 410 and NUR 303 or permission.

Credits: 3

## **FSN 512 - Current Food Safety Systems**

In-depth study of the development of Food Safety Systems such as Good Manufacturing Practices (GMPs), Hazard Analysis Critical Control Points (HACCP), and Food Safety Modernization Act (FSMA; Preventive Controls for Human Food Rule) and their application to the food processing industry. The role of these systems in ensuring a safe food supply at the local, national, and international level. Certifications for HACCP and PCQI (Preventive Controls Qualified Individual) are offered to students taking this class.

**Prerequisites & Notes**

FSN 330

Credits: 4

## **FSN 520 - Food Product Development**

An overview of the processes required to create and introduce new food products to the marketplace. Students will follow the development team approach to conceptualize, formulate and evaluate food products.

Satisfies the General Education Capstone Experience Requirement.

**Prerequisites & Notes**

FSN 330 or permission.

Credits: 3

## **FSN 524 - Responsible Design, Conduct and Analysis of Research**

Experimental design, ethical considerations, and statistics for responsible conduct of nutritional and medical research.

**Prerequisites & Notes**

Undergraduate statistics course or permission.

Credits: 3

## **FSN 528 - Food Microbiology**

Examines the importance of microorganisms in food processing, spoilage, and preservation; the role of microorganisms in fermentation and production of protein, enzymes, and other products; food as a vehicle of infection and intoxication. FSN 438 and 528 cannot both be taken for credit.

**Prerequisites & Notes**

Prerequisites: BMB 300

Credits: 3

## **FSN 529 - Food Microbiology Laboratory**

This course contains a series of experiments to allow students to perform and observe fundamental principles and practices of food microbiology. Students will work in the lab to execute the exact procedure utilized by the USDA/FDA for the detection and enumeration of microorganisms in food. FSN 439 and 529 cannot both be taken for credit/

### **Prerequisites & Notes**

Corequisites: FSN 528

Prerequisites: BMB 305

Credits: 2

## **FSN 530 - Integrative and Functional Nutrition**

Review of alternative practices such as traditional Chinese medicine, Ayurvedics, homeopathy, naturopathy, herbal medicine, and dietary supplements and how these practices can be integrated with conventional dietetic practice. Special needs of different life stages and disease conditions are addressed. Online class with scheduled discussions.

### **Prerequisites & Notes**

FSN 410 or FSN 501 or Instructor Permission. Prior classes in medial nutrition therapy recommended.

Credits: 3

## **FSN 538 - Fermented Foods and Probiotics**

Deals with application of the principles of microbiology to the understanding of the fermentation of various categories of foods. Reviews current understanding of probiotic mechanisms and efficacy in humans.

### **Prerequisites & Notes**

Must have a Graduate standing in FSN or permission.

Credits: 3

## **FSN 540 - Advanced Clinical Topics**

A critical evaluation of medical nutrition therapy in the inpatient clinical setting. Application of the current medical literature to practice decisions. Nutritional goals for a variety of medical conditions are discussed.

### **Prerequisites & Notes**

FSN 420 or equivalent.

Credits: 3

## **FSN 542 - Sustainability, Nutrition and Health**

This course explores sustainable practices when growing, processing, transporting, distributing, choosing, preparing, and consuming food and how these practices affect the tripod of sustainability, i.e. environment, society (health) and



economy in the context of the "Farm to Healthy Body" model. Applications for health professionals are addressed.

**Prerequisites & Notes**

Graduate standing or instructor permission

Credits: 3

**FSN 543 - Communication in Nutrition and Food Technology**

This course is designed to provide preparation for effective delivery of oral and written presentations in the fields of Nutrition and Food Technology. The course will also explore the differences and similarities in presenting to the scientific community and lay audiences and finally, the course will study other forms of communication including blogs, podcasts, and social media.

**Prerequisites & Notes**

None

Credits: 3

**FSN 545 - Utilization of Aquatic Food Resources**

Utilization and food quality of wild and farmed aquatic animals including production, chemical/physical properties, nutritional value, post-harvest changes, processing systems, regulatory issues, by-product utilization and food safety.

Credits: 3

**FSN 555 - Organic and Natural Foods**

Introduces organic and natural foods from an industry perspective. Discussion of food production and processing, legal issues, ingredient functionality, and controversies.

**Prerequisites & Notes**

FSN, AVS, or PSE Major or Permission of instructor.

Credits: 3

**FSN 560 - Research Methods in Community Nutrition**

This course provides students with the tools to develop, implement, and evaluate community nutrition interventions. Students will learn about theories for healthful behavior change and build on skill in conducting needs assessments, grant writing, and evaluating program implementation and effectiveness.

**Prerequisites & Notes**

FSN 401 or permission

Credits: 3

**FSN 571 - Technical Presentations**

Introduction to technical presentations. Computer graphics, slide making and presentation skills are emphasized. Students present one 15-20 minute talk.

Credits: 1

### **FSN 575 - Sensory Evaluation Laboratory**

A laboratory that provides training in the selection, design, execution, and analysis of sensory and consumer science experiments. Training in sensory science-specific software and execution of web-based surveys and focus groups.

#### **Prerequisites & Notes**

Corequisite: FSN 585

FSN 475 and FSN 575 may not be both taken for credit.

Credits: 3; 1 Lab

### **FSN 580 - Food Chemistry**

Study of the composition, structure, and properties of foods and chemical changes occurring during processing and utilization.

Credits: 3

### **FSN 580 - Food Chemistry**

Study of the composition, structure and properties of foods and chemical changes occurring during processing and utilization.

#### **Prerequisites & Notes**

BMB 322, CHY 252, or permission. FSN 482 and 580 cannot both be taken for credit.

Credits: 3

### **FSN 581 - Problems in Food Science and Human Nutrition**

Special topics - Opportunity is provided to pursue an individualized topic in the food science or human nutrition area.

#### **Prerequisites & Notes**

permission.

Credits: Ar

### **FSN 584 - Lipids, Diet and Cardiovascular Disease**

Lipid and lipoprotein metabolism and its relation to atherosclerosis. An in-depth study on the epidemiology, pathophysiology, etiology and mechanisms of atherosclerosis initiation and progression and genetic aspects of the disease. Clinical and basic research advances on the role of diet and dietary lipids on prevention and treatment of Cardiovascular Disease.

#### **Prerequisites & Notes**

FSN 410 and NUR 303

Credits: 3

### **FSN 585 - Principles of Sensory Evaluation**

Introduction to sensory evaluation practices including difference and affective testing. Online class with scheduled synchronous discussions. Prior classes in Food Science, Statistics, and Psychology are strongly recommended.

#### **Prerequisites & Notes**

FSN 330, MAT 232 and PSY 100 or permission.

Credits: 3

### **FSN 586 - Sensory and Consumer Science Applications**

Assessment of food behaviors and emotions, satiety, purchase intent, and other factors related to food selection. Online class with scheduled synchronous discussions. FSN 585 and FSN 524 are recommended.

#### **Prerequisites & Notes**

Graduate status or instructor permission

Credits: 3

### **FSN 587 - Food Analysis**

Nutrient composition, residues and natural toxicants, with emphasis on the use of GC and HPLC.

#### **Prerequisites & Notes**

BMB 322 or FSN 582 or permission.

Credits: 3

### **FSN 603 - Nutrient Changes in the Food System**

Review of the changes in food nutrient and phytochemical composition and bioavailability from the farm through the processing and distribution to consumers.

#### **Prerequisites & Notes**

Graduate status in ANS, BUA, FNS, FSN, ACL, or PSE programs, or instructor permission

Credits: 3

### **FSN 650 - Dietetic Internship Orientation and Application I**

Introduction to the dietetic internship program. Application of internship competencies through development of public policy team project part I, review of medical terminology, and participation in clinical case studies and diabetes nutrition care.

#### **Prerequisites & Notes**

Dietetic Interns only.

Credits: 2

### **FSN 651 - Dietetic Internship Orientation and Application II**

Orientation to supervised practice rotations, curriculum and evaluation. Application of the nutrition care process in clinical and community settings. Part II of public policy team project and review of medical terminology.

#### **Prerequisites & Notes**

FSN 650.

Credits: 2

### **FSN 652 - Dietetic Internship Evaluation**

Presentation of individual and program evaluation through oral and written assessments. Presentation of individualized projects.

#### **Prerequisites & Notes**

FSN 651 and FSN 681 or concurrently.

Credits: 1

### **FSN 671 - Advanced Graduate Seminar**

Presentation of research results and reviews of the literature in food science and human nutrition. May be repeated for credit.

#### **Prerequisites & Notes**

FSN 571 or permission.

Credits: 1

### **FSN 681 - Dietetic Supervised Practice**

Supervised practice in community and hospital sites to meet requirements of an American Dietetic Association accredited internship program.

#### **Prerequisites & Notes**

dietetic interns only by permission.

Credits: 1-10

### **FSN 695 - Food Science and Human Nutrition Practicum**

Supervised professional experience in an approved professional setting . May be taken once for credit. (Pass/Fail Grade Only)

#### **Prerequisites & Notes**

Permisson.

Credits: 1-3

### **FSN 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

### **SFA 551 - Infectious Diseases and Food Safety- From Plants to Humans**

Examines current concepts and trends in infectious disease biology, with a focus on enterobacterial human pathogens, plant pathogens and their impacts on one another. The nature of disease, the casual agents, mechanisms of transmission and epidemic, and strategies for management will be compared among humans and plants.

#### **Prerequisites & Notes**

One of these courses or equivalent: AVS 437, BMB 300, FSN 238, PSE 457/557, PSE 469, or permission.

Credits: 3

### **SFA 672 - Dynamic Technical Presentations**

Presentation of research results and literature information. May be repeated for credit up to three times.

#### **Prerequisites & Notes**

FSN 571 or permission.

Credits: 1

## **Forest Resources**

### **SFR 502 - Timber Harvesting**

Examine and analyze timber harvesting practices in the United States and Canada with special emphasis on Maine. Discussion of harvest methods and systems, production, and regulations. Because of overlap, SFR 401 and SFR 502 cannot both be taken for degree credit. Lec 2, Lab 3.

Credits: 3

### **SFR 503 - Advanced Forest Measurements and Models**

A continuation of the topics introduced in SFR 205 including methods used to measure log, tree, stand, and forest-level attributes. Students will also learn how to sample and analyze forest resources data including use of spreadsheets, databases, and stand projections models. Because of overlap, SFR 402 and SFR 503 cannot both be taken for degree credit. Lec 2, Lab 2.

**Prerequisites & Notes**

SFR 402 or Graduate Standing or permission.

Credits: 3

## **SFR 504 - Rural Communities: Theory and Practice**

Analysis of rural communities and development practices using economic and sociological frameworks. Rural communities in Maine are examined. Field trips required. Lec 4.

**Prerequisites & Notes**

Graduate standing of instructor permission.

Credits: 4

## **SFR 507 - Forest Ecology**

Biological principles and environmental factors governing the natural establishment and development of forest trees and stands. Because of overlap, SFR 407 and SFR 507 cannot both be taken for degree credit.

**Prerequisites & Notes**

Graduate standing or permission of instructor.

Credits: 3

## **SFR 509 - Silviculture**

Theory and practice of controlling the composition, growth, quality and regeneration of forest stands for human benefit. Advanced study of silvicultural research, literature, and practice. Because of overlap, SFR 408 and SFR 509 cannot both be taken for degree credit. Lec 3.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **SFR 520 - Tree Physiology**

Topics in tree physiology including carbon, nutrient, and water relations. Emphasis on plant structure-function relationships and responses to abiotic stress. Includes a mix of lecture and hands-on lab activities.

**Prerequisites & Notes**

Graduate standing.

Credits: 3

## **SFR 521 - Research Methods in Forest Resources**

Provides graduate students with the fundamental research skills needed to successfully prepare for their thesis research, as well as professional careers in scientific research. Students learn how to plan, write, and critique scientific research proposals. Instructions focuses on direct, hands-on learning by writing a proposal that can serve as a student's graduate thesis research proposal. Students learn to pose relevant, interesting, and researchable questions; design testable hypotheses; develop research goals and objectives; and apply critical thinking skills to design appropriate research methods. Key elements of research planning include funding, project management, responsible conduct in research, and journal publications are covered. Graduate students taking this course will meet the University of Maine's requirement for Responsible Conduct in Research training.

### **Prerequisites & Notes**

permission.

Credits: 3

## **SFR 528 - Qualitative Data Analysis in Natural Resources**

Principles and practices of qualitative data analysis in natural resources. The course covers various interpretive analytical traditions in the social sciences, as well as strategies used in qualitative data analysis. Students will analyze previously collected qualitative data, and develop a written document that includes both narrative and visual displays. The course includes hands-on NVivo training on coding data.

### **Prerequisites & Notes**

EHD 571 or permission.

Credits: 3

## **SFR 530 - Wood Physics and Applications in Building Systems**

This course addresses the non-mechanical properties of wood and wood-based composite materials in response to practical considerations of wood use with a focus on timber building systems. A broad spectrum of fundamental physical principles and laws in relation to the properties are reviewed.

### **Prerequisites & Notes**

understanding of basic physics, wood anatomy or permission.

Credits: 3

## **SFR 531 - Mechanics of Wood and Wood Composites**

Application of orthotropic and nonlinear constitutive relations, laminate theory, and failure criterion on the prediction of mechanical properties of solid wood, wood fibers, laminated, and other wood composite materials.

### **Prerequisites & Notes**

None

Credits: 3

## **SFR 539 - Biology of Woody Plants**

Advanced topics in woody plant biology including growth, development, and reproduction. Emphasis on forest tree biology and tree responses to abiotic stressors.

**Prerequisites & Notes**

Graduate standing.

Credits: 3

## **SFR 544 - Forest Resources Economics**

Economics of domestic and international forest resources production, processing and distribution. Contributions of forest resources to local, regional, and national economies. Fundamentals of financial analysis. Evaluation of priced and unpriced forest resources for acquisition, taxation, management, and disposal. Because of overlap, SFR 444 and SFR 544 cannot both be taken for degree credit.

**Prerequisites & Notes**

ECO 120

Credits: 3

## **SFR 545 - Adhesion and Adhesives Technology**

Fundamentals of adhesion and adhesives including surface science, chemistry and properties of adhesives, adhesive bond evaluation and applications in composite materials. Lec 3.

**Prerequisites & Notes**

Senior standing or permission.

Credits: 3

## **SFR 546 - Forest Resource Policy**

Mechanisms involved in, and influences on the evolution of national, state and private forest policies in the United States and other nations. Development of professional codes of ethics in Forestry and examination of professional, private business, environmental and public sector ethical challenges, particularly in the formation of forest and land use policies. Students may not receive credit for both SFR 446 and SFR 546.

**Prerequisites & Notes**

None.

Credits: 3

## **SFR 550 - Wood-Polymer Hybrid Composites**

Fundamentals of fiber reinforced polymer (FRP) materials, manufacturing and performance characteristics. Addresses issues of combining wood with FRP's such as interfacial properties and durability of the resulting wood-polymer hybrid composite materials. Lec 3.

**Prerequisites & Notes**

SFR 454 or permission.

Credits: 3



## **SFR 555 - Advanced Remote Sensing**

This course covers advanced topics in remote sensing related to applications in natural resources. The focus is on optical multi spectral and hyper spectral remote sensing for vegetation studies but other topics and platforms will also be discussed. The goal is to equip graduate students who intend to do research in the area of remote sensing with necessary tools and knowledge to perform research tasks.

### **Prerequisites & Notes**

SFR 406, INT 527 or any introductory remote sensing courses or instructor's permission.

Students should also have experience working with Microsoft Windows, GIS software, be familiar with raster and vector data structure, be able to use spreadsheets such as Excel, and have general knowledge of statistics.

Credits: 3; Lecture 2, Lab 1

## **SFR 557 - Tree Pests and Disease**

Advanced concepts about tree disease and its development, the role of tree disease in forest dynamics, and relevant characteristics of tree pests. Applies concepts to common disease complexes found in Maine and other regions of North America. Note: Because of overlap, SFR 557 cannot be taken if SFR 456 or SFR 457 have been taken for degree credit.

### **Prerequisites & Notes**

Graduate Standing.

Credits: 3

## **SFR 570 - Cellulose Nanomaterials and their Composites**

Comprehensive coverage of the production, characteristics, processing, applications and performances of renewable nanomaterials and their composites. The graduate level course will provide fundamental information on various types of cellulose nanomaterials as well as their performance in target applications. Students may be required to conduct individual/team experiments, visit production sites and hold informal meetings as scheduled along the course of the semester outside the original time frame.

### **Prerequisites & Notes**

Recommendation of the student's advisory committee or permission of the instructor.

Credits: 3

## **SFR 575 - Advanced Forest Biometrics and Modeling**

Advanced Forest Biometrics and Modeling explores the fields of forest growth modeling and biometrics. Growth modeling involves the projection of forest dynamics through time, while biometrics is the collection, synthesis, analysis, and management of quantitative data on biological communities such as forests.

### **Prerequisites & Notes**

SFR 402 or SFR 503; or graduate standing.

Credits: e

## **SFR 577 - Forest Landscape Management and Planning**

Integration of biophysical and socioeconomic sciences for the multiple use management to achieve desired products, services and conditions of forest lands. Application of modern analytical procedures for strategic, tactical and operational forest planning up to the landscape level. Because of overlap, SFR 477 and SFR 577 cannot both be taken for degree credit.

### **Prerequisites & Notes**

SFR 444 or SFR 544; SFR 409 or 349 or 509. All but SFR 349 can be taken as co-requisites.

Credits: 3

## **SFR 593 - Sustainable Tourism Planning**

Principles and practices of planning for sustainable tourism destinations. This course provides a basis for a tourism destination service learning project involving natural and cultural attractions. The project will include developing, facilitating, evaluating, and documenting the tourism destination planning process. Specific topics include tourism potential evaluation, tourism sociocultural and environmental impacts, community-based tourism planning, tourism regional and site planning, and strategic tourism planning. Because of overlap SFR 493 and SFR 593 cannot both be taken for degree credit. This course requires field trips within and outside of scheduled class periods.

### **Prerequisites & Notes**

SFR 150 or permission.

Credits: 3

## **SFR 601 - Forest Mensuration Problems**

Varies.

Credits: Ar

## **SFR 603 - Forest Management Problems**

Varies.

Credits: Ar

## **SFR 605 - Forest Biology Problems**

Can be repeated for graduate credit.

### **Prerequisites & Notes**

permission.

Credits: Ar

## **SFR 607 - Silviculture Problems**

Varies.

Credits: Ar

### **SFR 609 - Remote Sensing Problems**

Varies.

Credits: Ar

### **SFR 611 - Research Problems in Forest Economics**

Varies.

Credits: Ar

### **SFR 613 - Forest Recreation Problems**

Varies.

Credits: Ar

### **SFR 615 - Problems in Wood Technology**

Varies.

Credits: Ar

### **SFR 617 - Forest Policy Problems**

Varies.

Credits: Ar

### **SFR 690 - Master of Forestry Project**

Independent study on a topic approved by the student's Advisory Committee. May be repeated for graduate credit.

Credits: 1-3

### **SFR 695 - Graduate Seminar in Wood Science**

Reports and discussion of recent developments in wood science and related fields based on the literature or on current laboratory studies. Required in the program of study for wood science graduate students. Course must be taken once by M.S. students and twice by doctoral students.

Credits: 1

## **French**

### **FRE 507 - Seminar in Literature of the Nineteenth Century**

Individual writers, genres, or themes. Special emphasis on Hugo, Stendhal, Balzac, Flaubert, Zola, and Baudelaire.

Credits: 3

### **FRE 508 - Seminar in the Novel**

Trends and periods in development of the novel and narrative form. Content varies from year to year. May be repeated for credit.

Credits: 3

### **FRE 509 - Seminar in Poetry**

Movements in French poetry. The periods, groups and trends studied vary year to year. Course may be repeated for credit.

Credits: 3

### **FRE 510 - Seminar in the Theatre**

Content varies year to year. Course may be repeated for credit.

Credits: 3

### **FRE 530 - French Film Survey**

A survey of French cinema from its origins to the present, with an emphasis on understanding film as a narrative form.

#### **Prerequisites & Notes**

graduate standing.

Credits: 3

### **FRE 542 - Seminar in North American French Language**

A linguistic and sociolinguistic study of selected features of Franco-American French and its source dialects, Quebec and Acadian French. Research focus on examination of data gathered in New England and /or development of curriculum for elementary, middle or high school French courses.

#### **Prerequisites & Notes**

Graduate standing.

Credits: 3

### **FRE 598 - Projects in French II**

Varies.

Credits: 3

## **FRE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Gerontology**

### **GRN 500 - Opportunities and Challenges of Aging**

Challenges and opportunities with aging with a special focus on growing old in small towns and rural communities. Includes assessment, treatment, and service delivery implications of gerontological practice for health and human service practitioners. The role and status of older adults as a population group and a potential patient/client group will be considered recognizing that elders bring both needs and resources to families, and communities, and the professional helping relationship. This course partially satisfies the requirements for obtaining the University of Maine's Graduate Certificate in Gerontology.

### **Prerequisites & Notes**

Graduate standing or premission.

Credits: 3

### **GRN 502 - Interprofessional Care of Older Adults in Diverse Settings**

Best practice strategies for professionals who work with older adults and caregivers in a variety of settings. Through study of the health-illness trajectory and transitions in care-settings of older adults who develop chronic and acute health problems, students will gain knowledge and skill in performing assessments and in developing comprehensive interprofessional case management approaches to meet the needs of older adults and their caregivers. Diversity and complexity of health-illness needs, functionality, coping with chronic illness and transitions in care settings, harm reduction and a strengths-based approach informs the holistic perspective of this course. Special issues for rural elderly and caregivers are addressed. GRN 502 is a required course in the UM Interprofessional Graduate Certificate Program in Gerontology.

### **Prerequisites & Notes**

GRN 500, graduate standing or permission of instructor.

Credits: 3

## **Global Policy**

## **SPI 501 - Research Methods and Design**

This course introduces students to the social science techniques in international policy and international affairs and their critiques. Students gain experience with various forms of data collection and analysis, the visual representation of data, and discuss ethics of research and publishing. This course fulfills the responsible conduct of research requirement.

### **Prerequisites & Notes**

Graduate student in SPIA or instructor's permission.

Credits: 3

## **SPI 502 - Contemporary Issues in World Economy**

This course provides a higher level understanding of how the world economy actually works; its relation to economic growth, the distribution of wealth, sustainable development, culture, and political power. Because of overlap, ECO 502 and SPI 502 cannot both be taken for degree credit.

### **Prerequisites & Notes**

ECO 350 or ECO 420 and ECO 321; MAT 215 or MAT 232; graduate standing or permission of instructor.

Credits: 3

## **SPI 503 - Contemporary International Relations**

How the international system works. Peoples, states, and sovereignty. International organizations, diplomacy, and law. Globalization and development; environment; human rights; ideologies. Theory linked to cases, problems, and research.

### **Prerequisites & Notes**

Graduate or senior standing.

Credits: 3

## **SPI 504 - Global Justice**

A study of moral and political philosophies developed in response to the issues and challenges raised by political, economic, and technological globalization. These include such topics as sovereignty and self-determination, global institutions and democracy, nationalism and cosmopolitanism, poverty and international or global distributive justice, fair trade, intellectual property rights, global diversity, women and global justice, immigration, war, humanitarian intervention and terrorism.

### **Prerequisites & Notes**

Graduate standing.

Credits: 3

## **SPI 510 - Public Service Seminar**

A successful career in public service demands a personal dedication and selflessness that leads to building stronger relationships, stronger communities and a more workable and responsive world. This course is designed to help students gain knowledge in the areas of nonprofit, governmental, political, volunteer, or private sector work. The

course will consider contemporary perspectives, issues, and strategies regarding the public service sector and will help to prepare students for an international internship in the public service sector. The course will use individuals that have served or are currently serving in the public sector and will draw upon a wide variety of resources in an effort to enhance the students' personal and professional growth.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 1

**SPI 573 - Global Politics**

Reviews conceptual/thematic issues of global politics, including globalization and technology, climate change, international organizations and NGOs, democracy and development, multinational corporations, demographics and resource competition and organized crime. Examines the interests, strategies, challenges and prospects of selected key states or regions. Students will analyze and evaluate trends and changes in global politics and develop an understanding of how and why leaders of key and emerging powers perceive their interests, threats and opportunities.

**Prerequisites & Notes**

SPIA student or permission.

Credits: 3

**SPI 574 - Conduct of Foreign Policy**

Reviews foreign policy decision-making, information and intelligence, budget allocation, diplomacy and negotiation, threats of military action, economic aid and sanctions, participation in nation-building, and covert operations. Attention to ethical issues involved in conduct of foreign policy. Conducted as a workshop with weekly problem-solving exercises, cases, and scenarios.

**Prerequisites & Notes**

SPIA student or permission.

Credits: 3

**SPI 575 - Politics of Development**

This seminar provides a graduate level introduction to the study of political economy of development. It explores questions such as why some countries are rich and others poor, some stable and others wracked with violence, and why citizens of some countries enjoy individual freedoms and rule of law, while others do not.

**Prerequisites & Notes**

SPIA student or permission of instructor.

Credits: 3

**SPI 576 - The U.S. Intelligence Community and National Security**

This seminar provides a graduate level introduction to the organization and the mission of the different parts of the Intelligence Community (IC), the IC's interaction with the Executive Branch, and the historical development of U.S. intelligence agencies. Students will examine the different kinds of intelligence, how it is collected and classified, and especially the role it plays in formulation foreign and defense policy.

**Prerequisites & Notes**

SPIA student or permission of instructor

Credits: 3

**SPI 577 - Conflict and Violent Extremism Vulnerabilities**

This course will examine violent extremism and its frequent coexistence with violent conflict. The course will provide specific focus on jihadism, and the ways in which the phenomenon manifests in unstable environments. Discussion and readings will explore this topic broadly through theoretical frameworks and empirical evidence and more specifically through the context of case studies generated by students.

**Prerequisites & Notes**

SPIA student or permission of instructor.

Credits: 3

**SPI 578 - Development in Practice**

This selective internship project serves as a graduate level experiential learning opportunity. Content will be focused on research and production of a client product that will be distributed to government and private sector personnel at international development companies and nonprofits. Public presentation is an integral component of this project. The specific direction of the project is determined by the conclusion of the preceding semester each year.

**Prerequisites & Notes**

SPI 577 Conflict and Violent Extremism Vulnerabilities, and permission of instructor.

Credits: 3

**SPI 590 - Advanced Topics in Policy and International Affairs**

Advanced study in various aspects of international policy and international affairs. May be repeated for credit.

**Prerequisites & Notes**

Department consent required.

Credits: 1-3

**SPI 593 - Graduate Seminar**

Analysis of current issues in International Policy and international Affairs. Emphasis on the connection to US Foreign Policy. Interest areas vary from semester to semester. May be repeated for a total of 6 credits.

**Prerequisites & Notes**

Departmental consent required.

Credits: 1-3

**SPI 595 - SPIA Internship**



All students in the Global Policy masters program will complete an internship at an appropriate institution or business. The internship must have an international focus and can be either domestic or overseas. After the internship, each student is required to submit a report about the internship experience and fulfill any other reporting requirements required by the program, the host site, and/or sponsor(s).

**Prerequisites & Notes**

SPI 510 and SPIA graduate student.

Credits: 2-6

## **SPI 697 - Independent Study**

Provides an opportunity for well qualified students to pursue a selected topic in great depth under the supervision of an individual faculty member. The topic is to be determined in consultation with the faculty instructor.

**Prerequisites & Notes**

Permission of the instructor and the SPIA Director.

Credits: 1-3

## **SPI 699 - Graduate Thesis**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

# **History**

## **HTY 501 - History of U.S. Foreign Relations**

Examines the historical literature in the field of U.S. foreign relations. Special focus on current methodological debates over how to internationalize U.S. diplomatic history and how to incorporate themes of class, race and gender.

**Prerequisites & Notes**

graduate students, senior history majors and others by permission.

Credits: 3

## **HTY 502 - Revolutionary America**

Examines current and classic scholarship about the American Revolution in an intensive seminar format. As an influential field in U.S. historical scholarship, its methodological and historiographical disagreements can shed light on disciplinary practices of value to those who are not early American specialists. We will also consider pedagogical dimensions of the field. This course can be taken remotely through teleconferencing.

**Prerequisites & Notes**

Graduate students, senior history majors and others by permission.

Credits: 3

**HTY 505 - American Political History**

Advanced reading seminar. Covers major political ideas, constitutional and legal development, political issues and their impact on American society, political party evolution. Content varies.

**Prerequisites & Notes**

graduate students, senior history majors and others by permission.

Credits: 3

**HTY 517 - Seminar in Premodern European History**

Current research on premodern European history, especially as applied to graduate research and problems of teaching European or World Civilization at secondary school or college level.

Credits: 3

**HTY 519 - Modern Britain and Empire**

Evaluation of selected problems in British and British imperial history since 1700.

**Prerequisites & Notes**

graduate standing in History, History major with senior standing; others by permission.

Credits: 3

**HTY 521 - Canada and the United States, 1783 to the Present**

Wars, migration, boundaries, resources, and trade, emphasizing the historical background to contemporary political, strategic, economic, and cultural issues in Canadian-American relations.

**Prerequisites & Notes**

HTY 459, HTY 460, or HTY 473, HTY 474 or POS 374 or permission.

Credits: 3

**HTY 550 - Readings in Bibliography and Criticism in:**

1. American History 2. European History 3. British and Commonwealth History 4. Canadian History 5. African History  
6. Asian History

Credits: Ar

**HTY 577 - Environmental History**

Surveys major trends in environmental and conservation thought and major developments in land use and environmental change.

Credits: 3

### **HTY 597 - Field Work in Historical Institutions**

Field work in local museums, state agencies, and other historic laboratories. Involves preparation and repair of exhibits, research and preparation of historic preservation documents, and beginning archival and artifact handling.

#### **Prerequisites & Notes**

graduate students, senior history majors and others by permission.

Credits: 3-12

### **HTY 599 - Special Topics in History**

Exploration and analysis of new trends in research and interpretation in history.

#### **Prerequisites & Notes**

graduate students, senior history majors and others by permission.

Credits: 3

### **HTY 601 - Seminar in American Colonial History**

None.

Credits: Ar

### **HTY 607 - Seminar in American Foreign Relations**

None.

Credits: Ar

### **HTY 609 - Seminar in New England-Quebec Atlantic Provinces History**

None.

Credits: Ar

### **HTY 611 - Seminar in British and European History**

None.

Credits: Ar

### **HTY 647 - Seminar in Methodology and Historiography**

Introduction to historical skills and recent historical techniques: psychohistory, demography, quantitative history.

**Prerequisites & Notes**

graduate standing.

Credits: 3

## **HTY 665 - Digital and Spatial History**

The digital revolution has transformed historical scholarship and teaching by enabling access to a wealth of research material and instructional resources. Many historians, however, have been hesitant to adopt digital methods of empirical analysis. This seminar will examine the challenges and opportunities of digital scholarship, including how digital methods affect the process of research, the questions historians ask, the sources they use, and the answers they find. We will particularly consider spatial history, where GIS (geographic information systems), digital mapping, and other visual approaches to data analysis and representation push the boundaries of traditionally text-centric narrative history. Over-arching themes of the course are the costs and benefits of digital methods and the impact of methodological choices on historical research. This course can be taken remotely through teleconferencing.

**Prerequisites & Notes**

Graduate standing, or permission of the instructor for qualified undergraduate seniors.

Credits: 3

## **HTY 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Human Development**

### **HUD 505 - Infant and Toddler Development**

HUD 505 focuses on understanding development in infancy and toddlerhood across developmental domains in the context of families and communities. The impact of developmental challenges on the infant's and child's emerging capacities for engagement in relationships and learning is explored. The importance of the interaction of social, cultural, and interpersonal factors is stressed throughout. A major goal of the course is for students to gain a working knowledge of developmental processes that can be applied to assessment, curriculum development, and intervention planning and implementation. HUD 505 is being cross-listed with SED 505. These courses can not both be taken for credit.

**Prerequisites & Notes**

CHF 450

Credits: 3

## **HUD 511 - Seminar in Family Relationships**

Reports and discussions of current literature in family relationships and related social sciences with special attention to critical analysis.

Credits: 3

## **HUD 521 - Science as Inquiry: Teaching Young Children**

Applies developmental theory to the construction of curriculum and methods in early childhood science education.

Credits: 3

## **HUD 529 - Numeracy for the Young Child**

Applies developmental theory to the construction of curriculum and methods in early childhood mathematics education.

Credits: 3

## **HUD 551 - Fundamentals of Human Development**

This course presents the key perspectives for studying life-span development and family relationships. Emphasis is placed on the application of theory to understanding development and the design of interventions.

### **Prerequisites & Notes**

Master of Science students in the Human Development major or permission.

Credits: 3

## **HUD 552 - Professional Practices in Human Development**

This course is designed to provide students with a comprehensive overview of the many aspects of human services administration and leadership. This course seeks to educate and develop informed practitioners, preparing them for innovative and effective practices in diverse and complex environments.

### **Prerequisites & Notes**

Master of Science students in the Human Development major or permission.

Credits: 3

## **HUD 553 - Program Planning and Evaluation in Human Development**

This course is designed to provide an in-depth understanding of program development and evaluation in human service organizations.

### **Prerequisites & Notes**

Master of Science students in the Human Development major or permission.

Credits: 3

## **HUD 554 - Legislation and Policy in Human Development**

A detailed analysis of child and family policies, including what is family policy, how policy is made and implemented, how values and goals affect policy and legislation and future directions for policies in America and other countries.

### **Prerequisites & Notes**

Master of Science students in the Human Development major or permission.

Credits: 3

## **HUD 555 - Grant Development in Human Development**

This course provides an in-depth understanding of the grant seeking and writing process. Students will be expected to develop a fundable grant proposal.

### **Prerequisites & Notes**

Master of Science students in the Human Development major or permission.

Credits: 3

## **HUD 556 - Introduction to Research Methods in Child Development and Family Relations**

An overview of research methods applicable to the study of children and families. An in-class research project is completed.

### **Prerequisites & Notes**

CHF 200 and CHF 201, or Human Development Graduate students.

Credits: 3

## **HUD 601 - Supervised Fieldwork in Child Development and Family Relations**

Supervised work experience in an approved community agency related to the student's vocational goals.

### **Prerequisites & Notes**

permission. (Pass/Fail Grade Only.)

Credits: 1-6

## **HUD 609 - Family Counseling**

Theory and practice of therapeutic intervention in families, including the child in the family setting, the marital dyad and the family constellation.

### **Prerequisites & Notes**

a counseling course and a family course or permission of the instructor.

Credits: 3

## **HUD 618 - Sexuality and Human Interaction**

A course designed to increase awareness of the influence of sexuality on communication processes and to develop techniques for dealing with sexuality as it relates to the counseling process.

### **Prerequisites & Notes**

a course in counseling and a course in family or permission of instructor.

Credits: 3

## **HUD 649 - Investigation of Special Topics**

Advanced independent study for qualified students who present suitable projects for intensive, independent investigation in human development.

### **Prerequisites & Notes**

permission.

Credits: 1-6

## **HUD 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Independent Study**

### **IND 698 - Independent Study**

Advanced independent study for interdisciplinary Ph.D. students on an approved reading, research or experiential field project under the guidance of a graduate faculty member.

### **Prerequisites & Notes**

permission of dissertation committee chairperson.

Credits: 1-3

### **IND 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission

to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Innovation**

### **INV 510 - Fundamentals and Systems of Innovation**

Provides students with the fundamental skills to create, communicate and implement innovations in any field. Students will learn how to generate unique solutions to problems, define and communicate those solutions to stakeholders, and test the viability of innovations. Students will also learn the principles of system design and thinking in order to lead systems for innovation in organizing of any type.

#### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **INV 511 - Innovation Engineering: Advanced Innovation Methods**

Students learn advanced techniques for ideation, problem solving, positioning and pitching their innovations, and moving ideas through validation and development. These skills provide a systematic approach to innovation and apply to the creation and execution of ideas in any field.

#### **Prerequisites & Notes**

INV 510

Credits: 3

### **INV 590 - Using Innovation: Proposal and Project**

Emphasizes the intensive application of concepts explored in earlier Innovation Engineering courses to a graduate student's field of specialization, with the purpose of creating the student's own proposal and project. Students will be expected to identify a problem or opportunity and to research existing solutions to the problem before developing their own ideas. BEFORE taking this course, students must consult with a committee consisting of an advisor in the Student Innovation Center, as well as an advisor in their major field of study or graduate program. Students will have the opportunity to take their own idea from proposal stage to prototype and beyond. Projects may be individual or team-based.

#### **Prerequisites & Notes**

Graduate standing and INV 510 and INV 511 or permission.

Credits: 3

## **Interdisciplinary**

### **GRD 598 - Special Topics in College Teaching**



Covers selected topics in college teaching for graduate students who plan careers in higher education. May be repeated for graduate credit.

**Prerequisites & Notes**

graduate standing.

Credits: 1-3

**GRN 501 - Life Transitions and Health in Aging**

Interprofessional and cross-cultural overview of late life transitions, wellness, functionality, successful aging, and quality of life issues for the older adult. The health, financial effects and satisfaction of role changes in later adulthood will be explored. The physiology of aging, health promotion and evaluation, prevention and management of acute and chronic health problems, mental health illness and service needs will be examined. Controversial topics such as voting and driving regulations and qualifications for older adults will be debated and discussed. Ethical issues and challenges and end of life preparation for older adults and their families will be explored.

**Prerequisites & Notes**

SWK 584 or by permission of instructor. Online, asynchronous course via FC conference.

Credits: 3

**INT 500 - (ANT, BSC, GES, PSE, QUS) Seminar in Quaternary Studies**

Selected areas of study - physical, biological and anthropological - related to the Quaternary Period. One weekend field trip may be required. May be repeated for credit.

Credits: Ar

**INT 510 - (BSC, SMS) Marine Invertebrate Zoology**

Covers systematics, adaptive-functional anatomy, and life histories of free-living marine invertebrates, excluding protozoans. Laboratory emphasis on studies of living material from the local fauna. Numerous field trips required. Rec 2, Lab 6.

**Prerequisites & Notes**

BIO 353 or equivalent.

Credits: 5

**INT 527 - Integration of GIS and Remote Sensing Data Analysis in Natural Resource Applications**

Analysis of satellite imagery and GIS data bases including applications of raster and vector models, land cover analysis and forest change detection, wildlife habitat analysis, hydrological assessment, and landscape characterization.

**Prerequisites & Notes**

permission of instructor; senior or graduate standing.

Credits: 3

## **INT 598 - Special Topics in Interdisciplinary Studies**

Advanced study of timely or experimental topics that bridge two or more disciplines.

### **Prerequisites & Notes**

permission.

Credits: 1-6

## **INT 601 - Responsible Conduct of Research**

Key topics in conducting research responsibly. Guidelines, policies and codes relating to ethical research. Skills development for identifying and resolving ethical conflicts arising in research. Address case studies in the context of ethical theories and concepts.

Credits: 1

## **PAX 590 - Special Topics in Peace and Reconciliation Studies**

Review of specific subject areas in the field. Subject areas vary by semester. May be repeated for credit.

### **Prerequisites & Notes**

None

Credits: 3

## **PAX 699 - Masters Project**

This capstone course provides the structure and process for students to conduct a Master Project requiring advanced study in a topic or problem in PAX, showcasing skills gained during the program (1-6 credits).

### **Prerequisites & Notes**

PAX 410/510 & PAX 491/591

Credits: 1-6

## **Intermedia**

### **IMD 500 - Creative Concept Development**

This course is intended to provide an in depth introduction to the theory and practice of critical thinking and creative practices that facilitate innovation and model processes that are central to creative fields in general and Intermedia in specific. Emphasis will be placed on: the conceptual and interdisciplinary nature of innovative and creative practices; an awareness of perspectives drawn from traditional creative fields, such as the arts, as well as from non-traditional forms and practices of innovation; and a focus on each individual student building a creative praxis model for their own research, development and innovative production.

### **Prerequisites & Notes**

Admission in Intermedia Program or permission.

Credits: 3

## **IMD 501 - Histories and Theories of Intermedia**

This course will consider the varieties of historical explorations in the arts from the beginning of the twentieth century up to the present that can be seen as central in the formation of the conceptual frames and physical practice of the concept of Intermedia. The class will survey the historical, critical and theoretical writings of a range of artists, historians and critics who have addressed issues and forms related to interdisciplinary experimental creative practice in the arts.

### **Prerequisites & Notes**

Admission in Intermedia Program or permission.

Credits: 3

## **IMD 520 - Topics in Media Production**

This class will present topical explorations on production process, tools for innovative development, and technical means of production for creative work. Topics will vary from semester to semester but will focus on giving students an in depth exposure to a technical aspect of media, tools and production skills relevant to Intermedial forms. In addition to technical modes of production these classes will consider technological tools in relation to a variety of theoretical, practical and historical explorations of creativity that will help form the basis of a praxis model of Intermedia production.

### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 1-3

## **IMD 530 - Topics in Technical Development**

This class will provide diverse, topical explorations on fabrication process, tools for innovative development and technical means of production for creative work. Although topics will vary from semester to semester all iterations will focus on giving students an in-depth exposure to a technical aspect of materials, tools and production skills relevant to Intermedial forms. In addition to technical modes of production these classes will consider technological tools in relation to a variety of theoretical, practical and historical explorations of creativity that will help form the basis of a praxis model of intermedia production.

### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 1-3

## **IMD 540 - Topics in Intermedia Theory / History**

This class will cover diverse, topical considerations of historical forms of Intermedia and related directions, such as Futurism, concrete poetry, installation, artists' books and multiples, Fluxus, sound art and environmental art. Although topics will vary from semester to semester all iterations will focus on giving students an in-depth exposure to historical periods or theoretical aspects of arts creation related to Intermedial forms. In addition to the historical subjects, these classes will consider a variety of related production, practical and process explorations that will help form the basis of a praxis model for Intermedia production.

### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 1-3

### **IMD 560 - Research Studio I: Critical Research Methods for Creative Production**

This class will introduce the topic of research activity as a fundamental investigative process for creative development and production. The class will focus on learning a diverse number of research methodologies drawn from sciences, humanities, social sciences, and other areas in order to allow students to learn from these disciplinary approaches and subsequently develop their own hybrid research methodologies.

#### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 3

### **IMD 561 - Research Studio II: Projects in Collaborative Production**

This class will engage students in collaborative production centered on a project, presentation, exhibition or performance. This class engages in a praxis model of exploring the theory and practice of research and creative production and applying it in a real-world context of applied group-based productions. These productions will vary each semester, but could entail a large-scale performance, interactive installation, exhibition, anthologized publication, website/digital forum or similar form.

#### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 3

### **IMD 562 - Research Studio III: Professional Development and Large-scale Practices**

This class will focus on and encourage students to develop skills in conceptualizing and producing a professional practice in Intermedia. In addition to introducing students to practical/professional concerns such as grant writing, funding, business models, and other support structures, this class will generally focus on creating a model for students continuing to work after graduate school as professional creators, designers, entrepreneurs and producers.

#### **Prerequisites & Notes**

Admission into Intermedia MFA program or permission.

Credits: 3

### **IMD 570 - Intermedia Studio Critique I**

Intended to provide an environment for guided independent art/research/production in intermedia. Emphasis placed on the conceptual and interdisciplinary nature of this art form, awareness and manipulation of traditional art boundaries, and the exploration of non-traditional art media. This is an advanced graduate-level studio course emphasizing independent levels of work, theoretical engagement in the creative process and an ongoing commitment to individual studio praxis. May be repeated for credit. (This course is identical to ART 570 and NMD 570.)

#### **Prerequisites & Notes**

Admission into Intermedia MFA, graduate standing and permission.

Credits: 3

## **IMD 571 - Intermedia Studio Critique II**

This class will provide an environment for guided individual art|research|production in Intermedia as a continuation from IMD 570. Emphasis will be placed on the conceptual and interdisciplinary nature of this creative form in general and the individual student's own work as an awareness and manipulation of arts boundaries, and non-traditional art media and contexts. The goal for this course is to create an interdisciplinary forum where students develop research skills, learn how to best articulate their artistic production, and critique their peers' works.

### **Prerequisites & Notes**

Admission in Intermedia program or permission.

Credits: 3

## **IMD 572 - Intermedia Studio Critique III**

This class will provide an environment for guided individual art/research/production in Intermedia as a continuation from IMD 571. Emphasis will be placed on the conceptual and interdisciplinary nature of this creative form in general and the individual student's own work as an awareness and manipulation of arts boundaries, and non-traditional art media and contexts. The goal for this course is to create an interdisciplinary forum where students develop research skills, learn how to best articulate their artistic production, and critique their peers' works. Participants are expected to produce a completed body of work by the end of this class that will form the basis of their final portfolio presented for approval prior to the MFA exhibition.

### **Prerequisites & Notes**

Admission in intermedia program or permission.

Credits: 3

## **IMD 597 - Independent Study in Intermedia**

Graduate level study and research in Intermedia or related areas directed by a graduate faculty member associated with the Intermedia MFA Program. May be repeated for credit.

### **Prerequisites & Notes**

Admission into Intermedia MFA or permission.

Credits: 1-3

## **IMD 600 - Readings for Thesis Conceptual Development**

This class will provide a context for the research/reading phase of a student's work toward their thesis production. This class is an independent reading class that will be overseen by the student's thesis committee. The initial reading list for the class will be developed by the student in consultation with their committee and must be submitted prior to the time of the class sign up. The result of the class will be an annotated bibliography that will form the bibliographic background of the student's written thesis as well as help shape their ideas for their thesis research and production.

### **Prerequisites & Notes**

Admission into Intermedia program or permission.

Credits: 1-3

## **IMD 650 - Field Study and Research**

General or topical course for credit that can be used for work in another field or study abroad when no other credit options are available. This can cover work in a professional area or field, internships, study at another approved institution for which credits are not available through other means, or other such work for the Field Research requirement of the MFA degree. May be repeated for credit.

### **Prerequisites & Notes**

Admission into Intermedia program or permission.

Credits: 1-6

## **IMD 670 - Without Borders Exhibition**

This class covers the final work towards the MFA thesis exhibition and all aspects of the work required for the Without Borders festival itself. This involves not only individual work in preparation for the festival, but the collective work of the exhibition and presentations, including planning and other organizational matters, fundraising, PR, curation, exhibition design, installation and documentation. May be repeated for credit.

### **Prerequisites & Notes**

Permisson.

Credits: 1-3

## **IMD 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Kinesiology and Physical Education**

### **KPE 560 - Assessment and Evaluation of Human Performance**

The assessment and evaluation of selected anatomical, physiological and psychological aspects of human performance for the purpose of developing prescriptive exercise programs based upon individual needs, goals and interests.

### **Prerequisites & Notes**

KPE 378.

Credits: 3

### **KPE 573 - Motor Performance and Learning**

Study of motor performance to aid the instructor to provide better theoretical framework to structure learning experiences for skillful individual performance.

Credits: 3

### **KPE 575 - Current Studies in Kinesiology and Physical Education**

Analysis of current and emerging trends in kinesiology and physical education based on experiments, research, literature and empirical observations.

Credits: 3

### **KPE 580 - Human Biomechanics**

Analysis of activities provide the student with scientific basis for teaching and evaluating correct form for execution of the fundamental movements.

Credits: 3

### **KPE 588 - Advanced Exercise Physiology**

Broadens the knowledge base of graduate students and to identify potential research areas. Involves in depth study of selected topics in exercise physiology and requires students to extensively utilize the current research literature.

#### **Prerequisites & Notes**

KPE 378.

Credits: 3

## **Liberal Studies**

### **IDS 500 - Graduate Seminar in Interdisciplinary Studies**

Interdisciplinary exploration of selected topics both within and across the areas of humanities, social sciences and the nature sciences. Topic varies from semester to semester. May be taken more than once.

#### **Prerequisites & Notes**

permission of instructor.

Credits: 3

### **IDS 697 - Independent Study**

Advanced independent study for students in the MA in Interdisciplinary Studies program on an approved reading, research or experiential field project under the guidance of a graduate faculty member.

#### **Prerequisites & Notes**

permission of Graduate School.

Credits: 1-3

### **IDS 698 - Independent Study**

Advanced independent study for students in the MA in Interdisciplinary Studies program on an approved reading, research or experiential field project under the guidance of a graduate faculty member.

#### **Prerequisites & Notes**

permission of Graduate School.

Credits: 1-3

### **IDS 699 - Master Project in Interdisciplinary Studies**

Required of candidates for the Master of Arts in Interdisciplinary Studies completing their capstone projects.

#### **Prerequisites & Notes**

INT 601, CMJ 600 or alternative "Responsible Conduct of Research" (<https://umaine.edu/graduate/students/rcr/course>) approved by the Office of Research and Sponsored Programs and the Graduate School is required before or concurrently with completion of 3<sup>rd</sup> IDS 699 credit.

Credits: Ar

## **Maine Studies**

### **MES 501 - Maine Studies: An Interdisciplinary Approach**

This course offers an interdisciplinary approach to the study of Maine through sources in English, history, geology, anthropology, political science, Native American studies, Franco-American studies and other fields. At the broadest level, the course considers the landscapes and people of Maine, and the connections between the two. Other topics covered include industries such as farming, fishing, lumbering, and tourism; environmental concerns and regulations; economic challenges and opportunities; and demographic trends including an aging population and the development of recent immigrant communities. This course is required for students in the MA in Interdisciplinary Studies (Maine Studies track) and the graduate Certificate in Maine Studies.

#### **Prerequisites & Notes**

None.

Credits: 3

### **MES 520 - Advanced Topics in Maine Studies**

An advanced, interdisciplinary study of Maine Studies topics. May be taken more than once for degree credit if the topic differs.



Credits: 3

### **MES 530 - Maine Politics and Public Policy**

This seminar examines contemporary issues confronting the State of Maine and the politics that surround such issues. Particular attention is given to Maine's role in national affairs, its unique environment, political parties and elections, the dynamics of the legislative, executive and judicial branches, the structure and operation of local governmental institutions, including regional governance, and the formulation and administration of state and local politics, including taxing and spending policies.

Credits: 3

### **MES 540 - Maine and the Northeast Borderlands**

This interdisciplinary course examines Maine, Quebec, and the Maritime Provinces as borderlands regions that share both cultural and natural characteristics. Introduces students to the concept of borderlands as used in literature, history, economics, public policy, anthropology, and political science. Explores differences and commonalities, conflict and consensus among peoples living in the borderlands. Examines how the meaning of the border and its permeability have changed over time. Considers how governmental and non-governmental agencies regulate natural resources as well as the movement of people and trade in the border region.

#### **Prerequisites & Notes**

None

Credits: 3

### **MES 598 - Directed Study in Maine Studies**

Advanced, individual study, field experience, research, and writing projects in Maine Studies. Students will work with approved faculty on request. May be repeated for credit.

Credits: 1-3

## **Marine Sciences**

### **SMS 500 - Marine Biology**

Examines the biology of marine organisms including their diversity, distribution, form, and function within a broader context of evolutionary adaptation to the marine environment. Emphasizes scaling of physiological and ecological processes and the biology of acclimation and adaptation in representative marine taxa including microbes, primary producers, invertebrates, fishes, and marine mammals. Includes one weekend field trip to Darling Marine Center. Required for Marine Biology graduate students. Open to other graduate students in related disciplines and exceptionally well-prepared undergraduates with permission from instructor. (3 lec, 1 discussion/lab)

Credits: 4

### **SMS 501 - Biological Oceanography**

Marine organisms and their interrelationships with chemical, geological and physical aspects of their environments.

**Prerequisites & Notes**

BIO 319 or equivalent or permission.

Credits: 3

## **SMS 520 - Chemical Oceanography**

Distribution and cycling of elements in the marine system with emphasis on geochemical and biochemical interactions.

**Prerequisites & Notes**

CHY 121, CHY 123.

Credits: 3

## **SMS 531 - Coral Reefs**

An exploration of the combined geological, physical, chemical and biological factors that make coral reefs among the most diverse and productive systems in the world. Examines biology, taxonomy and ecological interactions of dominant reef organisms. Explores modern reef processes such as primary productivity, competition, predation and herbivory along with some geological processes such as the role of sea level in reef formation and growth.

**Prerequisites & Notes**

BIO 353 or permission.

Credits: 3

## **SMS 540 - Satellite Oceanography**

An overview of the use of remote sensing technologies for making measurements of the marine environment. Introduces the various sensors used by oceanographers, their background, the principles behind their operation and measurement retrieval. Emphasis will be placed on readings from the prime oceanography literature and biogeophysical applications of the data, their analysis, advantages and limitations rather than physical/optical theory.

**Prerequisites & Notes**

SMS 501 and SMS 541 or permission.

Credits: 3

## **SMS 541 - (SMS, CIE) Physical Oceanography**

Covers physical properties of sea water, waves and tides, distribution of variables, dynamics, water masses and the general circulation.

**Prerequisites & Notes**

PHY 121, PHY 122, MAT 126 or permission.

Credits: 3

## **SMS 544 - Oceanography and Natural History of the Gulf of Maine**

Class examines the basic workings of the Gulf of Maine: its geological history, basic marine biology and oceanography, nutrient dynamics, and various biological processes, from phytoplankton blooms to commercial fisheries and associated management issues. Class will also explore the impacts of human interactions in the Gulf, especially those related to fisheries, pollution, coastal processes and other recent global warming-related changes.

Credits: 3

### **SMS 552 - Coupled Natural and Human Systems**

This is a strongly interdisciplinary course concerned with the intersection between natural and social systems and is a basic introduction to complex adaptive systems. It addresses the question of how we can use our new understanding of complex systems to better adapt human behavior to the natural environment.

#### **Prerequisites & Notes**

Permission.

Credits: 3

### **SMS 553 - Institutions and the Management of Common Pool Resources**

Focuses on the various social science theories concerning the generation of institutions and rules including action theory, the IAD approach (Institutional Analysis and Development), rational choice theory and topics from political economy. Emphasis will be placed on the development of institutions governing the use of fisheries with some discussion of the management of other common pool resources such as forests, rangeland, air, and petroleum reserves. (SMS 553 and ANT 553 are identical.)

#### **Prerequisites & Notes**

senior or graduate standing or permission.

Credits: 3

### **SMS 555 - Resource Management in Cross-cultural Perspective**

Examines the institutions used to reduce risk and uncertainty in selected societies dependent on renewable resources. Emphasis on fishing societies around the world with some discussion of the utilization of forests and rangeland by different societies. Studies the governance structures used to manage common pool resources including state systems, local level management systems and co-management systems. (SMS 555 and ANT 555 are identical.)

#### **Prerequisites & Notes**

senior or graduate standing or permission.

Credits: 3

### **SMS 562 - Fisheries Population Dynamics**

Fisheries stock assessment theory and techniques with emphasis on estimating vital fisheries population parameters and biological reference points and conducting stock assessment for commercially exploited marine fisheries populations.

#### **Prerequisites & Notes**

A course each in ecology, statistics and calculus.

Credits: 3

## **SMS 563 - Fisheries Policy & Management**

This graduate course aims to provide a foundation in the theory and practice of contemporary fisheries policy and management. Students that participate in this class will learn about the key policy frameworks that guide fisheries management and the contemporary strategies being deployed to balance conservation and resource use. This course starts with a primer on the institutional architecture of fisheries management and a description of federal, state and local management and how these complex systems are interrelated. The second part of this course will focus on contemporary policy tools in fisheries management and the seminal and emerging scholarship that has shaped their use and refinement. In this course, students will also engage with policymakers, managers, and fishers first-hand through fieldtrips and guest lectures that are designed to provide a greater understanding of the complexity and nuance of the decision-making process. Student that take this class will deepen their understanding of fisheries management and policy and hone their written and analytical skills in the process.

### **Prerequisites & Notes**

None

Credits: 3

## **SMS 564 - Marine Resource Management**

This course uses the economic lens to explore issues related to the use and management of the oceans. Traditional biological/economic approaches to resource management are addressed. Frontier approaches, challenging traditional methods, are also discussed. This course draws on game theory and natural resource economics to explore topics, such as drawing lines in the sea, the management of wild capture fish stocks, recreation, tourism, aquaculture and pollution from land-water interactions.

### **Prerequisites & Notes**

None.

Credits: 3

## **SMS 585 - Marine System Modeling**

Covers ocean circulation models, coupled atmosphere-ocean models, sea ice models, modeling oceanic carbon and nutrient cycles, and marine ecosystem models: beginning with theory, followed by model development and the most recent research results. Examines model representation of interactions among physical, chemical and biological processes in the ocean. Term project required.

### **Prerequisites & Notes**

permission of instructor.

Credits: 3

## **SMS 595 - Data Analysis Methods in Marine Sciences**

Provides theoretical and computational guidance on techniques commonly used in data analysis. The first half of the course will cover regression methods and the second half will cover time series analysis and digital filters. Real data will be used to illustrate the practical aspects of the subject with emphasis on developing a hands-on understanding of the methods and correct interpretation of results.

### **Prerequisites & Notes**

MAT 126 or equivalent.

Credits: 3

### **SMS 597 - Independent Study**

A graduate-level readings course, lecture course, laboratory or seminar study course arranged between instructor and individual graduate students, covering selected topics or areas within the field of Marine Science. May be repeated for credit.

#### **Prerequisites & Notes**

permission of instructor.

Credits: 1-3

### **SMS 598 - Special Topics in Marine Science**

A graduate-level readings, lecture, seminar or laboratory course covering timely topics in Marine Science. May be repeated for credit.

#### **Prerequisites & Notes**

permission of instructor.

Credits: 1-3

### **SMS 683 - Internship in Marine Policy**

Professional experience with a marine resource management organization. Students must submit a plan approved by the graduate coordinator of the Marine Policy Program and the sponsoring organization. Reports and readings will be required.

#### **Prerequisites & Notes**

permission.

Credits: 1-6

### **SMS 691 - Marine Science Seminar**

This graduate seminar focuses on aspects of professional development, performance, and conduct currently practiced in the marine sciences. Topics include: professional habits of mind, science communication, scientific ethics, and responsible conduct of research. This course meets the Graduate School requirement for "Responsible Conduct of Research Training Requirement".

Credits: 1

### **SMS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission

to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Master's Comprehensives**

### **GRR 699 - Reading for Master's Comprehensives**

For master's-level students who have completed all other degree requirements.

Credits: 1-3

## **Mathematics and Statistics**

### **MAT 500 - Topics in Graduate Mathematics**

Topics in mathematics not regularly covered in other courses. Content varies to suit current needs. May be repeated for credit.

#### **Prerequisites & Notes**

departmental permission.

Credits: 1-3

### **MAT 523 - Real Analysis I**

Lebesgue measure on the real line, measurable functions, the Lebesgue integral, standard convergence theorems and, if time allows, differentiation. Normally preceded by a brief review of introductory real analysis (completeness axiom, cardinality, topology of the real line, Heine-Borel Theorem).

#### **Prerequisites & Notes**

A grade of C or better in MAT 426 or permission.

Credits: 3

### **MAT 524 - Real Analysis II**

Topics include differentiation and integration, completeness of the  $L^p$  spaces, Riesz representation theorem, Fubini's Theorem. As time and interest allow, other topics may include further theory of Banach and Hilbert spaces or abstract measure spaces. Fourier analysis, Radon-Nikodym Theorem, Haar measure.

#### **Prerequisites & Notes**

A grade of B- or better in MAT 523 or department permission.

Credits: 3

### **MAT 527 - Functions of a Complex Variable I**

Elementary properties of holomorphic functions including the classification of isolated singularities, Laurent expansion and infinite product representations. Introduction to conformal mapping and the Riemann Mapping Theorem.

**Prerequisites & Notes**

A grade of C or better in MAT 426 or permission.

Credits: 3

## **MAT 528 - Functions of a Complex Variable II**

A grade of C or better in Continuation of MAT 527.

**Prerequisites & Notes**

MAT 527.

Credits: 3

## **MAT 562 - Advanced Linear Algebra**

Topics covered include vector spaces, homomorphisms, bilinear forms, multilinear maps and tensor products, Jordan canonical forms of matrices, normed linear spaces, real and complex inner product spaces, basic ideas of functional analysis, applications.

**Prerequisites & Notes**

A grade of C or better in MAT 262 and MAT 425 and MAT 463 or their equivalent.

Credits: 3

## **MAT 563 - Abstract Algebra**

A study of basic structure theorems for groups, rings, fields and modules.

**Prerequisites & Notes**

A grade of C or better in two courses from among MAT 262, MAT 463 and MAT 464.

Credits: 3

## **MAT 564 - Abstract Algebra II**

A continuation of MAT 563, to include more advanced topics in ring theory; module theory with applications to canonical forms in linear algebra; fields and Galois theory; other topics in algebra as time and interest allow.

**Prerequisites & Notes**

MAT 563

Credits: 3

## **MAT 577 - Topology I**

Fundamental concepts of topology, including cardinal and ordinal numbers, topological spaces, cartesian products, connectedness, compactness, continuity, separation axioms and metric spaces.

**Prerequisites & Notes**

A grade of C or better in MAT 425 or permission.

Credits: 3

**MAT 578 - Topology II**

A continuation of MAT 577.

**Prerequisites & Notes**

A grade of C or better in MAT 577.

Credits: 3

**MAT 590 - Graduate Research Seminar**

Current topics of mathematical interest are studied under faculty supervision. May be repeated for credit to a maximum of four times.

Credits: 1

**MAT 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

**STS 531 - Mathematical Statistics I**

Covers axioms of probability, random variables, continuous and discrete distributions, moment generating functions, distributions of functions of random variables, sampling distributions.

**Prerequisites & Notes**

A grade of C or better in MAT 425, STS 434 or permission.

Credits: 3

**STS 532 - Mathematical Statistics II**

Topics include principles and methods of parametric point estimation, interval estimation and hypothesis testing, non-parametric inference.

**Prerequisites & Notes**

A grade of C or better in STS 531.



Credits: 3

### **STS 533 - Stochastic Systems**

The study of mathematical models which involve random processes. Topics include Poisson process, waiting-line models, Markov chains, decision analysis and reliability theory. Some emphasis on modeling problems encountered in business and industry.

#### **Prerequisites & Notes**

A grade of C or better in STS 434.

Credits: 3

## **Mechanical Engineering**

### **MEE 500 - Research Methods**

Focuses on the development of critical research skills that are broadly applicable to mechanical engineering research through the development of a research proposal with the guidance of the course instructor and the student's research advisor. Emphasis placed on the role of peer review on original research.

#### **Prerequisites & Notes**

Graduate standing.

Credits: 3

### **MEE 520 - Nanomaterials and Nanomechanics**

This course covers synthesis of nanomaterials, advanced characterization techniques, general and mechanical behaviors of nanomaterials and their technological applications. The basic physics and fundamental mechanisms responsible for nanoscale-induced changes in properties will be addressed. The course blends introductory and in-depth lectures with student presentations on recent scientific papers of interest to this class.

#### **Prerequisites & Notes**

MEE 320 or permission

Credits: 3

### **MEE 536 - Advanced Heat Transfer I**

A study of transfer of heat by conduction including use of approximate, exact analytical, and numerical techniques for the prediction of temperature distributions in both the steady and unsteady state.

#### **Prerequisites & Notes**

MEE 432.

Credits: 3

### **MEE 541 - Manufacturing and Testing of Composites**

An introduction to the manufacturing and material property determination of fiber reinforced polymer materials. Includes fabrication, post-processing, and testing of thermoset and thermoplastic composite materials.

**Prerequisites & Notes**

MEE 251 or MEE 252 or MET 219, or permission of the instructor

Credits: Lec 1, Lab 2

## **MEE 546 - Finite Elements in Solid Mechanics**

Basics of the finite element method with emphasis placed on solid mechanics applications. Fundamentals of the development of beam, plain strain, plate bending, axisymmetric and solid elements using the variation/isoparametric formulations. Solutions to composite structures and to eigenvalue problems included.

**Prerequisites & Notes**

MEE 456.

Credits: 3

## **MEE 549 - Numerical Methods in Engineering**

Modern numerical methods for engineering analysis, including numerical linear algebra, numerical methods for solving nonlinear systems of equations, the solution of initial-value problems, finite-difference methods for boundary-value problems, iterative methods for large sparse systems of equations, and an introduction to optimization techniques. This course is identical to CIE 549. (Fall)

**Prerequisites & Notes**

MAT 258 or MAT 259 and an introductory programming course is recommended, or permission of the instructor.

Credits: 3

## **MEE 550 - Mechanics of Laminated Composite Structures**

3-D anisotropic constitutive relations. Classical lamination theory and boundary conditions for composite beams, plates and shells. Boundary value problems and solutions for static loads, buckling and vibrations. Higher order theories incorporating shearing deformation and layerwise theories. Interlaminar stresses and edge effects.

**Prerequisites & Notes**

MEE 450 or permission.

Credits: 3

## **MEE 551 - Robot Dynamics and Control**

Introduction to planar and spatial rotations and homogeneous transformations. Introduction to forward kinematics of serial-link robotic manipulator and Denavit-Hartenberg frames and parameters. Introduction of dynamics of robotic manipulator through calculating velocity and acceleration of the links. Introduction to position feedback control using servo motors and gears to track a desired trajectory by a robotic manipulator. This course will include hands-on experience through the lab projects, and it will teach students how to use computer programming to model robots.

Students who have completed MEE 444 with a passing grade are not eligible to take MEE 544 or vice versa.

**Prerequisites & Notes**

A grade C or better in MEE 270, and MEE 380.

Credits: 3

**MEE 552 - Aircraft and Automobile Structures**

Introduction to aircraft and automobile structures. Structural mechanics of thin-walled stiffened and unstiffened members. Analysis and design of single- and multi-cell structures under torsion, bending, shear, and combined loading conditions. Instability and failure analysis of thin-walled columns and stiffened panels. Energy absorption in single- and multi-cell tubular members.

Students who have completed MEE 452 with a passing grade are not eligible to take MEE 552 or vice versa.

**Prerequisites & Notes**

MEE 251 (Strength of Materials).

Credits: 3

**MEE 554 - Theory of Elasticity**

Includes plane stress and plane strain, stress function; problems in Cartesian and polar coordinates; photoelasticity, strain energy; three-dimensional problems. Rec 3.

**Prerequisites & Notes**

MAT 251 and MAT 258.

Credits: 3

**MEE 555 - Smart Materials**

A general coverage of all existing smart/active materials and biomaterials, their characteristics, properties, functions, modeling and simulations and engineering, scientific and medical applications.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

**MEE 557 - Introduction to Continuum Mechanics**

Includes general formulation of classical field theories; fundamental concepts of motion, stress and energy for a continuum; general nature of constitutive equations for a continuum.

**Prerequisites & Notes**

MEE 251, MEE 360.

Credits: 3

## **MEE 559 - Engineering Optimization**

Analytical, graphical, and numerical approaches for solving unconstrained or constrained optimization problems involving linear or nonlinear functions. Application of optimality criteria and mathematical programming techniques to problems involving multiple design variables.

Students who have completed MEE 459 with a passing grade are not eligible to take MEE 559 or vice versa.

### **Prerequisites & Notes**

MAT 228 (Calculus III), MAT 258 (Introduction to Differential Equations with Linear Algebra).

Credits: 3

## **MEE 560 - Computational Methods in Fluid Dynamics**

Numerical solutions of partial differential equations using finite differences and spectral methods. CFL constraints and stability. Incompressible, unsteady Navier-Stokes equations. Numerical simulation and flow visualization using MATLAB.

### **Prerequisites & Notes**

MEE 360.

Credits: 3

## **MEE 562 - Advanced Fluid Mechanics**

This course is designed to provide in-depth understanding of the fundamentals in fluid mechanics at the introductory graduate level. It starts with formal derivation of unsteady three-dimensional Navier Stokes equations in both integral and differential forms. Exact solutions of viscous incompressible flow will then be derived for classic flow configurations, including Couette flow, Poiseuille flow, duct flow with different shapes of cross-sections, flow between rotating cylinders, Stokes' first problem, Stokes' second problem and stagnation-point flow. The boundary layer theory will be introduced, including the derivation of boundary layer separation. Potential flow theory will be introduced, including supposition of fundamental solutions, complex velocity potential, conformal transformation, Joukowski transformation, and Panel techniques.

### **Prerequisites & Notes**

MEE 360.

Credits: 3

## **MEE 564 - Fluid Structure Interaction**

Introduction to the basics of fluid-structure interaction (FSI) by a series of progressively complex problems. In the process, basics of fluid mechanics, wave hydrodynamics, floating system dynamics, and vibrations are also covered. Topics covered include linear wave theory, linear and non-linear oscillators, potential flow methods, wave force prediction methods, vortex-induced vibration and seakeeping.

### **Prerequisites & Notes**

MEE 462 and MEE 565.

Credits: 3

## **MEE 565 - Offshore Floating System Design**

The course introduces the basics of naval architecture and offshore engineering design concepts to graduate engineering students. A broad introduction is provided on the topics of floating platform stability, structural strength, global performance, mooring systems and installation. Use of industry guest lecturers will complement regular lectures for the course. Emphasis is placed on applying recommended practices by regulatory bodies into hands-on design projects.

### **Prerequisites & Notes**

MEE 360 and MEE 380 or permission from instructor.

Credits: 3

## **MEE 573 - Advanced Vibrations I**

Advanced vibration theory and applications including multi-degree of freedom systems, transient and random vibrations, Lagrange's equation, Laplace transformation and matrix iteration, computer techniques.

### **Prerequisites & Notes**

MEE 471.

Credits: 3

## **MEE 590 - Modern Control Theory and Applications**

This course introduces the state-space methods for analysis and design of linear control systems. The assumed prerequisites are undergraduate courses in linear algebra and dynamic systems and controls. The analysis part of this course is concerned with stability, controllability, observability, realization, and minimality of the state-space model, while the control design part delves into the methods of pole placement for state feedback and observer design, and optimal methods such as linear quadratic regulator (LQR) and Kalman filter. Students will also learn how to apply the theory to engineering problems using MATLAB for both continuous-time and discrete-time systems.

### **Prerequisites & Notes**

C or better in MEE 370, graduate standing in MEE or permission of instructor.

Credits: 3

## **MEE 638 - Advanced Heat Transfer II**

A study of transfer of heat by convection including solution for velocity and temperature fields in convection problems by integral methods and similarity transformation.

### **Prerequisites & Notes**

MEE 432 or permission.

Credits: 3

## **MEE 639 - Advanced Radiative Heat Transfer**

This course investigates the fundamentals of radiative heat transfer including the blackbody radiation law and radiative properties of real surfaces, radiative heat transfer between surfaces separated by transparent and participating media,

radiative exchange in the presence of conduction and convection, the radiative transfer equation and its solution methods, especially the discrete ordinates method.

**Prerequisites & Notes**

MEE 125 and MEE 432 or equivalent or permission of instructor.

Credits: 3

**MEE 644 - Mechanical Engineering Analysis I**

Formulation and study of mathematical models applicable to mechanical engineering. Problems in heat transfer, thermodynamics, solid and fluid mechanics.

**Prerequisites & Notes**

MAT 258 or permission.

Credits: 3

**MEE 646 - Advanced Finite Elements in Solid Mechanics**

Advanced techniques in applying the finite element methods to solid and structural mechanics. Solutions of eigenvalue problems associated with structural vibrations and buckling. Dynamic and nonlinear behavior. Emphasizes practical usage in solving engineering problems.

**Prerequisites & Notes**

MEE 546 or permission.

Credits: 3

**MEE 658 - Theory of Plates and Shells**

A study of small deflection theory of plates including Navier and Levy solutions, approximate methods including point matching, large deflection problems, introduction to theory of shells.

**Prerequisites & Notes**

MEE 251.

Credits: 3

**MEE 696 - Mechanical Engineering Graduate Seminar**

Recent developments in mechanical engineering and related fields based on the literature or current investigations. May be repeated for credit. (Pass/Fail Grade Only.)

Credits: 1

**MEE 697 - Mechanical Engineering Projects**

None.

Credits: Ar

## **MEE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Modern Languages and Classics**

### **MLC 566 - The Teaching of Modern Languages**

Includes current trends and methods in world language instruction, application of second language acquisition principles to classroom procedures, interplay of theory and practice at different proficiency levels, uses of technology in instructional process. For individuals seeking world language teaching (re)certification.

### **Prerequisites & Notes**

permission.

Credits: 3

### **SPA 520 - Seminar in Film**

Areas covered may vary and could include the following topics: national cinemas; directors of note; the social, political, historic and economic factors that influence both the creation and content of films; and an analysis of the components of cinematography. May be repeated for credit once

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

## **Music-Education**

### **MUE 630 - Contemporary Music Education**

Investigates the historical and philosophical foundations of music education in relation to contemporary music curricula, teaching techniques and materials. Examines areas of concern for music education and their implications for present and future directions.

Credits: 3

### **MUE 650 - Topics in Music Education**

Concentrated study of designated topics in Music Education. Topics will vary. May be repeated for credit.

**Prerequisites & Notes**

permission.

Credits: 3

## **Music-General**

### **MUS 510 - Special Topics in Music**

Specific topics and approaches will be chosen jointly by interested students and the staff. Designed to address the undergraduate course issues not covered in regular offerings. 01-Piano Pedagogy and Literature; 06-Seminar in Contemporary Music; 11-Harpsichord;

**Prerequisites & Notes**

permission.

Credits: 1-3

### **MUS 600 - Research in Music**

Survey of research procedure and scholarship in performance, music education, choral conducting or instrumental conducting.

Credits: 3

### **MUS 650 - Topics in Choral Music**

Concentrated study of approved topics in choral music. Topics will vary. May be repeated for credit.

**Prerequisites & Notes**

MUL 531.

Credits: 3

### **MUS 651 - Topics in Instrumental Music**

Concentrated study of approved topics in instrumental music. Topics will vary. May be repeated for credit.

**Prerequisites & Notes**

MUL 531.

Credits: 3

### **MUS 698 - Special Studies in Music**

Individual work on an approved project under the guidance of an graduate faculty member.

**Prerequisites & Notes**



MUS 600.

Credits: 2-4

## **Music-History**

### **MUH 550 - Music Period Course**

An in-depth study of one of four style periods in western classical music. Offered by section number on a four-year rotating basis: Section 001 - Music of the Baroque Period: A study of music in the 17th and first-half of the 18th centuries from Monteverdi and Schutz to Bach and Handel; 002 - Music of the Classical Period: The changing style in form and content as evolved by Haydn, Mozart and Beethoven viewed in historical content; 003 - Music of the Romantic Period: Study of musical expression during the 19th century with emphasis on the intellectual foundations of the romantic movement. Detailed analysis of representative works from Beethoven through Debussy; 004 - Music of the Twentieth Century: Trends in contemporary music and their relationship to the cultural and political life of our time. May be repeated for credit.

#### **Prerequisites & Notes**

MUH 202 or permission.

Credits: 3

### **MUH 650 - Topics in Music History**

Concentrated study of designated topics in music history. Topics will vary. May be repeated for credit.

#### **Prerequisites & Notes**

permission.

Credits: 3

## **Music-Organizations and Ensembles**

### **MUO 502 - University Singers**

Performance of choral concert repertoire. Public performance and extended concert tours. Five rehearsals per week. May be repeated for credit.

#### **Prerequisites & Notes**

audition.

Credits: 1-2

### **MUO 503 - Oratorio Society**

Participation and a leadership role in the rehearsal and performance of choral concert repertoire. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 2.

**Prerequisites & Notes**

audition.

Credits: 1-2

**MUO 504 - Collegiate Chorale**

Participation and a leadership role in the rehearsal and performance of choral music appropriate for choral singers with limited background and training. No audition required; open to all students. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 2.

Credits: 1-2

**MUO 505 - Marching Band**

Participation and a leadership role in the rehearsal and performance of marching band repertoire beginning four days prior to opening of classes. Rehearsal of concert music on limited schedule during final weeks of semester. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 4.

**Prerequisites & Notes**

permission.

Credits: 1-2

**MUO 506 - Concert Band**

Participation and a leadership role in the rehearsal and performance (on and off campus) of a variety of concert band literature appropriate for the general University instrumentalist. Attendance at rehearsals and public performances required. May be repeated for credit. Lab 3.

**Prerequisites & Notes**

permission.

Credits: 1-2

**MUO 507 - Pep Band**

Participation and a leadership role in the rehearsal and performance of band music appropriate for athletic events including current marching band selections. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 2.

**Prerequisites & Notes**

permission.

Credits: 1-2

**MUO 508 - Symphonic Band**

Participation and a leadership role in the rehearsal and performance of the most challenging and significant band literature. Attendance at all rehearsals and public performances required. Occasional touring on class days. May be repeated for credit. Lab 3.

**Prerequisites & Notes**

audition.

Credits: 1-2

**MUO 509 - University Orchestra**

Participation and a leadership role in the rehearsal and performance of standard orchestral repertoire. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 4.

**Prerequisites & Notes**

audition.

Credits: 1-2

**MUO 511 - Opera Workshop**

Participation and a leadership role in the study and performance of standard opera repertory. May be repeated for credit. Lab 3.

**Prerequisites & Notes**

audition.

Credits: 1-2

**MUO 514 - UM Jazz Ensemble**

Participation and a leadership role in the rehearsal and performance of music for the large (16-24 member) jazz ensemble. Attendance at all rehearsals and public performances required. May be repeated for credit. Lab 5.

**Prerequisites & Notes**

audition.

Credits: 1-2

**MUO 518 - Percussion Ensemble**

Participation and a leadership role in the rehearsal and performance of percussion ensemble repertoire. Attendance at all rehearsals required. May be repeated for credit. Lab 2.

**Prerequisites & Notes**

permission of instructor.

Credits: 1-2

**MUO 520 - Chamber Jazz Ensemble**

The rehearsal and performance of music for the Chamber Jazz Ensemble. Attendance at all rehearsals and public performances required. Some emmorization required. May be repeated for credit. Lab 2.

**Prerequisites & Notes**

Permission of Instructor.

Credits: 1

## **Music-Performance**

### **MUP 511 - Advanced Chamber Music I**

The study and performance of the standard ensemble literature for string instruments, wind instruments, and piano.

**Prerequisites & Notes**

Audition.

Credits: 2

### **MUP 512 - Advanced Chamber Music II**

A continuation of MUP 511.

**Prerequisites & Notes**

permission.

Credits: 2

### **MUP 610 - Vocal Performance**

Advanced study of vocal performance techniques with concentration on preparation of literature appropriate for graduate recital.

**Prerequisites & Notes**

MUS 350 or equivalent.

Credits: 2

### **MUP 611 - Keyboard Performance**

Advanced study of keyboard performance techniques with concentration on preparation of literature appropriate for graduate recital.

**Prerequisites & Notes**

MUS 350 or equivalent.

Credits: 2

### **MUP 612 - String Instrument Performance**

Advanced study of string instrument performance techniques with concentration on preparation of literature appropriate for graduate recital.

**Prerequisites & Notes**

MUS 350 or equivalent.

Credits: 2

**MUP 613 - Wind Instrument and Percussion Performance**

Advanced study of wind instrument and percussion performance with concentration on literature appropriate for graduate recital.

**Prerequisites & Notes**

MUS 350 or equivalent.

Credits: 2

**MUP 695 - Graduate Recital**

Presentation of a full-length public recital following preparation of appropriate literature under guidance of a graduate faculty member.

Credits: 2

**Music-Theory****MUY 650 - Topics in Music Theory**

Concentrated study of designated topics in music theory. Topics will vary. May be repeated for credit.

**Prerequisites & Notes**

permission.

Credits: 3

**New Media****DIG 500 - Introduction to Digital Curation**

As the introductory course to the Digital Curation program, this class surveys the variety of digital artifacts that we consciously or unconsciously create and consume today, with a focus on how to collect and manage digitized and born-digital artifacts and their related data. Students learn technical skills such as how to digitize analog documents, photographs, and videos, as well as curatorial knowledge such as how selection criteria vary as a function of type of institution (archives v. libraries v. museum) and field (art v. archeology). The course also reviews methods for ensuring the ongoing integrity of the artifact and laws governing the acquisition and use of intellectual property, such as how copyright extends to images, editions, and future versions of a work.

Credits: 3

**DIG 510 - Metadata Systems**

This course covers digital formats for describing the contents and contexts of artifacts with an emphasis on their use in libraries, archives, and online repositories. This includes a discussion on the need for and use of metadata in a variety of digital contexts, exposure to specific metadata standards used in a number of fields, and demonstrations of how these metadata are expressed in several output formats.

**Prerequisites & Notes**

DIG 500 strongly recommended

Credits: 3

## **DIG 540 - Digital Collections & Exhibitions**

This course covers the technical means and social consequences of assembling and sharing cultural data and artifacts. Topics include the fundamentals of relational databases; a survey of collection management packages, both proprietary and open-source; and an introduction to the special concerns and programming concepts necessary to customize off-the-shelf database solutions for domain and content appropriateness.

**Prerequisites & Notes**

DIG 500 and 510 strongly recommended

Credits: 3

## **DIG 550 - Digital Preservation**

This course acquaints students with the challenges of, and best practices for, preserving digital artifacts. Topics include a survey of the (sometimes bewildering) array of formats for digital media, along with their vulnerabilities and half-lives; analysis of various preservation strategies (storage, migration, emulation, reinterpretation); institutional, legal, and practical impediments to preservation; preservation standards and resources for digital media (Media Matters, Variable Media Questionnaire).

**Prerequisites & Notes**

DIG 500, 510, and 540 strongly recommended

Credits: 3

## **Nursing**

### **NUR 502 - Families in Health and Illness**

Theories of family structure and functioning, social issues affecting contemporary American families, and health-related research provide the framework for systematic assessment of family health needs and for development of nursing interventions. Provision of primary health care for families in rural communities will be emphasized. One-half of class time is spent in the classroom and one-half is conducted via WebCT for asynchronous online learning.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

### **NUR 503 - Advanced Health Appraisal and Physical Assessment: Nurse Practitioner**

The learner will develop knowledge and skill necessary to conduct a comprehensive health assessment of individuals throughout the lifespan. Strong emphasis will be placed on complete and detailed history-taking, physical examination techniques, and complete documentation of findings. Holistic and comprehensive approach is emphasized with attention to identifying health promotion, disease prevention needs, as well as the evaluation of common signs and symptoms that present in the primary care setting. The diagnostic reasoning skills needed in the advanced practice role are introduced and practiced.

**Prerequisites & Notes**

Department consent required

Credits: 3

## **NUR 504 - Theory Development in Nursing**

Historical development of nursing theories and the generation of scientific knowledge. Selected theories from other disciplines useful for understanding nursing phenomena are also presented. An electronic component is also part of the course.

**Prerequisites & Notes**

MSN student or permission.

Credits: 3

## **NUR 505 - Nursing Research**

Explore inductive and deductive approaches to generating research emphasizing internal and external validity. Students will review and critique nursing studies and carry out an analysis project.

**Prerequisites & Notes**

Admission to graduate nursing program or permission.

Credits: 3

## **NUR 506 - Professional Issues in Advanced Practice Nursing**

Issues of advanced practice nursing, including professional role transition; ethical, legal and business aspects of practice; leadership domains of advanced practice nursing; and strategies to enhance the quality of care and health care outcomes will be addressed.

**Prerequisites & Notes**

NUR 522.

Credits: 2

## **NUR 507 - Advanced Pathophysiology**

Advanced study of normal and abnormal human physiology with a focus on the physiological, genetic and biochemical basis of human disease. Provides a framework for nurses to understand and integrate clinical findings, diagnostic and therapeutic regimens.

**Prerequisites & Notes**

permission.

Credits: 3

### **NUR 508 - Advanced Pharmacology and Therapeutics: Nurse Practitioner**

This course is designed to prepare family nurse practitioner (FNP) students in drug therapy of individuals across the lifespan with emphasis on the primary health care setting. This pharmacology/pharmacotherapeutics course is intended as an advanced course based upon previous knowledge that a nurse obtained in undergraduate education and clinical practice.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **NUR 512 - Curriculum and Course Development and Evaluation in Nursing Education**

Introduces the student to curriculum and course development and evaluation in nursing education with emphasis on organizational frameworks, teaching-learning strategies and evaluation of learning. This course will be conducted through asynchronous distance education technology supplemented with in-class meetings.

#### **Prerequisites & Notes**

MSN student or permission.

Credits: 3

### **NUR 515 - Assessment, Measurement and Evaluation in Nursing Education**

Introduces the graduate student to assessment, measurement and evaluation with an emphasis on nursing education. Planning, teaching and assessment are the three interactive components of educational instruction and this course will examine the role of assessment in instruction. Assessment principles, concepts, terminology, models and methods are explored. Evidence based evaluation strategies are discussed within the context of ethical, legal, social and political aspects of nursing education.

#### **Prerequisites & Notes**

NUR 512 Curriculum and Course Development

Credits: 3

### **NUR 516 - Field Experience in Nursing Education or Administration**

Integrates theory in a reality context of the teaching or administration role; participates in classroom, laboratory, and clinical settings pertinent to area of interest; integrates teaching/learning or management theories in a practice setting. Asynchronous BlackBoard discussions will supplement actual field experiences and faculty/student conferences.

#### **Prerequisites & Notes**

NUR 512, NUR 515 or permission.

Credits: 4



## **NUR 520 - Family Nurse Practitioner Management of Neonate to Adolescent**

This course is one of four primary care courses in the Masters of Science in Nursing Rural Family Nurse Practitioner program. Pathophysiology is seen as a strong basic component throughout primary care. Emphasis is placed on understanding assessment, evaluation, and management of pediatric ambulatory episodic healthcare problems commonly encountered in rural practices. Prevention and health promotional concepts to promote optimal health for infants, children, adolescents, and their families are discussed. Incorporating evidence-based approaches to care of infants, children, and adolescents including pharmacological and nonpharmacological interventions, patient education, and lifestyle changes.

### **Prerequisites & Notes**

NUR 503 and NUR 507. Permission.

Credits: 3

## **NUR 521 - Nurse Practitioner Gynecologic and Reproductive Care of Women**

Focuses on the nurse practitioner's clinical assessment and management of the female client's gynecologic, reproductive and sexual health. The lecture portion of this course covers didactic content, with over 50% delivered online. The clinical portion of this course includes 150 hours of practicum caring for obstetrical and gynecological patients in a primary care setting.

### **Prerequisites & Notes**

NUR 503.

Credits: 2-4

## **NUR 522 - Family Nurse Practitioner Care of Adults I**

This course is fourth in a series of five primary health care courses in the Master of Science in Nursing Family Nurse Practitioner program. Emphasis is placed on assessment, evaluation, and management of adult health care problems commonly encountered in rural primary care settings. Attention is given to the complex socioeconomic and cultural issues that impact care of rural populations by the family nurse practitioner.

### **Prerequisites & Notes**

NUR 503, 507, 508, 520, and 521; permission

Credits: 3

## **NUR 523 - Family Nurse Practitioner Care of Adults II**

Continuation of NUR 522 with emphasis on health care needs of older adults and other underserved populations. Lec 1-3, Clin 1-3.

### **Prerequisites & Notes**

NUR 502, NUR 522; permission.

Credits: 1-6

## **NUR 524 - Family Nurse Practitioner Management of Neonate to Adolescent-Clinical**

This course is one of four primary care courses in the Masters of Science in Nursing Rural Family Nurse Practitioner program. Pathophysiology is seen as a strong basic component throughout primary care. Emphasis is placed on clinical application of assessment, evaluation, and management of pediatric ambulatory episodic healthcare problems commonly encountered in rural practices. Prevention and health promotional concepts to promote optimal health for infants, children, adolescents, and their families are executed. Utilization of evidence-based approaches to care of infants, children, and adolescents including pharmacological and non-pharmacological interventions, patient education, and lifestyle changes are executed in the clinical setting.

**Prerequisites & Notes**

NUR 503 and NUR 507 and permission

150 clinical hours

Credits: 2

**NUR 526 - Family Nurse Practitioner- Care of Adults 1 (Clinical)**

This course is fourth in a series of five primary health care clinical courses in the Master of Science in Nursing Family Nurse Practitioner program. Emphasis is placed on assessment, evaluation, and management of adult health care problems commonly encountered in rural primary care settings. Attention is given to the complex socioeconomic and cultural issues that impact care of the rural populations by the family nurse practitioner. The objective for this clinical is for the student to gain experience in conducting health appraisals and physical examinations, determining differential diagnosis, and developing a treatment plan on actual patients under the supervision of a licensed health care practitioner (MD, DO, CNP, PA).

Students will complete a minimum of 150 supervised clinical hours.

**Prerequisites & Notes**

NUR 503/507/508/520/521, permission

Credits: 2

**NUR 527 - FNP Care of Adults II-Clinical**

This course is fifth in a series of five primary health care clinical courses in the Master of Science in Nursing Family Nurse Practitioner program. Emphasis is placed on assessment, evaluation, and management of adult health care problems commonly encountered in rural primary care settings. Attention is given to the complex socioeconomic and cultural issue that impact care of rural populations by the family nurse practitioner. The objective for this clinical is for the student to gain experience in conducting health appraisals and physical examinations, determining differential diagnosis, and developing a treatment plan on actual patients under the supervision of a licensed health care practitioner (MD, DO, CNP, PA). Students will complete a minimum of 224 supervised clinical hours

**Prerequisites & Notes**

Department permission; Concurrent NUR 523

Credits: 3

**NUR 531 - Advanced Health Appraisal and Physical Assessment (Lab)**

The learner will practice the knowledge and skills necessary to conduct a comprehensive health assessment of individuals throughout the lifespan through hands-on learning in a lab setting. Additionally, using virtual simulations,

the learner will practice detailed history-taking, physical examination technique, and documentation of findings. A holistic and comprehensive approach is emphasized with attention to identifying the health promotion, health prevention needs, as well as the evaluation of common signs and symptoms that present in the primary care setting. The diagnostic reasoning skills needed in the advanced practice role are introduced and practiced.

**Prerequisites & Notes**

NUR 503 or department permission

Credits: 1

**NUR 644 - Healthcare Leadership and Management**

This course presents information about leadership and management within the dynamic environment of healthcare and offers students the opportunity to explore key concepts critical to successful healthcare leadership and management. Students examine how leadership/management models/approaches influence outcomes within the direct care environment as well as more broader environments such as the clinical team, department, professional workload, organization, community and their profession. Through case studies, online discussion groups, literature review, and self-assessment/reflection, this course helps to better prepare students for their leadership role as a healthcare professional.

**Prerequisites & Notes**

graduate standing in the School of Nursing, Communication Sciences and Disorders, Kinesiology and Physical Education, Food Science and Human Nutrition, and Social Work or instructor permission.

Credits: 3

**NUR 675 - Philosophical Foundations and Ethical Decision Making Frameworks for Advanced Practice Nursing**

This course constitutes an exploration of logical and epistemological foundations of empirical science. This course engages students in a reflective and dialogical process that utilizes theory to guide structuring of nursing knowledge and the philosophical underpinnings of advanced nursing practice, leadership, and practice inquiry. Ethical decision-making frameworks and relevant research findings will be used to promote the development of application skills for clinical practice.

**Prerequisites & Notes**

Undergraduate/graduate course work in philosophy, ethics, science and social science preferred. Graduate standing or consent of instructor.

Credits: 3

**NUR 693 - Ethical Inquiry in Health Care**

The influence of philosophical, cultural, ethical, legal, economic and political systems upon health care will provide the framework for examining contemporary issues. The process of ethical reasoning and analysis will be used with selected clinical cases to systematically examine ethical distress and ethical dilemmas.

**Prerequisites & Notes**

Graduate standing or permission of instructor.

Credits: 3

## **NUR 694 - Health Policy, Politics and Practice**

Introduces students to health policies and political activities and their impact on health care and health care management systems, interweaving sociopolitical and ethical frameworks. Students examine the changing content of health care and critically evaluate the process of policy development, including the political role of health professionals and the fiscal impact of policy change.

### **Prerequisites & Notes**

Graduate student in nursing or permission.

Credits: 3

## **NUR 695 - Topics in Nursing**

Concentrated study of designated topics in nursing. Topics may vary depending on faculty and student interest. May be repeated for credit. Some sections may have prerequisites beyond the following.

### **Prerequisites & Notes**

Graduate student or permission.

Credits: 1-3

## **NUR 697 - Scholarly Project**

An opportunity to integrate research, clinical and theoretical knowledge bases in a rigorous, faculty-guided project. Critical thinking, analysis and synthesis provide the framework for the project which may include philosophical, theoretical or clinical papers.

Credits: 1-6

## **NUR 698 - Independent Study in Nursing**

Individual work on an approved project.

### **Prerequisites & Notes**

permission.

Credits: 1-3

## **NUR 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Peace Studies**

### **PAX 510 - Theories in Peace and Reconciliation Studies**

An exploration and critical discussion of historical and contemporary theories about conflict, peace, and reconciliation.

Credits: 3

### **PAX 591 - Forgiveness: Creating a Culture of Peace & Reconciliation**

How do we forgive those we consider enemies? Are there limits to forgiveness? Can we learn forgiveness? These questions form the core of our class exploration as we study forgiveness from academic, personal, historical, and cultural perspectives. Through reading, writing, conversation, and other forums, we will look at forgiveness as a tool for peacebuilding.

Credits: 3

### **PAX 598 - Independent Graduate Study**

Advanced research and writing projects in Peace and Reconciliation Studies. May be repeated for credit.

#### **Prerequisites & Notes**

Permission.

Credits: 3

## **Philosophy**

### **PHI 566 - Graduate Readings in Philosophy**

Individual study of a selected topic, agreed upon by the student and the instructor. Designed to address advanced issues not covered in normal offerings or on a graduate level.

#### **Prerequisites & Notes**

graduate standing and permission of department and instructor.

Credits: 1-3

## **Physics**

### **PHY 501 - Mechanics**

Covers kinematics and dynamics of particle and rigid body motion, Lagrange's equations, variational principles, Hamilton's equations, canonical transformations, Hamilton-Jacobi theory.

#### **Prerequisites & Notes**

Graduate standing in Physics and Astronomy or permission.

Credits: 3

## **PHY 502 - Electrodynamics I**

Electrodynamics, including Maxwell's Equations, Special Relativity, and Lagrangian dynamics

### **Prerequisites & Notes**

Graduate standing in Physics and Astronomy or permission.

Credits: 3

## **PHY 503 - Quantum Mechanics I**

Topics include Dirac notation, state vectors and operators, one dimensional systems, angular momentum, central forces, perturbation theory, scattering.

### **Prerequisites & Notes**

PHY 501 or permission of instructor.

Credits: 3

## **PHY 510 - Graduate Laboratory**

Experience with sophisticated techniques and specialized equipment acquaints students with different areas of experimental physics. For graduate students in physics and for scientists and engineers in allied studies or industry.

### **Prerequisites & Notes**

graduate standing in physics, chemistry, electrical engineering, or permission of instructor.

Credits: Ar

## **PHY 512 - Statistical Mechanics**

A study of macroscopic behavior of matter derived from a statistical consideration of microscopic properties of systems, as well as relationships to Thermodynamics and Kinetic Theory.

### **Prerequisites & Notes**

Corequisite: PHY 503 or permission.

Credits: 3

## **PHY 574 - Methods of Theoretical Physics I**

Topics may include linear algebra, complex analysis, theory of differential equations, special functions, Green's functions, integral transforms calculus of variations, with applications from physics.

### **Prerequisites & Notes**

permission of instructor.

Credits: 3

## **PHY 575 - Methods of Theoretical Physics II**

Advanced topics in mathematical physics of special interest. May include chaos, complex analysis, theory of integral equations, tensor analysis, elements of group theory, Green's functions theory.

**Prerequisites & Notes**

PHY 574 or equivalent.

Credits: 3

**PHY 588 - Graduate Seminar**

Report and discussion of recent developments in Physics and related fields based on the literature or results of current investigation.

Credits: Ar

**PHY 598 - Special Topics in Theoretical or Experimental Physics**

Specific topics determined by current interests of students and staff. Offered on demand with approval of the Department Chairperson.

Credits: Ar

**PHY 603 - Quantum Mechanics II**

Covers electron spin, spinors, relativistic wave equations, Dirac equation for electron, relativistic treatment of hydrogen atom, second quantization of electromagnetic and electron fields.

**Prerequisites & Notes**

PHY 503 or equivalent.

Credits: 3

**PHY 624 - Solid State Physics I**

Covers free electron theory of metals, crystal lattices and reciprocal lattices, X-ray diffraction, electron levels in a periodic potential, semi-classical model of electron dynamics.

**Prerequisites & Notes**

PHY 503 or permission of instructor.

Credits: 3

**PHY 625 - Solid State Physics II**

A continuation of PHY 624 covering other phenomena in solid state physics with emphasis on current research topics.

**Prerequisites & Notes**

PHY 624 or equivalent.

Credits: 3

## **PHY 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Plant, Soil and Environmental Science**

### **PSE 509 - Experimental Design**

Principles of research in biological sciences, design of experiments, statistical analysis and interpretation of data. Lec 3, Lab 2.

Credits: 4

### **PSE 513 - Weed Ecology and Management**

Ecological principles and their application in non-chemical and reduced input weed management strategies. Course will include field trips during class hours.

PSE 403 and PSE 513 cannot both be taken for credit. Lec 2, Lab 2.

### **Prerequisites & Notes**

PSE 100 (or BIO 200 or SFR 100) (prerequisites or corequisites)

Credits: 3

### **PSE 557 - Advanced Plant Pathology**

This course provides an understanding of the biology of plant diseases, the agents that cause them, the conditions that affect their severity, and the methods used to manage them. Students should develop the ability to recognize or diagnose particular diseases and an understanding of the principles of disease management. PSE 457 and PSE 557 cannot both be taken for credit.

### **Prerequisites & Notes**

Graduate standing or permission.

Credits: 4

### **PSE 580 - Scientific Communications I**



Presentations of research proposal to faculty and graduate student peers. Covers the use of scientific graphic and presentation software.

Credits: 1

## **PSE 581 - Scientific Communications II**

Literature review and poster presentation of scientific ecological and environmental research topics.

### **Prerequisites & Notes**

None.

Credits: 1

## **PSE 597 - Special Topics in Plant, Soil and Environmental Sciences**

Advanced study of topics in plant, soil and environmental sciences.

### **Prerequisites & Notes**

permission.

Credits: Ar

## **PSE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Political Science**

### **POS 531 - Topics in Comparative Politics**

Examines various issues in comparative politics such as comparative democratization, regime types and conflict management, with emphasis on readings in the theoretical literature in the discipline of comparative politics through class discussions and individual research. May be repeated for credit.

Credits: 3

### **POS 549 - Seminar in American Politics**

Examines theoretical and practical issues in American politics in a small group setting, with emphasis on individual research and class participation.

Credits: 3

## **POS 596 - Directed Research in Political Science**

An individualized research course for graduate students seeking to explore an advanced research topic in political science. May be repeated for credit.

### **Prerequisites & Notes**

graduate standing or permission of instructor.

Credits: 3

## **Psychology**

### **PSY 507 - Multicultural Issues in Clinical Psychology**

The course is designed to enhance students' multicultural counseling competencies for providing psychological services to culturally diverse populations by: introducing students to the field of multicultural psychology; increasing students' awareness of assumptions, values, and biases; developing awareness, sensitivity, and understanding of the experiences of diverse groups; increasing knowledge of multicultural theories, models, and research; and increasing awareness of cultural factors in assessment, case conceptualization and diagnosis, and therapy.

### **Prerequisites & Notes**

Permission

Credits: 3

### **PSY 522 - Social Development**

An advanced survey of current theories and research on social development. Topics include attachment, parenting style, sibling relationships, peer relationships, aggression, prosocial behavior, and moral development.

### **Prerequisites & Notes**

permission.

Credits: 3

### **PSY 528 - Life Span Development**

An advanced developmental psychology course that covers the entire life span. Topics include developmental theories and research methodology, as well as biological, cognitive, social, and emotional development.

Credits: 3

### **PSY 540 - Advanced Psychological Statistics and Methods I**

A two semester advanced-level course. Topics include control, reliability of measurement, and validity in relation to both experimental and nonexperimental approaches.

**Prerequisites & Notes**

PSY 241 or equivalent.

Credits: 3

**PSY 541 - Advanced Psychological Statistics and Methods II**

A two semester advanced-level course. Topics include control, reliability of measurement, and validity in relation to both experimental and nonexperimental approaches.

**Prerequisites & Notes**

PSY 241 or equivalent.

Credits: 3

**PSY 551 - Advanced Physiological Psychology**

Reading and discussion on topics of current interest including memory, brain stimulation, neurotransmitter systems and neuronal plasticity.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 561 - Advanced Social Psychology**

Consideration of current theoretical and methodological issues in social psychology including interpersonal perception, attitude and attitude change, communication and persuasion, language and cognition.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 567 - Advanced Cognitive Psychology**

Representative topics include a comparison of the cognitive or information processing paradigm with behavioristic and psychodynamic paradigms, feature analysis and pattern recognition, memory storage and retrieval, attention, psycholinguistics, problem solving and neuropsychological bases of cognitive processes.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 581 - Supervision, Consultation, and Interprofessional Issues**

This course is designed to build students' initial competencies in clinical supervision, clinical consultation, and in navigating interprofessional issues. Students will critically evaluate the existing empirical literature on supervision,

consultation, and interprofessional issues; obtain working knowledge of guiding theories for supervision, consultation, and interprofessional functioning; and gain first-hand experience of the practice of supervision, consultation, and interprofessional work through peer supervision, peer consultation, and interprofessional role plays.

**Prerequisites & Notes**

Permission.

Credits: 3

**PSY 592 - Directed Readings:(area)**

Opportunity to read in a particular area of psychology under faculty direction.

**Prerequisites & Notes**

permission.

Credits: 1-6

**PSY 601 - Proseminar in Psychological Sciences**

Readings and presentations of journal literature and research projects in experimental psychology. Topics vary. May be repeated for credit.

**Prerequisites & Notes**

Permission

Credits: 1

**PSY 602 - Clinical Research Forum**

Exposure to advanced topics in clinical research methodology (e.g. study design, bias and confounding, hypothesis testing, sample size and power calculations). Students will develop the ability to design and conduct clinical research proposals.

**Prerequisites & Notes**

Permission

Credits: 1

**PSY 603 - Ethics and Professional Problems**

Ethical obligations of the psychologist with regard to clinical practice, supervision, teaching, and key areas in the responsible conduct of research.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 621 - Affective Science of Emotion Regulation and Psychopathology**

This course provides foundational knowledge on the growing field of affective sciences to include behavioral and neuroscience models of emotion. Students critically evaluate current theories and methodologies used in the study of emotions. Course discussions enhance understanding of the neural systems involved in emotion regulation processes and how underlying individual differences interact with environmental factors to affect functional outcomes and influence psychological health.

**Prerequisites & Notes**

Permission

Credits: 3

**PSY 625 - Basic Methods in Assessment**

Basic theory, administration, scoring and interpretation of tests frequently used for psychological evaluation with focus on individually administered tests for personality and intelligence.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 626 - Advanced Clinical Assessment**

Analysis, integration and presentation of material obtained in clinical assessment. Includes advanced training in interviewing and appropriate selection of tests, interpretation and integration of test data, and report writing.

**Prerequisites & Notes**

permission.

Credits: 3

**PSY 630 - Current Topics in Social Psychology**

An introduction to one of several current topics in social psychology. Topic areas may include applied social psychology, attitudes and persuasion, prejudice, social cognition, the self, and social influence. May be repeated for credit.

**Prerequisites & Notes**

PSY 561 or permission.

Credits: 3

**PSY 634 - Advanced Psychopathology**

Intensive reading and discussion of classification, etiology and maladapted disordered behavior.

**Prerequisites & Notes**

permission.

Credits: 3

## **PSY 647 - Foundations of Clinical Neuropsychology**

General overview of the field of Clinical Neuropsychology, which is the study of brain-behavior relationships and its application to clinical populations (i.e., individuals with central nervous system disorders/injuries). This course will provide basic overview of the biological foundations of behavior, with emphasis on clinical disorders.

### **Prerequisites & Notes**

UMaine Psychology Department graduate students or by instructor permission.

Credits: 3

## **PSY 651 - Developmental Psychopathology**

Readings and discussions of development and dynamics of psychological disorders in children. Consideration given to implications for psychotherapy.

### **Prerequisites & Notes**

PSY 641, PSY 643 and permission.

Credits: 3

## **PSY 655 - Seminar in Psychotherapy**

Study of principles involved in psychotherapy from theoretical and empirical perspectives. Includes readings of original research and theory.

### **Prerequisites & Notes**

PSY 641 and permission.

Credits: 3

## **PSY 661 - History and Philosophy of Psychology**

Scientific development of psychology from its origins in the 19<sup>th</sup> century to the major systems of contemporary psychology with emphasis on theoretical rather than applied psychology. History of psychology, nature of scientific change, rise and evolution of experimental psychology, influence of Darwinian theory, and gestalt, behaviorist, psychoanalytical, and cognitive traditions.

### **Prerequisites & Notes**

PSY 470 or its equivalent.

Credits: 3

## **PSY 691 - Practicum (activity)**

Closely supervised experience in psychological evaluation, psychotherapy, behavior modification, consulting, research, teaching, or a combination of these in a field setting. (Pass/Fail Grade Only.)

### **Prerequisites & Notes**

permission.

Credits: Ar

## **PSY 692 - Directed Research**

Opportunity to select and research a particular problem in psychology under faculty direction.

**Prerequisites & Notes**  
permission.

Credits: 1-6

## **PSY 695 - Internship in Clinical Psychology I**

One-year full-time supervised experience in a professional setting approved by the Clinical Psychology Training Committee. Open to advanced graduate students in Clinical Psychology and must be taken in consecutive semesters. Students enrolled in this course are considered to be in residence and in good standing as full-time graduate students.

**Prerequisites & Notes**  
Good standing in the Clinical Psychology Training Program and approval of the Clinical Training Committee.

Credits: 1

## **PSY 696 - Internship in Clinical Psychology II**

A continuation of PSY 695.

Credits: 1

## **PSY 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**  
Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Quaternary and Climate Studies**

### **QUS 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Resource Economics and Policy**

### **ECO 527 - Regional Economics: Modeling**

Analysis and measurement of changes in state and local economies. Emphasis on analytical tools, such as input - output modeling. ECO 527 and 427 cannot both be taken for credit.

#### **Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 3

### **ECO 571 - Advanced Environmental and Resource Economics I**

Benefit-cost analysis of public projects and valuation of non-market benefits and costs.

#### **Prerequisites & Notes**

B or better in ECO 514 or permission

Credits: 3

### **ECO 572 - Advanced Environmental and Resource Economics II**

Economic analysis of centralized and decentralized regulation of markets with externalities and public goods. Optimal management of renewable and nonrenewable natural resources.

#### **Prerequisites & Notes**

B or better in ECO 514 or permission

Credits: 3

### **ECO 593 - Graduate Seminar**

Analysis of current problems in community development, resource use, management. Emphasis on economic and social effects. Problem areas vary from semester to semester. May be repeated for a total of 6 credits.

#### **Prerequisites & Notes**

Graduate standing in the School of Economics or permission

Credits: 1-3

### **ECO 597 - Independent Studies**



Analysis of current problems in resource economics and policy and community development. May be repeated for a total of 6 credits.

**Prerequisites & Notes**

Prior approval of student's graduate committee

Credits: 1-3

## **Science Mathematics Teaching**

### **SMT 500 - Educational Psychology with Applications to Science and Mathematics Teaching and Learning**

Theories of teaching and learning of science and mathematics learning and teaching, including recent results. Applications of psychological concepts, principles, theories, and research to problems encountered in educational settings.

**Prerequisites & Notes**

permission.

Credits: 3

### **SMT 501 - Integrated Approaches to Physics Education I**

Applications of physics education research to the teaching of physics concepts and problem solving in introductory courses. Students will explore guided inquiry approaches to teaching, methods of curriculum assessment and research-based teaching strategies.

**Prerequisites & Notes**

permission.

Credits: 3

### **SMT 502 - Integrated Approaches to Physics Education II**

Applications of physics education research to the teaching of physics concepts and problem solving in introductory courses. Students will explore guided inquiry approaches to teaching, methods of curriculum assessment and research-based teaching strategies.

**Prerequisites & Notes**

permission.

Credits: 3

### **SMT 503 - Integrated Approaches in Earth Sciences Education I**

Develops the concepts and methods associated with teaching the dynamics of the Earth System. Uses education research to improve student learning and assessment.

**Prerequisites & Notes**

permission.

Credits: 3

### **SMT 504 - Integrated Approaches in Earth Sciences Education II**

Science content and methods course designed for in-service and pre-service teachers wishing to engage their science students in genuine environmental and Earth science research problems. Teachers develop research skills by designing and conducting their own field research investigation in their local community. Explores practical and school-culture challenges of engaging students in open-ended research projects and develops strategies for achieving desired learning outcomes for students.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **SMT 505 - Integrated Approaches in Mathematics Education I**

Applications of mathematics education research to the teaching of mathematics concepts and problem solving in introductory courses. Students will explore guided inquiry approaches to teaching, methods of curriculum assessment and research-based teaching strategies.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **SMT 506 - Integrated Approaches in Mathematics Education II**

Applications of mathematics education research to the teaching of mathematics concepts and problem solving in introductory courses. Students will explore guided inquiry approaches to teaching, methods of curriculum assessment and research-based teaching strategies.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **SMT 507 - Integrated Approaches in Biology Education**

Applications of biology education research to the teaching of biology concepts and problem solving. Students will explore common student conceptual difficulties in biology, methods of assessment, and research-based instructional strategies.

#### **Prerequisites & Notes**

Permission.

Credits: 3

### **SMT 588 - Seminar in Science and Mathematics Education Research**

Provides background in qualitative and quantitative methods and findings of education research and a forum for the development and critique of discipline-based education research projects.

**Prerequisites & Notes**

permission.

Credits: 1

**SMT 589 - Graduate Seminar**

Report and discussion of recent developments in science and mathematics education research, its application, or related topics based on the literature or results of current investigation. May be repeated for credit.

**Prerequisites & Notes**

permission.

Credits: Ar.

**SMT 590 - Seminar for Teaching Interns**

Students examine and reflect on their understanding about teaching and learning, apply integrated educational skills and knowledge and synthesize academic and professional experiences to develop and finalize their portfolios. May be repeated for credit.

**Prerequisites & Notes**

None. Corequisite: SMT 591.

Credits: 1

**SMT 591 - Secondary Student Teaching**

Observation and student teaching in selected secondary schools. May be repeated for credit.

**Prerequisites & Notes**

Second year standing in the MST Program. Corequisite: SMT 590.

Credits: 1-5

**SMT 598 - Special Topics in Science and Mathematics Education**

Specific topics determined by current interests of students and staff. Offered with approval of the program's graduate coordinator. May be repeated for credit with advisor approval.

Credits: 1-3

**SMT 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research

and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar.

## **Social Work**

### **INT 610 - Advanced Seminar in Integrated Behavioral Healthcare**

This course builds on foundational understanding of integrated behavioral health care developed in SWK 586 and PSY 581. Students will advance their understanding of the roles of behavioral health providers in integrated healthcare practice, develop team-based assessment and treatment planning skills, and learn to navigate issues that arise related to practice overlap and different disciplinary perspectives. Course will emphasize the challenges and opportunities associated with integrated health care practice in rural areas.

#### **Prerequisites & Notes**

Prerequisite or concurrent enrollment in SWK 589 or PSY 581.

INT 610 is designed to be a two-semester course.

Credits: 1

### **SWK 530 - MSW Advanced Standing Bridging Course-Social Welfare Policy**

Analysis of social welfare policies for social work practice.

#### **Prerequisites & Notes**

Advanced Standing MSW student or permission.

Credits: 2

### **SWK 531 - MSW Advanced Standing Bridging Course-Social Work Practice**

Integration of generalist knowledge, values and skills with application to simulated and actual social work practice situations.

#### **Prerequisites & Notes**

Advanced Standing MSW student or permission.

Credits: 2

### **SWK 533 - MSW Advanced Standing Bridging Course-Human Behavior and the Social Environment**

Utilizes multiple theoretical approaches for understanding human behavior in the social environment.

#### **Prerequisites & Notes**

Advanced Standing MSW student or permission.

Credits: 2

### **SWK 540 - Social Welfare Policy and Issues for Generalist Practitioners**

Analysis of the provision of social services and the interrelatedness of practice and policy analysis with emphasis on dimensions of choice in social welfare policy and major issues.

#### **Prerequisites & Notes**

MSW student or permission.

Credits: 3

### **SWK 550 - Human Behavior and The Social Environment I**

Examines research and theories related to normative life span development as influenced by age, gender, social class, social structures oppression and other environmental factors. Uses systems theory and person-in-environment construct as the analytical framework. Considers implications for social work practice and social welfare policy.

#### **Prerequisites & Notes**

MSW students or by permission.

Credits: 3

### **SWK 560 - Practice in Generalist Social Work I**

Develops knowledge, values and skills necessary for direct practice of generalist social work with small systems, including individuals, small groups and families. Covers social systems and problem solving framework.

#### **Prerequisites & Notes**

MSW student.

Credits: 3

### **SWK 563 - Practice in Generalist Social Work II**

Topics include theory and practice of purposive social change in social agencies and communities, participation of social workers in politics, and social worker roles as advocate, resource mobilizer, program planner and organizer. Integrates classroom and field experience.

#### **Prerequisites & Notes**

SWK 560, MSW student.

Credits: 3

### **SWK 571 - Trauma Theory and Treatment in Social Work Practice**

Explains current research and controversies in the areas of psychobiology of trauma, memory, dissociation, developmental impacts, diagnosis and treatment.

**Prerequisites & Notes**

MSW student or Permission

Credits: 3

**SWK 577 - Group Strategies in Health/Mental Health Settings**

Group strategies for social work practice in health and mental health settings including team-meetings, psychoeducational issues in health care, workshops, communities, organizations, counseling and psychotherapy.

**Prerequisites & Notes**

MSW student or Permission

Credits: 3

**SWK 580 - Adult and Child Psychopathology**

Overview of DSMIV, gender differences in mental illness, current conceptions of serious mental illness, impact of psychiatric labeling and stigma on individuals and families.

**Prerequisites & Notes**

MSW student or Permission

Credits: 3

**SWK 585 - History, Assessment and Interventions in Substance Use and Abuse**

This course will examine various aspects of substance use and abuse including historical perspectives of addiction and contemporary issues related to prevention, treatment, state and federal healthcare policy. The course will review major classifications of drugs of abuse and the physiological and psychological impact as they relate to assessment, treatment and course of condition. Contemporary theories and practice models will be reviewed and then applied to clinical scenarios with attention to social-cultural, gender, development and embodied diversity.

**Prerequisites & Notes**

MSW student or permission

Credits: 3 web-based

**SWK 586 - Advanced Clinical Social Work Practice in Integrated Healthcare**

The objective of the course is to introduce social work students to the direct practice of integrated behavioral health in primary care. Students will become knowledgeable of the roles of behavioral health providers working in primary care settings, theories and models of care, and cross cultural issues. They will develop skills in engagement, assessment, intervention planning and implementation, and practice evaluation. Because the population served in primary care settings span the spectrum of severity in both the physical and behavioral health dimensions, students will develop competencies in engaging and supporting patients across a range of health conditions.

**Prerequisites & Notes**

MSW 586 Advanced Clinical Social Work Practise in Integrated Healthcare

Credits: 3

## **SWK 595 - Field Practicum in Social Work**

Supervised generalist social work practice in community agencies provides opportunities to apply social work knowledge and skills toward planned intervention and change efforts.

### **Prerequisites & Notes**

MSW student.

Credits: 4

## **SWK 597 - Advanced Topics in Social Work**

Content varies to suit student needs. May be repeated for credit.

### **Prerequisites & Notes**

permission.

Credits: 1-3

## **SWK 600 - Advanced Integrative Professional Seminar**

Considers multi-disciplinary knowledge bases that inform advanced social work practice from a generalist perspective as well as the purposes of the profession, professional role, skill, policy applications and evaluation of practice.

### **Prerequisites & Notes**

SWK 661 and SWK 665.

Credits: 3

## **SWK 640 - Issues in Social Welfare Policy for Advanced Generalist Practitioners**

Social welfare policy analysis and evaluation with emphasis on skills in the use of government data, policy advocacy and analytic decision-making related to social welfare and advanced generalist social work practice.

### **Prerequisites & Notes**

SWK 540, SWK 563 or SWK 530 or permission.

Credits: 3

## **SWK 650 - Human Behavior and the Social Environment II**

Examines research and theories related to normative development of families, small groups and communities. Explores the impact of age, gender, social class, social structures, oppression and other environmental factors. Examines the social structures and context of organizations and institutions and their impact on individuals, families, small group and communities. Considers implications for social work practice and social welfare policy.

### **Prerequisites & Notes**

MSW student or permission.

Credits: 3

### **SWK 661 - Advanced Generalist Social Work Practice with Individuals**

Develops knowledge, skills and values necessary for advanced generalist social work practice with individuals, across the lifespan.

#### **Prerequisites & Notes**

SWK 563 or SWK 531.

Credits: 3

### **SWK 664 - Generalist Social Work Practice with Families and Small Groups**

Develops knowledge, skills and values necessary for advanced generalist social work practice with families and small groups.

#### **Prerequisites & Notes**

SWK 661 and SWK 665.

Credits: 3

### **SWK 665 - Advanced Generalist Social Work Practice with Organizations and Communities**

Develops knowledge, skills and values necessary for advanced generalist social work practice with organizations and communities.

#### **Prerequisites & Notes**

SWK 563 or SWK 531.

Credits: 3

### **SWK 691 - Advanced Social Work Research I**

Application of social work research to the evaluation of social work practice and program and policy-making.

Credits: 3

### **SWK 692 - Advanced Social Work Research II**

Application of social work research methods to social work research project.

#### **Prerequisites & Notes**

SWK 691.

Credits: 3

### **SWK 695 - Advanced Field Practicum in Social Work**



Advanced generalist social work practice in community agencies. Provides students the opportunity to apply advanced social work knowledge and skills directed toward planned intervention and change efforts.

**Prerequisites & Notes**

SWK 595 or SWK 531.

Credits: 1-5

## **Spanish**

### **SPA 515 - Seminar in Advanced Grammar**

An advanced presentation of Spanish grammar utilizing a linguistic approach rather than prescriptive grammatical rules.

Active, frequent participation by students is expected, leading to the level of ADVANCED SUPERIOR according to ADTFL guidelines.

**Prerequisites & Notes**

Permission of instructor.

Credits: 3

### **SPA 544 - Seminar in Translation**

Course is designed to develop student's ability to translate texts from Spanish into English. Attention will also be paid to the acquisition of practical and theoretical aspects of translation in general, through readings on translation, its history and current status as a profession. Texts to be translated will be cultural and literary, and develop sensitivity to the Spanish language and its diverse forms.

**Prerequisites & Notes**

Permission of instructor.

Credits: 3

### **SPA 597 - Projects in Spanish I**

Specific projects vary from semester to semester depending on the needs of the graduate student and the skills of the faculty member. May be repeated for credit.

Credits: 3

### **SPA 598 - Projects in Spanish II**

Specific projects vary from semester to semester depending on the needs of the graduate student and the skills of the faculty member. May be repeated for credit.

Credits: 3

## **Spatial Information Engineering**

## **COS 540 - Computer Networks**

Provides an introduction to the concepts, protocols, technologies and principles of computer networking. Utilizes the technologies and protocols of the Internet as the primary vehicle for studying the fundamental concepts of computer networking. Uses a "top-down" approach to the study of the Internet, beginning with the "application layer," with such technologies as the Web and HTTP, peer-to-peer applications, and electronic mail. It then examines the other four layers of the Internet protocol stack (the transport, network, link, and physical layers), and the services they provide that enable the development of increasingly sophisticated and powerful networking applications.

COS 440 and COS 540 may not both be taken for degree credit.

### **Prerequisites & Notes**

COS 235 or permission of instructor.

Credits: 3

## **SIE 501 - Introduction to Graduate Research**

Covers process of successful graduate research from identification of a researchable question, preparation of a thesis proposal, to completion of the research and its publication. Focus on engineering research methods for spatial information.

Credits: 1

## **SIE 502 - Research Methods**

Covers process of successful graduate research, including the written and verbal presentation of plans and results. Students formulate hypotheses, perform a literature search, write abstracts and introductions of research papers, learn about presentation styles and techniques, make two presentations (3-minutes and 10-minutes) about research proposals. Lec 1.

### **Prerequisites & Notes**

SIE 501 and students must have selected a thesis topic.

Credits: 1

## **SIE 504 - The Beauty and Joy of Computing**

This is an introductory course in computer science designed to prepare students with the skills and knowledge necessary to teach the first Advanced Placement (AP) course "Computer Science Principles", but will also be useful for students wishing to integrate computer science concepts into other academic disciplines. The course covers the AP Principles Framework and Computational Thinking Practices.

### **Prerequisites & Notes**

None

Credits: 3

## **SIE 505 - Formal Foundations for Information Science**

Increases student's understanding of the approach to information systems and science by formalisms. Draws on mathematics to increase familiarity with formal syntax and language, develops understanding and technical ability in handling structures relevant to information systems and science. Includes a review of fundamental material on set theory, functions and relations, graph theory, and logic; examines a variety of algebraic structures; discusses formal languages and the bases of computation.

**Prerequisites & Notes**

SIE 550 or instructor permission

Credits: 3

## **SIE 507 - Information Systems Programming**

Programming for those envisioning careers focused on developing and managing information systems and databases as opposed to software design. Data structures, algorithms, and their analysis. Lec. 3.

**Prerequisites & Notes**

Graduate standing or permission

Credits: 3

## **SIE 508 - Object Oriented Programming**

Addresses the integration of software components into large-scale software architecture. This course introduces advanced programming skills and focuses on programming and design using a high-level object oriented language with emphasis on Python or Java with some coverage of the other. The core concepts of object-oriented programming are examined and practical applications in the domain of data science and as seen in stacks, queues, lists, and trees are explored.

**Prerequisites & Notes**

SIE 507 or programming experience in Python, or permission of the instructor.

Credits: 3

## **SIE 509 - Principles of Geographic Information Systems**

Covers foundation principles of geographic information systems, including traditional representations of spatial data and techniques for analyzing spatial data in digital form. Combines an overview of general principles associated with implementation of geographic information systems and practical experience in the analysis of geographic information. Not open to those who have taken SIE 271.

**Prerequisites & Notes**

Graduate standing or instructor permission.

Credits: 3

## **SIE 510 - Geographic Information Systems Applications**

Introduces both conceptual and practical aspects of developing GIS applications. Covers application areas from natural resource planning through transportation, cadastral and land information systems and their spatial modeling requirements, and application development from requirement analysis to database design and implementation.

**Prerequisites & Notes**

SIE 509 or Instructor permission.

Credits: 3

**SIE 512 - Spatial Analysis**

Introduces students to techniques for spatial analysis. Covers methods and problems in spatial data sampling, issues in preliminary or exploratory analysis, problems in providing numerical summaries and characterizing spatial properties of map data and analysis techniques for univariate and multivariate data. Students will be responsible for completing several hands-on exercises.

**Prerequisites & Notes**

Introductory statistics course and graduate standing or instructor permission.

Credits: 3

**SIE 515 - Human Computer Interaction**

Students are introduced to the fundamental theories and concepts of human-computer interaction (HCI). Topics covered include: interface design and evaluation, usability and universal design, multimodal interfaces (touch, gesture, natural language), virtual reality, and spatial displays.

**Prerequisites & Notes**

Graduate standing or permission.

Credits: 3

**SIE 516 - Interactive Technologies for Solving Real-World Problems**

This course is designed to provide students with an overview of the basic principles of interactive design and immersive technology (virtual, augmented, mixed, and extended reality). The goal is to learn enough about the strengths and limitations of this technology, and the associated human factors, to design simple prototypes aimed at solving real-world problems.

**Prerequisites & Notes**

Programming experience and graduate standing or permission.

Credits: 3

**SIE 517 - Spatial Interaction Design**

The main objective of this course is to provide a hands-on experience of interaction design research practice focusing on interactive prototype construction. This project-based interdisciplinary course engages students with the fundamentals of interaction design and applied interaction design methods to shape behavior between people and products, services, and environments.

**Prerequisites & Notes**

None

Credits: 3

## **SIE 525 - Information Systems Law**

Current and emerging status of computer law in electronic environments: rights of privacy, freedom of information, confidentiality, work product protection, copyright, security, legal liability; impact of law on use of databases and spatial datasets; legal options for dealing with conflicts and adaptations of law over time.

### **Prerequisites & Notes**

Graduate standing or instructor permission.

Credits: 3

## **SIE 550 - Design of Information Systems**

Cognitive and theoretical foundation for representation of knowledge in information systems and fundamental concepts necessary to design and implement information systems. Logic programming as a tool for fast design and prototyping of data models. Formal languages and formal models, conceptual modeling techniques, methods for data abstraction, object-oriented modeling and database schema design. Relational data model and database query languages, including SQL.

### **Prerequisites & Notes**

Graduate standing or instructor permission.

Credits: 3

## **SIE 554 - Spatial Reasoning**

Qualitative representations of geographic space. Formalisms for topological, directional and metric relations; inference mechanisms to derive composition tables; geometric representations of natural language-like spatial predicates; formalizations of advanced cognitively motivated spatial concepts, such as image schemata; construction and analysis of relation algebras.

### **Prerequisites & Notes**

Graduate standing.

Credits: 3

## **SIE 555 - Spatial Database Systems**

Covers internal system aspects of spatial database systems. Layered database architecture. Physical data independence. Spatial data models. Storage hierarchy. File organization. Spatial index structures. Spatial query processing and optimization. Transaction management and crash recovery. Commercial spatial database systems.

### **Prerequisites & Notes**

Programming experience and graduate standing or instructor permission.

Credits: 3

## **SIE 557 - Database System Applications**

Study, design and implementation of object-relational database system applications. Introduction to database systems. Integrating database systems with programs. Web applications using database systems. Final database

project.

**Prerequisites & Notes**

Graduate standing or Instructor permission.

Credits: 3

**SIE 558 - Real-time Sensor Data Streams**

This course is an introduction into the technology of sensor data stream management. This data management technology is driven by computing through sensors and other smart devices that are embedded in the environment and attached to the Internet, constantly streaming sensed information. With streams everywhere, Data Stream Engines (DSE) have emerged aiming to provide generic software technology similar to that of database systems for analyzing streaming data with simple queries in real-time. Sensor streams are ultimately stored in databases and analyzed using scalable cloud technologies.

**Prerequisites & Notes**

Programming experience in Java, C++ or C or permission of the instructor.

Credits: 3

**SIE 559 - Geosensor Networks**

Readily available technology of ubiquitous wireless communication networks, the miniaturization of computing and storage platforms as well as the development of novel microsenors and sensor materials has lead to the technology of wireless geosensor networks (GSN). Geosensor networks have changed the type of dynamic environmental phenomena that can be detected, monitored and reacted to, often in real-time. In this course, we will survey the field of wireless geosensor networks, and explore the state of the art in technology and algorithms to achieve energy-efficient, robust and decentralized spatial computing.

**Prerequisites & Notes**

Programming experience in Java or C++, or instructor permission.

Credits: 3

**SIE 580 - Ontology Engineering Theory and Practice**

Ontologies are explicit specifications of information models and their semantics in formats that are interpretable by humans and computers. This course introduces the philosophical and logical foundations of ontologies and surveys formalisms, modern languages and methods for designing, analyzing and using ontologies. The stages of ontology development from conceptual design to ontology evaluation and verification are studied and practiced using concrete domains.

**Prerequisites & Notes**

SIE 505 or instructor permission.

Credits: 3

**SIE 589 - Graduate Project**

Directed study on a particular spatial information science topic and implementation of a related project.

**Prerequisites & Notes**

SIE Master Project Students.

Credits: 3

**SIE 590 - Information Systems Internship**

Utilization of knowledge gained from a School of Computing and Information Science graduate program within a business, non-profit or government organization and acquisition of practical training.

**Prerequisites & Notes**

Successful completion of nine credits of required courses in a graduate program in SCIS.  
May be repeated for credit.

Credits: 3

**SIE 598 - Selected Studies in Spatial Information Engineering**

Topics in any subfield of spatial information science and engineering. Content varies to suit current needs. May be repeated for credit.

Credits: 1-3

**SIE 693 - Graduate Seminar**

Presentations and discussions on term projects, literature reviews, current events, or thesis topics. Lec 1.

Credits: 1

**SIE 694 - Doctoral Seminar**

Advances the dissertation work of SIE doctoral students and PhD candidates. Students will work as peers to review each other's progress with dissertation writing. Advancements over the last 12 months will be presented as poster and in a seminar talk, in order to maintain the momentum on making progress with the dissertation writing.

**Prerequisites & Notes**

SIE 501, SIE 502, and SIE 693

Credits: 1

**SIE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

**Prerequisites & Notes**

Department Consent.

Credits: Ar

# **Special Education-Early Intervention**

## **SED 505 - Infant and Toddler Development**

Focuses on understanding development from infancy through childhood, including patterns for children who are at-risk or have disabling conditions. The impact of developmental challenges on the infant's and child's emerging capacities for engagement in relationships and learning is explored. The importance of the interaction of social, cultural, and interpersonal factors are stressed throughout. A major goal of the course is for students to gain a working knowledge of developmental processes that can be applied to assessment, curriculum development, and intervention planning and implementation.

### **Prerequisites & Notes**

Graduate Standing

Credits: 3

## **SED 506 - Assessment and Program Planning in Early Childhood Intervention**

Examines issues in measurement and test development, child find and screening, eligibility and programmatic assessment, alternative assessment, and team-based assessment of children with disabilities under the age of 5, as well as collaboration with families. Includes a 30 hour practicum.

### **Prerequisites & Notes**

SED 505

Credits: 3

## **SED 511 - Planning Inclusive Early Childhood Programs and Environments**

Design and evaluation of environments, curriculum development, activity planning, individualized instruction, and adaptations to meet the needs of infants and young children with special needs within inclusive early care and education settings. Also focuses on supporting social and emotional development and play.

### **Prerequisites & Notes**

SED 505 or permission of the instructor.

Credits: 3

## **SED 513 - Early Childhood Intervention/Special Education Individualized Practicum**

Focuses on planning, implementing and evaluating developmentally appropriate curricula and interventions for inclusive early care and education programs. Emphasis on the design and adaptation of environments, materials, and activities to promote full participation by infants and young children with developmental delays and disabilities.

### **Prerequisites & Notes**

SED student, or permission

Credits: 1-6

## **SED 514 - Administration and Public Policy for Early Childhood Programs**



Focuses on program administration and promotion of public policy and community outreach for diverse early childhood programs, including inclusive programs serving young children with disabilities. topics include program evaluation and accreditation, leadership, management approaches, managing personnel, finance and budgeting, strategic planning, program evaluation, service delivery systems and models, public policy and advocacy.

**Prerequisites & Notes**

SED 505 or permission of the instructor.

Credits: 3

## **SED 516 - Seminar and Practicum in Collaborative Consultation**

Examine methods of collaboration, consultation, technical assistance, teaming, and developing partnerships within inclusive environments for young children with disabilities. Students practice collaborative and consultative relationships with families, staff of early care and education programs, and related service professionals within the practicum setting.

**Prerequisites & Notes**

SED 505 or permission of the instructor.

Credits: 3

## **SED 517 - Serving Infants and Toddlers in Natural Environments**

Methods for providing early intervention services to infants and toddlers with disabilities or who are at risk for developmental problems and their families. The importance of service provision in a variety of natural environments for infants and toddlers, as well as family-centered and culturally-sensitive practices and team collaboration are emphasized. Students will observe and participate in home-based settings and inclusive community early care and education settings.

**Prerequisites & Notes**

SED 505 or permission of the instructor.

Credits: 3

## **SED 521 - Center-based Practicum and Seminar in Early Childhood Intervention**

Focuses on the application of methods for providing early intervention services to infants and toddlers with disabilities or who are at-risk for developmental problems and their families in center-based settings including inclusive community early care and education settings. An important emphasis of the field experience is the design and adaptation of curricular goals and objectives, instructional strategies, environments, materials, and activities to promote active learning and full participation by infants and young children with development delays and disabilities in inclusive early care and education settings.

**Prerequisites & Notes**

SED 505 and SED 511 or permission of the instructor.

Credits: 3

## **SED 529 - Language Development and Literacy for Diverse Young Learners**

Focuses on early language and early literacy theory and strategies for teaching and facilitating these skills and behaviors in all young children birth to age five. The course also will focus on language intervention techniques, augmentative and alternative communication (AAC), and methods for working with English Language Learners. The course uses learning principles and concepts of brain development, family involvement, and the application of assessment to intervention/instruction.

**Prerequisites & Notes**

None

Credits: 3

**SED 546 - Intervention for Writing Difficulties**

Explores strategies for adapting writing expression instruction (for example, grammar, syntax, prewriting, content generation, revision) for students with written expression difficulties. Topics include theoretical explanations of writing difficulties, multi-tiered systems of support, research-based approaches to intervention, and procedures for evaluation. Addresses the needs of students with high- and low-incidence disabilities as well as other students at-risk for writing difficulties. This course requires access to a student with a disability to complete the course project.

**Prerequisites & Notes**

Graduate standing or permission of the instructor

Credits: 3

**SED 566 - Executive Function in Learning**

Executive function development may be delayed in students with learning difficulties and developmental disabilities. Supporting development of goal setting, organization, cognitive flexibility, working memory, and self monitoring are key in advancing the skills of all students. Clear links between executive function development and academic performance are seen in reading, writing, and math, as well as study skills. This course will look at theory and application support.

**Prerequisites & Notes**

None.

Credits: 3

**SED 587 - Collaborations and Transitions for Special Educators**

This course addresses lifespan issues for persons with disabilities, stressing curriculum content and instructional strategies that promote interdisciplinary career development and transition education at all age levels, but with an emphasis on post school outcomes that lead to independence and a high quality of life.

**Prerequisites & Notes**

Graduate standing

Credits: 3

**SED 655 - Graduate Project in Early Childhood Intervention**

Students identify a significant problem or issue in the field of early intervention and use a collaborative approach of inquiry to address the issue. The project requires the student to demonstrate competencies in action research, reflective practice, collaboration, leadership, and systems change at the micro or macro level.

**Prerequisites & Notes**

Permission of the instructor.

Credits: 3

## **SEI 525 - Center-Based Practicum and Seminar in Early Intervention**

Focuses on the application of methods for providing early intervention services to infants and toddlers with disabilities or who are at-risk for developmental problems and their families in center-based settings, including inclusive community early care and education settings. An important emphasis of the field experience is the design and adaptation of curricular goals and objectives, instructional strategies, environments, materials, and activities to promote active learning and full participation by infants and young children with development delays and disabilities in inclusive early care and education settings.

**Prerequisites & Notes**

SED 505 AND SED 511 or permission of the instructor.

Credits: 3

## **Surveying Engineering Technology**

### **SVT 501 - Advanced Adjustment Computations**

Direct formation of reduced form of normal equations; Cholesky decomposition and back substitution; using Cholesky algorithms for computing select variance-covariance terms; optimization of solutions via banded and column profile minimization; recursive matrix partitioning; use of conjugate gradient procedures in solution efficiency; post-adjustment variance-covariance propagation for computed terms.

Credits: 3

### **SVT 511 - Geodetic U.S. Public Land Survey Computations**

Review of townships, sections, closing corners, parenthetical distance and acreage; section subdivision, fractional rules; major changes in the 2009 Manual; the USPLS datum; Mean bearing in geodesy; geodetic coordinate geometry; geodetic computations of single and double proportioning; geodetic one, two, and three point control; geodetic compass rule adjustment, grant boundary adjustment, irregular boundary adjustment, and meander line computations; Geographic coordinate data base issues is an updatable system; mega-adjustments and error propagation.

**Prerequisites & Notes**

Permission.

Credits: 3

### **SVT 512 - Advanced Survey Law**

This course will cover applicable law related to surveying from the location of property boundaries to the operation of a surveying business.

**Prerequisites & Notes**

None

Credits: 3

## **SVT 531 - Advanced Digital Photogrammetry**

Airborne GPS-IMU processing techniques; conversion between local cartesian and conventional mapping coordinate systems; techniques in automated pixel matching; digital cameras and their calibration; optimization of automated photocoordinate measurement for aerotriangulation; recursive partitioning techniques for aerotriangulation solution optimization; techniques for automated feature extraction; synthesis of digital imagery and Lidar; image enhancements issues in orthophotos and mosaics; multi-ray considerations.

**Prerequisites & Notes**

Prior coursework in photogrammetry/remote sensing.

Credits: 3

## **SVT 532 - Survey Strategies in Use of Lidar**

Types of Lidar sensors and their applications; integration of GPS-IMU with Lidar; calibration; elimination of non-ground data; break line extraction; ground based mobile Lidar; Integration of survey control into Lidar data sets; accuracy assessment of overlapping scanned data; the industry standard .las format; integration with other survey information; Lidargrammetry; classifying Lidar data by return number and layer; procedures for geodetic accuracy assessment; corridor mapping.

Credits: 3

## **SVT 541 - Geodesy**

Types of coordinate systems and mathematical models; defining datums; defining transformation parameters between datums; Building of gravity models; Modeling continental drift; Conventional celestial and terrestrial references frames, precession, nutation, and polar motion; spherical trigonometry and spherical harmonic expansions; Geodesic line, geodesic curvature, differential equations of the geodesic, direct and inverse solutions; Conformal mapping of the ellipsoidal surface.

Credits: 3

## **SVT 542 - Applied Hydrographic Surveying**

The use of applied hydrographic surveying techniques with a focus on single-beam echo sounders for underwater mapping projects. Discussions will include lectures on Parameters of Sound, Speed of Sound, Transducers, Single-Beam Echo Sounders, Planning Single-Beam Surveys, Object Detection, Multi-Beam Echo Sounders, Vessel Movement, Vessel Geometry, Other Methods of Determining Depths, and Doodson Filter. The basics of Hypack software will be taught and used during the course.

**Prerequisites & Notes**

Permission of instructor.

Academic or professional experience in computer aided design, projection systems and datums, and GPS/GNSS/ geodesy.

Credits: 3

## **Theatre**

### **THE 667 - Special Studies in Theatre I**

Seminar with research orientation, designed to explore selected topics in depth. Topics will vary.

#### **Prerequisites & Notes**

permission.

Credits: 3

### **THE 669 - Theatre Laboratory**

Advanced laboratory work in directing or design. May be repeated for credit, if work performed is in a different area of study.

#### **Prerequisites & Notes**

THE 466 depending on the nature of the project.

Credits: 3

### **THE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

#### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School (<https://umaine.edu/graduate/students/rcr/>) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Wildlife Ecology**

### **WLE 591 - Movements and Migrations**

Considers the evolution, physiology, ecology and behavior of animal movements and migrations across diverse taxa. Topics include characterization of movements, bioenergetics, navigation, research methods, seasonality and circadian and circannual rhythms. Also considers management implications for culturally and economically important species.

#### **Prerequisites & Notes**

One of the following ecology courses (BIO 319, WLE 200, SMS 306) or permission of instructor.

Credits: 3

## **WLE 650 - Graduate Seminar in Wildlife Science**

Varies.

**Prerequisites & Notes**  
permission.

Credits: Ar

## **WLE 697 - Special Problems in Wildlife Ecology**

Varies.

Credits: Ar

## **WLE 699 - Graduate Thesis/Research**

Graduate thesis or research conducted under the supervision of student's advisor.

### **Prerequisites & Notes**

Students who have not yet completed a "Responsible Conduct of Research" course approved by the Office of Research and Sponsored Programs and the Graduate School ([www.umaine.edu/graduate/responsible-conduct-research](http://www.umaine.edu/graduate/responsible-conduct-research)) must receive permission to enroll in thesis/ research credits. Students must enroll in an RCR course before or concurrent with their third credit of thesis/research.

Credits: Ar

## **Women's, Gender, and Sexuality Studies**

### **WGS 501 - Graduate Topics in Women's, Gender and Sexuality Studies**

A graduate-level interdisciplinary study of topics such as "Women's Health," "Hegemonic Masculinity", or "Multicultural Issues in Women's, Gender, and Sexuality Studies".

Credits: 3

### **WGS 510 - Advanced Studies in Feminist and Queer Theory**

An advanced introduction to major issues in contemporary feminist and queer theory.

Credits: 3

### **WGS 580 - Feminist Pedagogy and Women's, Gender and Sexuality Studies Practicum**

A history of Women's, Gender, and Sexuality Studies as an interdisciplinary, a survey of feminist teaching strategies, and an examination of the philosophies of education on which those strategies are based. A practicum applying the course material in a Women's, Gender, and Sexuality Studies class, a departmental course, or possibly in a K-12 school or other workplace setting will be included.

#### Prerequisites & Notes

Permission.

Credits: 3

### WGS 698 - Individualized Projects in Women's, Gender, and Sexuality Studies

Individualized study, action projects, internships, and writing projects, available especially for non-thesis students. Conducted under the guidance of a member of the WGS Studies graduate faculty.

#### Prerequisites & Notes

WGS 510 or WGS 520; permission of the office.

Credits: 1-3

## Digital Curation

### DIG 580 - Digital Curation Internship

Digital Curation Internships provide valuable experiential learning in an emerging and changing field that provides complex challenges. An internship experience is essential to the certificate program, providing students with current and vital knowledge and skills they will need in the workplace. Internships provide students opportunities to reinforce their academic learning, and provide opportunities to establish professional contacts. Because our digital curation curriculum is online, and because our students will be located in many different places, we offer two types of internships: place-based and virtual.

#### Prerequisites & Notes

Permission.

Credits: 1-3

## Graduate Education

### The University

Founded in 1865, the University of Maine is the land-grant, sea-grant, and space-grant university of the State of Maine. The University of Maine received the R1 Carnegie Classification for very high research activity in 2022. Located on a 660-acre campus adjoining the town of Orono, it is nine miles from Bangor, Maine's third-largest city.

The flagship campus in the University of Maine System, the Orono campus is dynamic and cultural. Enjoying a classic New England setting, the campus offers easy access to both Maine's urban and rural areas. **Last year over 500 students from 70 foreign countries and most American states studied at UMaine; more than 35% of the total enrollment regularly is admitted from other states and nations.** Culturally, the University of Maine should appeal to every taste. Guest speakers provide insight into current political, social, and scientific thought. Special programs in the arts abound, including theatre productions, musical offerings, and art exhibits. Intercollegiate athletic events occur throughout the academic year.

The full-time faculty numbers over 600. There are nearly 12,000 students enrolled at The University of Maine. The graduate student population exceeds 2,200.

Graduate study at the University of Maine is focused on academic departments within the following colleges: Business; Education and Human Development; Engineering; Liberal Arts and Sciences; and Natural Sciences, Forestry, and Agriculture.

### **Mission**

The mission of the Graduate School of the University of Maine is to produce engaged scholars and professionals by promoting excellence in all aspects of the graduate student experience. The school provides advanced education and professional training through innovative teaching, mentorship, research, and creative activity in established and emerging areas. This rigorous education prepares students to contribute meaningfully to the advancement of the state of Maine, the nation and the global community.

### **Graduate Study and Graduate Life**

Graduate work has been available at the University of Maine for many years. The first master's degree was conferred in 1881; the first doctoral degree in 1960. Since 1923, graduate work has been a separate division of the University. Today the master's degree is offered in over 85 areas of study and the doctorate in 35 areas.

In addition to coordinating graduate admissions in conjunction with individual graduate programs, the Graduate School has primary responsibility for administering the policies and procedures relating to graduate study. Graduate School policy is made by the Graduate Faculty, acting through its representative body, the Graduate Board.

University of Maine graduate courses are offered on other campuses/centers and via distance education on a program-by-program basis, including the Master of Social Work (MSW) degree; the Master of Business Administration (MBA); the PhD programs in Biomedical Science and in Biomedical Engineering. The College of Education and Human Development offers a Master of Education and an Educational Specialist degree both online and in cohort-based programs.

### **Graduate School Office:**

The Graduate School's staff located on the ground level of Stodder Hall is available to assist graduate students in both academic and personal matters. The staff offers advice concerning admission, registration, degree requirements, thesis format, procedures for changing programs, and the availability of fellowships and scholarships as well as housing information. Students are encouraged to contact this office concerning any matters for which additional information is needed. [umaine.edu/graduate](https://umaine.edu/graduate)

Stodder Hall also houses the office of the Graduate Student Government and a residence hall for single graduate students and graduate student couples (<https://umaine.edu/graduate/housing/>).

**Online Education:** The Division of Lifelong Learning, in partnership with the Graduate School and the academic colleges, offers nearly 50 online and blended graduate degrees and certificate programs. Online programs are delivered by the same expert faculty and respected field professionals teaching on campus. Dedicated online student support services are available. For a full list of UMaineOnline offerings see [online.umaine.edu](https://online.umaine.edu). Non-Maine resident graduate students enrolled in University of Maine online programs are eligible for a discounted e-tuition rate.

### **Auxiliary Services**

Auxiliary Services provides on-campus housing for graduate students in Stodder Hall, and graduate students with families at University Park. Auxiliary Services also operates UMaine Dining, providing dining services for the entire campus community.



**Housing:** Stodder Hall is a coed facility that offers continuous housing throughout the academic year. The majority of the rooms are single occupancy with a limited number of double rooms. The room and board license covers the academic year. Graduate students may also apply for summer housing. Stodder Hall is smoke-free.

**Eligibility for Housing:**

- Graduate students must be matriculated and enrolled in University of Maine course work. Verification of graduate status will be made by the Graduate School.
- If in compliance with all other requirements, graduate students may remain in the residence hall for up to five continuous years.

Graduate students with families (spouse or partner, and/or children) may apply to live at University Park Family Housing. For more information and an application please call (207) 581-4854 or e-mail: [jkosnow@maine.edu](mailto:jkosnow@maine.edu) or visit our web site at: <http://umaine.edu/housing/family-housing/>.

**UMaine Dining Meal Plan Information:** UMaine Dining is pleased to offer our student customers various options to purchase meals that are designed to provide value, flexibility, and convenient spending; along with a variety of professional restaurant facilities, right here on campus! Our friendly staff is dedicated in providing a wide selection of healthy and fresh dining options whether it is a familiar home favorite to gourmet and international cuisine.

A meal plan is required for all on-campus residents (with the exception of the apartment-style housing at DTAV and Patch). Graduate residents and commuter students have a variety of meal plan options. Find out more about on-campus dining at [www.umaine.edu/dining](http://www.umaine.edu/dining).

**Contact Information:**

Housing Services, 5734 Hilltop, Suite 103, Orono, ME 04469-5734. E-mail: [um.housing@maine.edu](mailto:um.housing@maine.edu)  
UMaine Dining, 5734 Hilltop, Suite 101, Orono, ME 04469-5734. Email: [um.dining@maine.edu](mailto:um.dining@maine.edu)

**Services for Commuter and Non-Traditional Students.** Commuter and Non-Traditional Student Programs (CNTSP) advocates for and responds to the needs of the University's commuter students (any student who does not live in University housing) and non-traditional students. (generally 24 or older, assuming responsibilities in addition to studies, such as parent, spouse or partner, family caretaker, or employee, back in school after several years of employment, homemaking, or other activity and /or are veterans of the armed services.)

CNTSP provides students with information about programs and services, as well as personal and academic support and referrals. Knowledgeable staff are available in the Commuter Lounge in the Wade Center on the ground floor of Memorial Union, 8AM to 9PM Mon-Fri. Services provided include off-campus housing information, microwave, refrigerator, free coffee and lockers rentals. Programming includes a monthly event on the first Friday of every month, numerous workshops revolving around technology, academics, and finances, a monthly meeting for students who are also parents, family friendly events, and a family friendly/lactation space. For additional information, contact CNTSP by phone at (207) 581-1420 or [UM.CNTSP@maine.edu](mailto:UM.CNTSP@maine.edu) Visit the CNTSP web page at <http://www.umaine.edu/cntsp/>

**Veterans Education and Transition Services (V.E.T.S.)** provides advocacy, support, resources and programs that serve the needs of the UMaine veteran population. These services include VA certification for both student veterans and veterans' dependents who are accessing VA educational benefits. The VETS office offers, Veterans Week, Student-Veteran Orientation, M-Project Guides (peer mentors for new student- veterans), Student-Veterans Awareness Panels and a Veterans Lounge. V.E.T.S. is located at 161 Memorial Union. <http://www.umaine.edu/veterans>

**Safety Management (SM)** empowers UMaine's mission of advancing learning and discovery through excellence, innovation, research and public service by providing occupational safety training, audit, guidance, and consultation services to the campus.

SM programs are drafted to foster a safe and healthful campus and research environment, to encourage fulfillment of Board of Trustees policies, as well as, Federal and State regulatory requirements, by being flexible, building trust and empowering the shared campus communities. SM also supports all University of Maine System campuses as part of its role in the University of Maine System's Department of General Services. This role was developed as part of the Mission Excellence initiative to help focus scarce public higher education resources and ensure our systems, structures, processes, and employees are efficient and effective.

**Annual Basic Safety Training and Annual Department Safety Training** is required for all regular, part time, temporary and student employees. Classes are offered monthly, and training is available online through UMS Academy 24/7 and through individual departments for site-specific details.

Log into the UMaine Portal (Intranet) <https://my.umaine.edu/> to access UMS Academy by clicking the icon containing blue apple set on a book inscribed with an outline of the State of Maine. Basic Safety should be listed on your course list. Other training courses of use may also be found in UMS Academy. More information may be found at <https://mycampus.maine.edu/group/mycampus/sm-training>.

Refresher training must be completed on an annual basis. Additional annual department-specific training is conducted and required within each department, laboratory, or operational unit. Specific information may be obtained from the laboratory manager, Principal Investigator, or your supervisor. Other occupational safety training may also be required based on the functions of the work assigned. If you have any occupational safety concerns, training needs, or additional support needs, please contact SM for assistance at 581-4055.

**Cutler Health Center** (<https://umaine.edu/auxservices/cutler/>)

To meet the needs of the students at the University of Maine, Cutler Health Center offers comprehensive healthcare to the University campus community. Clinical services at Cutler Health Center are provided by Northern Light Eastern Maine Medical Center. Services offered include but are not limited to: general medical care including the treatment of acute medical problems or injuries, chronic illness, immunizations, women's health issues, contraception, sexual health, smoking cessation and skin cancer screenings. Northern Light/Cutler Health Center also provides students with an on-site laboratory, physical therapy, and x-ray.

The clinical staff includes physicians, nurse practitioners, physician assistants, nurses, an athletic trainer, and a physical therapist.

All graduate students including teaching and research assistants are welcome to use the health center for medical care. We also provide services to University of Maine employees and their dependents. Northern Light/Cutler Health Center is a primary care provider with physicians available to take care of your primary care needs. Review Northern Light Cutler Health Center's website for a biography of providers to assist with your primary care provider selection. Please be sure to make contact with your insurance company if you choose to change your primary care provider (PCP) to one of the Northern Light Cutler Health Center's providers.

**Appointments:** We offer appointment-based care Monday - Friday, from 8:00 am to 5:00 pm. Students should arrive at the health center at least 10 to 15 minutes prior to their scheduled appointment to allow adequate time for the check-in process to be completed. A limited number of same-day appointments are held and assigned based on the order you arrive at the facility with an acute injury or illness. An appointment can be requested by calling 207-581-4000.

**myNothernLightHealth:** *myNothernLightHealth* is a secure, convenient, no cost way for you to manage health and wellness information for you and your family. With *myNothernLightHealth* you have a secure, easy to navigate place to request appointments or prescription refills, review test results, communicate with your healthcare team, and more. *myNothernLightHealth* provides you with a stronger voice in your own health. Your healthcare provider will invite

you to join *myNorthernLightHealth*. After you register you will receive an email asking you to confirm the registration and create a secure, individualized, personal login. After that is completed, you can exchange health-related messages in this secure setting with your healthcare team.

**Appointment Cancellation Policy:** (Notify Us in Advance). Students who make an appointment and cannot keep the allotted appointment time have the responsibility to call the Cutler Health Center appointment line at 207-581-4000 or send a secure message via *myNorthernLightHealth* to cancel or reschedule their appointment in advance, 24 hours prior to the scheduled appointment time.

**Radiology and Laboratory Services:** All radiology and laboratory services require an order from a physician. Orders must provide the diagnosis and specify the phone number and office address of the physician ordering the tests. Laboratory services are available for all Northern Light Cutler Health Center's primary care patients as well as students.

**Women's Health Services:** Women's Health Services include annual exams, emergency contraception counseling, screening and treatment for sexually transmitted diseases and infections, pregnancy testing, pregnancy options counseling and referral, breast exams and self-breast exam education, birth control provisions, as well as assessment and treatment of urinary tract infections. For consultation, follow-up, and referral for a variety of women's concerns including PMS, menopause, colposcopy, biopsy for abnormal pap evaluation call 207-581-4000.

**Emergency Services:** In an EMERGENCY please dial 911 from any phone. The University of Maine operates a state licensed volunteer ambulance service U.V.A.C. (University Volunteer Ambulance Corps). This ambulance service responds to all campus locations and operates mutually with surrounding community emergency services.

**Non- Emergency Transportation Support:** If it is determined you need to go to a hospital or local clinic but it is not an emergency, Cutler Health Center provides "No Charge " taxi transport to and from the local hospital, urgent care center, medical specialist referrals and pharmacies; 7 days a week/24 hours a day (see After Hours Services). Contact 581-4000 for more information in regards to coordinating the taxi service.

**After Hours Service:** A health care provider is available 24 hours a day 7 days a week. Coverage varies for each break so please check the website for details. The medical answering service is available to coordinate taxi transportation to and from the local hospital, urgent care center, specialist referrals and pharmacies 7 days a week/24 hours a day. Calling 207-581-4000 when the Health Center is closed activates the service. There is no charge for the taxi service. The costs of all hospital, emergency room, medication, radiology, laboratory, non-health-center physician, and/or other services are the responsibility of the student.

**Counseling Center.** The Counseling Center staff consists of Licensed Psychologists, Licensed Clinical Social Workers and Doctoral Level Psychology Interns that provide free and confidential services to graduate students enrolled in 1 or more credits. Services are typically short term individual counseling and group counseling and workshops. The Counseling Center website at [www.umaine.edu/counseling](http://www.umaine.edu/counseling) offers many additional resources and links to other services. Due to the impact and/or aftermath of the Pandemic the method for delivering service may be subject to change. Please visit our website for up to date information about services, hours and procedures for making an appointment: [www.umaine.edu/counseling](http://www.umaine.edu/counseling). You may also call 207 581-1392, to obtain information or leave a message.

If you experience an emergency and are unable to reach the Counseling Center at 207 581-1392, you may contact UMaine Police at 207 581-4040, Maine Crisis Services at 1 888 568-1112 or go to the nearest Emergency Department.

**Career Center.** The Career Center assists graduate students in planning for professional careers. Services available include individual career counseling, career information for exploring options, assistance in identifying potential employers, resume/vitae development and critiques, job search strategy sessions, mock interviews and interview coaching, job listings, employer information, and information on preparing for an academic job search. Students may access job listings via CareerLink on the Career Center website which gives students immediate access to job listings

nationwide. Career counselors who specialize in the health and legal professions are available to meet with students considering professional school in the health professions or law school. There is no charge to students for these services. The Career Center is located on the third floor of the Memorial Union and is open Monday-Friday, 8:00 a.m.-4:30 p.m. For further information, call 581-1359 or access our website: [www.umaine.edu/career](http://www.umaine.edu/career)

**Peace Corps Recruiting.** The University hosts a Peace Corps recruiter on a regular basis who conducts interviews, provides informational sessions, and is available for class presentations. Contact information for the New England Peace Corps recruiter may be obtained by calling the Career Center in the Memorial Union at 581-1359. The Peace Corps offers graduating students the opportunity to make a difference in another part of the world while gaining valuable personal and professional experience. Volunteers are needed for a wide variety of fields, including ESL, education, forestry, environmental education, parks & wildlife, and small business development.

**Office of International Programs.** The Office of International Programs (OIP) has primary responsibility for coordinating and promoting UMaine international initiatives, exchanges, and programs. The OIP fosters and supports international education on campus and strives to advance international understanding and global awareness.

The Office of International Programs is responsible for admission of undergraduate international students; establishing and coordinating successful university linkages, exchanges, and study abroad programs for students and faculty; immigration processing and advising; the University's exchange visitor program; and, international student orientation and support services. With academic departments, the OIP promotes internationalization of the curriculum and sponsors activities, seminars, and programs to promote international awareness both on campus and in the community. Services to foreign nationals include immigration, cultural and academic advising, and various social activities including a weekly coffee hour. There is an active International Student Association. Every fall OIP offers Culturefest, a celebration of cultures through exhibits, arts and food, and an International Dance Festival in the spring. The office also provides support to faculty and researchers.

The University of Maine's Study Abroad Program is located in the Office of International Programs and there are opportunities for graduate students to participate in an international experience.

For additional information call 581-3437, visit OIP at 300 Stodder Hall, e-mail [international@maine.edu](mailto:international@maine.edu), or visit [www.umaine.edu/international](http://www.umaine.edu/international).

**Intensive English Institute (IEI)** prepares international students and non-native speakers of English for university study or for professional activities where English is the medium of communication. Intensive English core language classes are offered in the Fall, Spring and Summer semesters. Custom short programs are also available. In addition to a full-time course of study, the IEI offers academic advising, cross-cultural counseling, tutorials and self-study opportunities in a variety of content and skill areas. Students may also participate in the Conversation Partners Program.

Full-time study consists of eighteen hours per week of class time. Students are charged a tuition fee for each IEI course. Conditionally admitted students may take a combination of language study courses and degree courses. For more information please contact the IEI by telephone: (207) 581-3821, e-mail: [um.iei@maine.edu](mailto:um.iei@maine.edu), or the website: [www.umaine.edu/iei/](http://www.umaine.edu/iei/).

The mission of **Student Accessibility Services (SAS)** is to work with students and campus partners to create an inclusive university experience for students with disabilities. We equip students with accommodations, remove barriers to educational access, and connect students with campus resources. Students with documented physical, mental health, learning and other disabilities may request accommodations by contacting SAS and providing documentation of their

disability. SAS provides testing accommodations, alternative format textbooks, note takers, classroom relocation, other auxiliary aids, as well as housing accommodations. For further information please contact Student Accessibility Services via phone at 207.581.2319 or visit our website at [www.umaine.edu/studentaccessibility](http://www.umaine.edu/studentaccessibility).

**Graduate Student Government.** The Graduate Student Government (GSG) continues to nurture a long tradition of graduate students who join together in research, mutual academic concerns, and educational and social activities. The GSG is the delegated governing unit for the graduate student body as pronounced by the University of Maine and the Board of Trustees (BOT). It is administered by an Executive Committee of Officers elected each year. The GSG maintains a healthy, professional and working relationship with the University Administration in order to best serve the graduate student community and the University as a whole. The Graduate Student Government is composed of Senators from various graduate departments and programs within the colleges of the University of Maine. Dependent upon the particular department, program, and the number of graduate students enrolled, each graduate department or program is encouraged to send at least one (1) graduate student to be a voting member of the GSG. It is the mission of the GSG to support both the academic and non-academic activities of the graduate student body. Keeping with its mission, GSG will continue to perform the following duties: act as a liaison between the University of Maine's Administration, faculty, staff and graduate students; encourage graduate students' involvement in GSG activities and University functions; facilitate and encourage educational, professional and research activities of graduate students; disseminate information regarding graduate activities to graduate students, Administration, faculty, staff and the campus community as a whole; represent graduate student interests to the University community, the state of Maine, and national organizations. The GSG meets every other week to discuss and vote on matters of policy, procedure and budget. These meetings are open to all graduate students. They are invited to not only attend these meetings, but also become more involved on campus and in the community! There are several committees within the GSG that bring together Senators to focus on a specific topic, including, but not limited to health insurance, services, and finance. The GSG has the ability to make a difference in all aspects and levels of the University of Maine, such as influencing University policy decisions, serving on University committees and sponsoring special services to graduate students.

- **Funding for Graduate Students:** The primary responsibility of the Graduate Student Government is directed toward the academic concerns of graduate students. This includes grants reviews and awards processes each semester. This year, approximately \$82,000 was awarded to graduate students for research, travel, conferences and other degree-related expenses. The GSG is able to provide funding for numerous graduate students and plan various social and educational events in most part due to the Graduate Student Activity Fee.
- **Graduate Student Spring Appreciation Event:** The Graduate Student Government was instrumental in initiating the Spring Appreciation event, which has become an annual event and an integral part of presenting awards at the University of Maine.
- **Student Symposium: Research & Creative Activity:** Each spring, the Graduate Student Government co-sponsors the Student Symposium to showcase the best of graduate and undergraduate students' research efforts and innovation.
- **Clubs and Organizations:** The Graduate Student Government also sponsors over 25 clubs and organizations that benefit the graduate student body. If there's a club or an organization not listed, but that you would like sponsored by the GSG, then think about starting up your own! It's fun and easy!
- **Health Insurance:** We advocate for better health insurance options and coverage for all graduate students, including graduate assistants (GAs), research assistants (RAs), teaching assistants (TAs), and graduate students who are not on assistantships.
- **How to Contact Us:** For more information, please email us at [gsg@umaine.edu](mailto:gsg@umaine.edu) and visit the GSG website at <https://umaine.edu/gsg/>. Become a fan of the GSG on Facebook, follow the GSG on Twitter and Instagram (@umainegsg), or stop by Stodder Hall to say hello! We would love to hear from you! We hope to see you soon!

**Campus Recreation** is a central student service in the Division of Student Life, and offers a wide variety of recreational programming. Maine Bound, which is part of Campus Recreation, offers a wealth of indoor and outdoor recreation and education opportunities. Access is automatically granted to all enrolled students. Open Recreation is available in the state-of-the-art New Balance Student Recreation Center (NBSRC), as well as the Bridge Tennis Courts, Wallace Pool, and Mahaney Dome. Amenities at these facilities include nearly 200 pieces of weight/cardio equipment, 3 basketball/volleyball courts, 2 racquetball/squash courts, 1 multi-activity court, 2 multi-purpose group exercise studios, competitive lap pool, leisure pool with spa, sauna, and vortex, indoor turf field, indoor track, and eight outdoor lighted tennis courts. The NBSRC offers a wide range of group fitness classes, and many other fitness programs including personal training. Numerous intramural sports are available for men, women and coed. Campus Recreation maintains more than 15 miles of trails in the University's DeMeritt Forest for hiking, biking, horseback riding, snowshoeing, and skiing. Outdoor gear such as tents, canoes, kayaks, cross country skis and snowshoes are available for rent at Maine Bound. Lockers are available for rental or for complimentary day use. The Maine Bound Adventure Center, located near the Collins Center for the Arts, houses an indoor rock climbing tower and bouldering wall. Trips, clinics and courses (credit and noncredit) are available in kayaking, canoeing, climbing, backpacking, hiking, camping, snowshoeing, skiing and more. For more information, visit the Campus Recreation website <http://www.umaine.edu/campusrecreation>.

**Memorial Union.** The Memorial Union is one of the two major student hubs on campus (the New Balance Student Recreation Center being the other one). Many student support services are located in the Memorial Union. These include the following: University Bookstore; the Multicultural Center; Title IX Student Services; the Career Center; the Commuter Lounge; the Student Wellness Resource Center; the Hackerspace; the Veterans Center; the First Year and Transfer Student Center; the Package and Postal Center, -the University Credit Union and ATM; the Rainbow Resource Center (LGBTQ+ support/services); the Bodwell Center for Service and Volunteerism; Residence Life; Fraternity and Sorority Affairs; Center for Student Involvement; Mind Spa; the e-Sports Arena; and the Vice President for Student Life/Dean of Students Office. In addition to all of these services, the Bear's Den (food court) is on the main (2nd floor) floor of the Union and includes the campus pub. The Union is a great place to meet and hang out with friends and colleagues. It is also the site of a wonderful variety of events and activities such as the International Student Coffee hour, comedians and musicians, films, lectures and a great many other things. The Maine Campus (student newspaper), WMEB (student radio station), Student Government, Inc. (undergraduate student government) offices, and the Spirit Room (Bananas the Bear Display) are also found in the Memorial Union. The Union is host to many conferences and meetings, and rooms can be reserved by calling (207) 581-1406.

**The Package and Postal Center:** The Package and Postal Center is located on the ground level of the Union and is home to the post office. You can buy stamps, send/receive packages, etc. In fact, all packages deliverable to residence halls come to the Center for easy, secure, and convenient student pick up. The Center is also the quick copy center on campus. They do color and black/white copying, binding, and transparencies.

**University Promotions:** University Promotions is located next to the University Credit Union on the first floor of the Union. Individuals, groups, departments and others can order UM themed gear, mugs, and other items to promote their organization, their event, and/or for re-sale.

**The University Bookstore** is centrally located in the heart of campus on the lower level of the Memorial Union. The Bookstore offers many competitively priced options for course material such as rentals, digital delivery as well as used and new textbooks. As the official bookstore of the University of Maine the Bookstore can guarantee you will get the correct material to meet your academic needs while still being competitive with such online sellers as Amazon. The Bookstore not only features course materials but carries one of the largest selections of official UMaine clothing and gifts, official class rings and electronics. As an Authorized Apple Campus Store, the Bookstore offers educational discount pricing for students on Apple computer products as well as an assortment of Apple and Dell computers and accessories with a professional computer service & repair center available on site. Contact the Bookstore at 207-581-1700 or go to [umaine.edu/bookstore](http://umaine.edu/bookstore).

**The Division of Student Life.** The Division of Student Life provides a network of student-oriented programs and services, which address a variety of student needs. Our services are unique; they are dynamic collaborations of multiple efforts, from leadership programs and ethnic cultural celebrations to volunteer activities, health education opportunities, and outdoor adventure programs. In addition, we provide an appointed liaison from our office committed to serving graduate students' specific needs. We are here for personal advice, for small and large problems, and for educational life concerns. For more information or to schedule an appointment with a graduate student advocate, please call 581-1406 or visit us on the website at <http://umaine.edu/studentlife/>

**The Collins Center for the Arts** is a cultural and artistic centerpiece for eastern and northern Maine. The 1,435 seat Hutchins Concert Hall provides the perfect venue to see a wide variety of performances including Broadway tours, legendary musicians and singers, nationally-known comedians, classic and modern dance, live theatre, family shows, and much more. The John I. and Elizabeth E. Patches Chamber Music Series brings some of the finest instrumental and vocal chamber musicians in the world to Orono, Maine. Home to one of the largest projector screens in Maine, audiences can see broadcasts from The Metropolitan Opera's award-winning "The Met: Live in HD" and "National Theatre Live," broadcasting the best of British theatre recorded live from the London stage. The CCA is proud to be the home of the Bangor Symphony Orchestra, one of the oldest, continually-operating community orchestras in the nation. Each year, the Symphony performs the Nutcracker, and other orchestral masterworks for thousands of fans. The Collins Center is also the perfect place to see arts education in action with performances presented by UMaine's School of Performing Arts ensembles. Additionally, the Collins Center plays hosts to a number of campus and community events, including performances, lectures, rallies and public forums. For more information about the CCA's performances and events, visit [www.collinscenterforthearts.com](http://www.collinscenterforthearts.com).

**The Hudson Museum.** The Hudson Museum's collection features an extraordinary collection of Pre-Columbian artifacts ranging from Olmec to Aztec - The William P. Palmer III Collection, Native American holdings from Maine, the Southwest, Northwest Coast, Arctic, and Plains, as well as collections from Africa, Oceania and Asia. The Museum hosts temporary and permanent exhibits, offers guided tours and gallery programs for learners of all ages, lectures, workshops and an annual Wabanaki Winter Market. It also offers staff assistance for directed research projects and internships and programs for UMaine classes. For further information, please call 581-1904 or visit us on the web at [www.umaine.edu/hudsonmuseum](http://www.umaine.edu/hudsonmuseum).

**Versant Power Astronomy Center.** Versant Power (formerly Emera) Astronomy Center on Rangeley Road opened in 2014 as Maine's largest and most advanced astronomy facilities of its kind, financed by the generous contributions of anonymous donors. The facility houses the Maynard F. Jordan Planetarium featuring a 10 meter dome, digital 4K projection system, and digital 5.1 audio. The Jordan Observatory with a 20 inch PlaneWave research telescope, and the Clark Observatory which has been relocated to this facility host the 8 inch Alvin Clark refractor for visual astronomy viewing. Intended for the use of students, researchers, and the public, the facility offers a variety of astronomy and other science programs throughout the year and serves as a resource for the UMaine Campus. Audiences in the planetarium can enjoy a view of the stars and journeys of adventure through space and to the limits of the imagination. Public showings are offered on Friday evenings and Sunday afternoons, along with other selected times. Private programs can be arranged for school classes, private groups, birthday parties, families and more.

For more information visit the Versant Power Astronomy Center web site: [Astro.UMaine.edu](http://Astro.UMaine.edu).

## **Graduate Programs, Certificates, Specializations, Emphases**

# Animal Sciences

The M.S. degree in Animal Sciences may be earned for a program of study in reproductive physiology, animal health, nutrition or management. The Ph.D. degree may be earned by completing a program of study in Food and Nutrition Sciences or Biological Sciences. Thesis research constitutes a major portion of the M.S. and Ph.D. programs. Students are required to take Graduate Seminar (AVS 633). Ph.D. students must present four seminars and M.S. students must present two seminars. For the M.S. degree, a minimum of 30 semester hours, including credit given for the thesis, is required. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. In addition, a minimum of 12 hours (exclusive of thesis) of 500- and/or 600-level course work is required. Additional requirements for M.S. and Ph.D. degrees can be found in the General Policies and Regulations of the Graduate School elsewhere in this catalog.

Students interested in pursuing graduate studies in animal nutrition should have undergraduate courses in mathematics, physics, organic chemistry, biochemistry, and quantitative analysis. Training in physiology and biochemistry is desirable for students interested in animal physiology, and some work in statistics is desirable for all graduate students.

Graduate students will take many of their formal graduate courses in supporting departments, depending upon their specific interests and fields of study.

Graduate students appointed to assistantships in Animal and Veterinary Sciences devote a minimum of half time to research or teaching activities. Complete research facilities are available, including laboratories and animal units, with opportunities for field tests.

The program also offers a non-thesis Master of Professional Studies (M.P.S.) degree in Animal Sciences. Requirements for the M.P.S. are 30 credit hours, of which at least 15 hours must be 500- and/or 600-level. In addition, each student will be required to complete a minimum of three hours in an "independent study" type course in the area of Animal and Veterinary Science. The M.P.S. student is required to demonstrate competence in chosen fields of specialization during an oral comprehensive examination at the completion of his or her program. Courses selected must include a minimum of 12 credits in Animal and Veterinary Sciences. In addition, a minimum of 12 hours must be selected in a specialized field of study. The three credit "independent study" type course is to be a short-term research project. Upon completion of the project, a written report will be presented to the major professor and a seminar on the project will be presented to the Animal Science faculty and students.

## Graduate Faculty

**Timothy Bowden**, Ph.D. (University of Aberdeen, 1998), Associate Professor. Aquatic animal health.

**Robert C. Causey**, Ph.D. D.V.M., (Louisiana State, 1985, University of Minnesota, 1989), Associate Professor. Equine reproduction, veterinary microbiology.

**Suzanne L. Ishaq**, Ph.D. (University of Vermont, 2015), Assistant Professor. Host-associated microbial communities and animal health.

**Pauline Kamath**, Ph.D. (University of California, Berkeley, 2011), Assistant Professor. Ecology and evolution of infectious diseases in wildlife and livestock, population and phylogenetics/genomics.

**Colt Knight**, Ph.D. (University of Arizona, 2016), Assistant Professor of Extension - State Livestock Specialist

**Anne Lichtenwalner**, Ph.D. D.V.M., (University of Idaho, 1995, Oregon State University, 1989), Associate Professor. Diseases of Livestock, poultry and fish.

**David Marcinkowski**, Ph.D. (The Ohio State University, 1982), Associate Extension Professor. Dairy Management.



**Glenda M. Pereira**, Ph.D. (University of Minnesota, 2021), Assistant Extension Professor. Dairy Management, animal genetics, and organic dairy production.

**Juan J. Romero**, Ph.D. (University of Florida, 2013), Associate Professor. Ruminant nutrition, forage quality, and hay and silage production.

**James Weber**, Ph.D., D.V.M., (University of Idaho, 1992, Washington State University, 1994), Associate Professor. Reproductive physiology of horses and sheep, parasite management of small ruminants, and medical implant design.

#### **Associate Graduate Faculty**

**Gary W. Anderson**, Ph.D. (Virginia Tech, 1982), Associate Extension Professor. Reproduction efficiency of livestock, dairy farm management, animal health.

**Robert C. Bayer**, Ph.D. (Michigan State, 1972), Professor. Fisheries and aquaculture nutrition, management and physiology.

## **Anthropology and Environmental Policy**

Today a variety of environmental specters threaten Earth's populations. Greenhouse-gas emissions are changing earth systems, global ecology, disease patterns, and land-use. Ocean fisheries and forests in many parts of the world, including Maine, are in precipitous decline. Loss of agricultural land in combination with population increases may well result in widespread famines in the near future. There are also growing problems associated with nutrient pollution, loss of wildlife and biodiversity, soil erosion, the depletion of non-renewable resources, and environmental degradation. These problems affect people, but people also cause them. Moreover, many are global in origin but local in their effects. Demands on forests and fisheries are international, for example, but the environmental consequences are felt locally in over-cut woodlands and wiped-out fisheries. Climate is affected by human activity at a global level, but climate changes will have very different effects in different regions of the globe. Since Maine is a natural resource state, the global origins of these threats are particularly relevant to the people of Maine, their culture, and their society.

The PhD and MA programs in Anthropology and Environmental Policy center on understanding human society and culture in cross-cultural perspective and their pivotal role in implementing successful environmental policy. The program engages students in a multi-disciplinary framework bridging environmental sciences and policy while focusing on the sociocultural impacts of, and responses to, local and global environmental change.

Students engage with faculty in cutting-edge research on the way social relations, human organization, cultural perceptions, and ecological behavior affect the causes and consequences of local, national, and global environmental change. Students analyze social and cultural dimensions of policy that mitigate negative environmental consequences of this change while safeguarding or promoting human well-being. Areas of environmental policy and research include global climate change, energy resources, marine resources, eco-tourism, forestry resources, land-use, water management, and pollution control.

The program core is a firm grounding in anthropological social and cultural theory, qualitative and quantitative methodology, and policy development and analysis. Students engage in methodological and specialized courses tailored to their specific environmental interests at the local, national, or international scale.

Students may enter the program with a Bachelor's or Master's degree in Anthropology, Biology, Climate Change, Economics, Marine Sciences, Forestry, or any other related field. All students take the Core Curriculum courses in Cross-Cultural Human Dimensions, with the remaining curriculum individually tailored depending on each student's background, environmental focus area, and national or international environmental policy interest. Courses in policy and basic methodology will be dependent on courses students have taken previously.

## Financial Aid

Graduate Teaching Assistantships and Work Study positions are available on a competitive basis for qualified students.

# Graduate Faculty

**Christine Beitzl**, Ph.D. (University of Georgia, 2012), Graduate Coordinator, Associate Professor of Anthropology; Sustainability science, coastal/ marine anthropology, economic anthropology, environmental anthropology, political ecology

**Aram Calhoun**, Ph.D. (University of Maine, 1996), Professor of Wetland Ecology. Wetland ecology and conservation, field studies in ecology, environmental solutions.

**John Daigle**, Ph.D. (University of Massachusetts, 1997), Associate Professor of Forest Recreation Management. Recreation planning and management, social research methods for natural resource professionals, human dimensions of natural resources management.

**Samuel P. Hanes**, Ph.D. (Rutgers University, 2008) Associate Professor of Anthropology. Historical geography, human ecology, agriculture, aquaculture, natural resource management.

**Stephen Hornsby**, Ph.D. (University of British Columbia, 1986), Professor of Geography and Canadian Studies, Director for the Canadian American Center. Historical geography, expansion of Europe overseas, eastern Canada and northeastern United States.

**Cindy Isenhour**, Ph.D. (University of Kentucky, 2010), Associate Professor of Anthropology, Cooperating Faculty Climate Change Institute. Environmental anthropology, economic anthropology, climate policy

**Teresa Johnson**, Ph.D. (Rutgers University, 2007), Associate Professor of Marine Policy, Cooperating Professor of Anthropology. Fisheries management, marine policy.

**Alice Kelley**, Ph.D. (University of Maine, 2006), Associate Research Professor of Climate Change Institute, Cooperating Professor of Anthropology. Geoarchaeology, surficial geology, and geomorphology.

**Jessica Leahy**, Ph.D. (University of Minnesota, 2005), Professor of Human Dimensions of Natural Resources. Social psychological aspects of natural resources management, environmental attitudes and behavior, information effects.

**Paul Mayewski**, Ph.D. (Ohio State University, 1973), Director, Climate Change Institute and Professor of Earth and Climate Sciences. Climate change and atmospheric chemistry.

**Lisa Neuman**, Ph.D. (Duke University, 2002), Associate Professor of Anthropology and Native American Studies. Politics of Indian identities. Tribal sovereignty and economic enterprise, gender studies, cultural production, cultural history, North America, Oklahoma, Maine.

**Bonnie Newsom**, Ph.D. (University of Massachusetts, 2017), Assistant Professor of Anthropology and Faculty Associate, Climate Change Institute. Archaeology of Maine and the Maritimes, Indigenous archaeologies, aboriginal pottery, historic preservation, shell midden research.

**Darren Ranco**, Ph.D. (Harvard University, 2000), Associate Professor of Anthropology and the Senator George Mitchell Center for Environmental and Watershed Research, Chair of Native American Programs. Indigenous intellectual property rights, research ethics, environmental justice, tribal governance.

**Paul (Jim) Roscoe**, Ph.D. (University of Rochester, 1983), Professor Emeritus of Anthropology, Cooperating Professor of the Climate Change Institute, Cooperating Professor in the School of Policy and International Affairs. Anthropology of climate change, warfare, social and political evolution.

**Jonathan Rubin**, Ph.D. (University of California-Davis, 1993), Professor of Resource Economics and Policy, and the Margaret Chase Smith Policy Center. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

**Daniel Sandweiss**, Ph.D. (Cornell University, 1989), Professor of Anthropology and Climate Change. Prehistoric and historic archaeology, coastal adaptations, climate change.

**Rachel Schattman**, Ph.D. (University of Vermont, 2016), Assistant Professor of Sustainable Agriculture; Agroecology, climate change, sustainability, water resources, participatory action research

**Linda Silka**, Ph.D. (Oklahoma State University, 1974), Professor of Resource Economics. Research partnerships, research ethics, grant writing, program evaluation, community-university partnerships.

**Marcella Sorg**, Ph.D. (Ohio State University, 1979), Research Professor, Margaret Chase Smith Policy Center, State of Maine Forensic Anthropologist, Faculty Associate in Anthropology. Forensic anthropology, taphonomy of human remains.

**Mario Teisl**, Ph.D. (University of Maryland, 1997), Director, School of Economics, Professor of Resource Economics. Information economics, food safety, environmental and social marketing, environmental economics.

**Tim Waring**, Ph.D. (University of California-Davis, 2010). Associate Professor of Resource Economics. Sustainability, human cooperation, human cultural evolution, evolutionary ecology.

**Gregory Zaro**, Ph.D. (University of New Mexico, 2005), Associate Professor of Anthropology and Climate Change. Archaeology, historical ecology, agricultural intensification, urbanism, Mesoamerica, Andes, Eastern Adriatic.

## Aquaculture and Aquatic Resources

### Program of Study

The program leading to the M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources is an interdisciplinary program with core faculty drawn from the School of Food and Agriculture, the School of Marine Sciences, School of Biology and Ecology, the School of Economics, and the College of Engineering.

The graduate program in Aquaculture and Aquatic Resources is designed to train professionals for a career in aquaculture and related industries or for further academic training.

The M.S. and Ph.D. degrees are intended to have a strong basis in the biological and/or physical sciences with additional training and research opportunities in areas such as aquatic health, physiology and nutrition, aquaculture production, engineering, food science and technology, social sciences, policy, and economics.

The Program Faculty come from multiple disciplinary areas including:

- engineering, pathology, physiology, nutrition, seafood processing, and population and habitat modeling.

Faculty work with a variety of aquatic species including, but not limited to:

- cod, halibut, salmon, trout, oysters, clams, mussels, sea urchins, sea horses, abalone, seaweed, and lobsters.

## Research Facilities

Extensive analytical facilities and associated research support are available on the Orono campus, and at off-campus locations both east and west of Orono.

The Aquaculture Research Center (ARC) is located on the Orono campus and houses numerous temperature-controlled recirculating saltwater systems from 150 gallons to 4000 gallons.

- Facilities are available for egg incubation of cod, haddock, and halibut.
- A larval rearing laboratory allows the production of juvenile cod and haddocks as well as other fish species. A live food production laboratory is available for the production of rotifers and brine shrimp.
- The Center houses numerous aquaria for holding lobsters, shellfish, sea urchins, and tropical reef fish.
- The Center also houses a 120X8X4 ft wave tank which is used to conduct scale model tests.

The Matthew Highlands Pilot Plant, also located on campus, has state-of-the-art food processing equipment including: Blast freezer, smoke house, pasteurizer, ozone system, and other equipment necessary for value-added product development of wild-caught and farm raised aquatic species.

The Center for Cooperative Aquaculture Research (CCAR) is located on a 24-acre site in Franklin and has 610 feet of tidal marine frontage on Taunton Bay.

- It comprises both seawater and freshwater aquaculture systems.
- The objectives of CCAR are to develop integrated aquaculture techniques, to serve as a business incubator, to produce finfish juveniles for commercial grow-out, to develop sustainable aquaculture techniques, and to train staff and students in aquaculture techniques.
- The Center houses a salmonid egg incubation facility, pilot scale recirculation systems for marine finfish, a marine finfish nursery, a marine broodstock facility, and several large grow-out systems. The systems currently hold halibut, cod, sea worms, sea urchins, and the red alga *Porphyra*.

The University of Maine at Machias Marine Science Field Station (MSFS) at the Downeast Institute (DEI) is located on a 14-acre peninsula on Great Wass Island in the town of Beals. It has 2,500 feet of tidal frontage (rocky shore with some soft-bottom intertidal) overlooking Western Bay.

- The facilities include a large ecology wet lab, three small climate-controlled labs for work with quarantine organisms, ocean acidification studies, and other climate-related efforts. A dry lab, specimen lab, and sample processing lab round out the marine research laboratory.
- Business incubator.
- Office space for PIs and graduate students.

- Adjacent production-scale shellfish hatchery to produce commercially important bivalves for research, development, and outreach activities. Currently, species in culture include soft-shell clams, razor clams, Atlantic surf clams, Arctic surf clams, blue mussels, European oysters, American oysters, and sea scallops.
- Classroom and Conference room.
- Two fully-functional tidal impoundments (2- and 3-acres) for mesocosm studies.
- 100-ft x 30-ft pier constructed of fiber composites with two 12-ft x 20-ft floats.
- A new residence hall is within a 5-minute walk of the marine research lab. It can accommodate 18-20 scientists and students.

\*Since admission into the program depends on obtaining a suitable faculty advisor, interested students should begin the application process by first contacting potential faculty advisors to find out if they anticipate accepting new students. A list of current associated faculty is provided. All interested students must contact the program coordinator prior to submitting an application. Applications submitted without prior contact will be rejected. \*

## Cost and Financial Aid

More information on cost and financial aid can be obtained through:

The Bursar's Office: <https://umaine.edu/bursar/>

Student Financial Aid Office: <https://umaine.edu/stuaid/>

## Correspondence

<https://umaine.edu/graduate/>

### Graduate Faculty

**Robert C. Bayer**, Ph.D. (Michigan State), Professor. The Lobster Institute, School of Food and Agriculture. Lobster fisheries and aquaculture nutrition, management and physiology.

**Brian F. Beal**, Ph.D. (University of Maine), Professor. University of Maine at Machias. Shellfish aquaculture, estuarine biology, marine benthic ecology, and experimental design.

**Kathleen P. Bell**, Ph.D. (University of Maryland), Professor, School of Economics. Environmental and natural resources economics, spatial modeling and analysis, human-environment interactions, and marine policy.

**Tim J. Bowden**, Ph.D. (University of Aberdeen, UK), Associate Professor, School of Food and Agriculture. Aquatic animal health, environmental impacts on animals, seasonality and circadian impacts.

**Deborah A. Bouchard**, Ph.D. (University of Maine), Assistant Extension Professor, University of Maine Cooperative Extension. Aquatic animal health specialist.

**Damian C. Brady**, Ph.D. (University of Delaware), Associate Professor, School of Marine Sciences. Spatial and temporal dynamics of water quality and organism behavior.

**Ian R. Bricknell**, Ph.D. (University of Lancaster, UK), Professor. School of Marine Sciences. Aquatic animal health, especially parasites such as sea lice.

**Laurie Connell**, Ph.D. (University of North Carolina), Research Professor, School of Marine Sciences, Marine algae, shellfish toxins and shellfish health.

**Chris Davis**, Ph.D. (University of Maine), Maine Aquaculture Innovation Center; Adjunct

Assistant Professor, School of Marine Sciences, shellfish biology, aquaculture.

**Keith S. Evans**, Ph.D. (Iowa State University). Associate Professor. School of Economics and School of Marine Sciences. Marine resource economics, marine development, non-market valuation, and marine policy.

**Heather Hamlin**, Ph.D. (University of Maine). Professor. School of Marine Sciences Reproductive biology and endocrinology of aquacultured animals.

**Kim Huguenard** Ph.D. (University of Florida). Associate Professor of Civil and Environmental Engineering. Coastal and ocean engineering, estuarine hydrodynamics, nearshore processes, turbulence and mixing, including aquaculture engineering.

**Sue Ishaq**, Ph.D. (University of Maine), Assistant Professor of Animal and Veterinary Sciences, School of Food and Agriculture. Animal microbiomes.

**Heather Leslie**, Ph.D. (Oregon State University). Professor and Director of the University of Maine's marine laboratory, Darling Marine Center. Drivers of ecological and social processes in marine systems, and how to more effectively connect science to policy and management.

**Anne Lichtenwalner**, Ph.D. (University of Idaho), DVM (Oregon State University), Associate Professor. School of Food and Agriculture. Extension Veterinarian and Director, University of Maine Veterinary Diagnostic Laboratory. Animal health and animal disease surveillance.

**Jean MacRae** Ph.D. (University of British Columbia Vancouver, B.C., Canada). University of British Columbia Vancouver, B.C., Canada. Research interests include microbial processes that affect pollutant and nutrient cycling, sustainability issues and access to water and sanitation in the developing world.

**Caroline Noblet**, Ph.D. (University of Maine), Associate Professor. School of Economics. Consumer choice, sustainable behavior, labeling.

**Lewis (Brian) Perkins**, Ph.D. (University of Maine), Laboratory Director and Assistant Research Professor. School of Food and Agriculture. Analytical method development for bioactive compounds, naturally occurring toxins and pesticide residues in food and environmental matrices.

**Jen Perry** Ph.D. The Ohio State University. Associate Professor of Food Microbiology. Investigation of the effect of probiotic supplementation and dietary modulation on the composition of the bacterial and fungal communities in the GI tract, evaluation of differences in genomic and transcriptomic profiles.

**Brian Peterson**, Ph.D. Center Director, The National Cold Water Marine Aquaculture Center, USDA, Franklin, Maine. Research program areas address: Genetic Improvement, Growth and Development, Health, and Sustainable Production Systems for Atlantic salmon and for cold water marine finfish species.

**Paul D. Rawson**, Ph.D. (University of South Carolina), Professor of Marine Science. School of Marine Science. Ecological genetics of marine invertebrates and marine bivalve aquaculture.

**Laura Rickard** Ph.D. Associate Professor, Department of Communication and Journalism. Communication in the context of science, health, environmental, and risk-based issues, with a strong focus on aquaculture and working waterfronts.

**Denise I. Skonberg**, Ph.D. (University of Washington), Professor. School of Food and Agriculture. Seafood by-product utilization, seafood processing, quality evaluation of aquaculture products.

**Joshua Stoll**, Ph.D. (University of Maine), Assistant Professor, School of Marine Sciences.

Ocean governance, fisheries and aquaculture policy, social-ecological systems.

**Peter Van Walsum**, Ph.D. (Dartmouth College), Professor. Department of Chemical and

Biomedical Engineering. Seaweed processing, process engineering

**Gayle Zydlewski**, Ph.D. (University of Maine), Associate Professor, School of Marine Sciences. Environmental impact on behavior, population dynamics and physiology.

#### **External Graduate Faculty**

**Carrie J. Byron**, Ph.D. (University of Rhode Island), Assistant Professor. Department of Marine Science. University of New England. Food web ecology, trophic dynamics and carrying capacity of ocean foods production.

**Barry A. Costa-Pierce**, Ph.D. (University of Hawaii), Henry L. & Grace Doherty Professor, Chair of Marine Sciences, and Director of Marine Science Center - University of New England. Ecological aquaculture, detritus and food web trophic dynamics, social ecology of aquaculture and fisheries systems.

**Joseph Zydlewski**, Ph.D. (University of Massachusetts), Assistant Unit Leader-Fisheries U.S. Geological Survey, Maine Cooperative Fish and Wildlife Research Unit, Ecology & Environmental Science. Migratory behavior, ecology and physiology of fishes.

## **Autism Spectrum Disorders (Certificate)**

#### **Autism Spectrum Disorders (Certificate)**

In 2022, the Center for Disease Control estimated that 1 in 44 children were diagnosed with an autism spectrum disorder (ASD). All preK-12 schools in Maine are required to provide educational services to students with an ASD in the Least Restrictive Environment (LRE). The primary purpose of this 4-course certificate sequence is to prepare experienced educators, administrators and related service providers to assume a leadership role in the development and implementation of educational programs for students with autism in school settings.

#### **Certificate program objectives:**

1. *Candidates will develop theoretical knowledge and applied skills for understanding the needs of students with ASD and providing evidence-based practices according to individual needs.*
2. *Candidates will have the necessary theoretical and applied background to provide leadership to their schools and districts in developing a sound model of educational and social/behavioral support and intervention.*
3. *Candidates will be familiar with and able to access available resources to support their districts' efforts in providing services for their students with ASD.*
4. *Candidates will have the knowledge and skills to serve as team leaders and coaches in supporting program implementation in their schools and districts.*

There are two tracks for the **Graduate Certificate in Autism Spectrum Disorders**:

1. Special educators enroll in the following courses:
  - SED 528 Educational methods for students with autism
  - SED 585 Social Communication for students with ASD
  - SED 556 Assessment in special education: Students with ASD and severe disabilities
  - SED 563 Positive behavioral supports for students with ASD
2. General educators or others supporting individuals with autism enroll in the following courses:
  - SED 528 Educational methods for students with autism
  - SED 585 Social Communication for students with ASD
  - SED 564 Universal design for learning in classrooms
  - SED 532 Behavior management

## Biochemistry

### Biochemistry

Return to: Graduate Programs, Certificates, Specializations, Emphases

Graduate studies in the Department of Molecular and Biomedical Sciences can lead to an M.P.S., M.S. or Ph.D. degree in Biochemistry. Students may choose from biomedical research areas such as cell regulatory systems, protein biochemistry, molecular immunology, cellular and molecular toxicology, microbiology, bioinformatics, and genomics. Financial aid is available on a competitive basis, primarily in the form of graduate teaching assistantships. Research assistantships and University fellowships are also available.

Faculty members are actively involved in research that is supported at the federal level. Students admitted to the graduate program in Biochemistry may also carry out their research with faculty listed under Microbiology in this catalog, in a number of laboratories in other departments at the University, or through cooperative institutional arrangements such as those at the Mount Desert Island Biological Laboratory, the Maine Medical Center Research Institute in Portland, and others. (In addition to the University of Maine-based faculty listed below, several faculty at external cooperating institutions mentor research students in this degree program).

The Ph.D. degree in Biochemistry and Molecular Biology is awarded for significant and original contributions to basic knowledge through research. The curriculum plan is variable and will take into account each student's goals for graduate study and the content and quality of his or her undergraduate preparation.

The Master's program prepares students for further studies toward the Ph.D., or medical degrees, as well as for careers in academic or industrial research, or teaching. The M.P.S., Master of Professional Studies, is a non-thesis Master's degree.

The Department of Molecular and Biomedical Sciences is housed in Hitchner Hall, which is well equipped to do modern research in biochemistry, bacteriology, virology, molecular biology, genomics, bioinformatics, and immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, phase, confocal, and fluorescent microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals.



Prerequisite for admission to these programs is the completion of undergraduate work in chemistry, mathematics, physics and molecular biology/biochemistry substantially equivalent to that required of undergraduate students at this institution whose major is Biochemistry.

### Graduate Faculty

**Suzanne Angeli**, Ph.D. (University of California, San Francisco, 2010) Assistant Professor. *Caenorhabditis elegans* to study the biological processes of aging and mitochondrial function.

**Julie A. Gosse**, Ph.D. (Cornell, 2005) Associate Professor and Graduate Coordinator. Biochemical, molecular, and cellular toxicology to aid in human environmental health risk assessment.

**Joshua B. Kelley**, Ph.D. (University of Virginia, 2008) Associate Professor. Spatio-temporal regulation of G-proteins in receptor mediated gradient tracking using microfluidics and computational cell biology approaches.

**Benjamin L. King**, Ph.D. (University of Maine, 2016) Associate Professor. Bioinformatics and Systems Biology of Stress Responses.

**Melissa S. Maginnis**, Ph.D. (Vanderbilt, 2007) Associate Professor. Virus-host cell interactions that regulate JC Polyomavirus infection and pathogenesis.

**Sally Molloy**, Ph.D. (University of Maine, 2007) Associate Professor. Genomics and Microbiology.

**Melody N. Neely**, Ph.D. (University of Michigan School of Medicine, 1998) Chair and Associate Professor. Host-pathogen interactions, with focus on *Streptococcus*.

**Robert T. Wheeler**, PhD (Stanford, 2000) Associate Professor. Genetics, genomics, biochemistry and cell biology of fungal pathogens with mammalian hosts.

## Biochemistry and Molecular Biology

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immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, confocal and other microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals.

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**Melody N. Neely**, Ph.D. (University of Michigan School of Medicine, 1998) Chair and Associate Professor. Host-pathogen interactions, with focus on *Streptococcus*.

**Robert T. Wheeler**, PhD (Stanford, 2000) Associate Professor. Genetics, genomics, biochemistry and cell biology of fungal pathogens with mammalian hosts.

## Biological Sciences

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

### Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

### Master of Science

- Botany and Plant Pathology

- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

### **Research Specializations**

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoospore fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

### **Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

### **Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

### **Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: [umbiosci@maine.edu](mailto:umbiosci@maine.edu), <https://sbe.umaine.edu/>.

## **Graduate Faculty**

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem

ecology.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

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**Michael T. Kinnison**, Ph.D. (University of Washington, 1999) Professor of Evolutionary Applications. Microevolution, eco-evolutionary dynamics, aquatic ecology, population and conservation genetics, fish ecology.

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**Brian Olsen**, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.

**Jasmine Saros**, Ph.D. (Lehigh University, 1999). Professor. Paleolimnology, phyto-plankton ecology, lake ecosystem response to global change.

**Michelle Smith**, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

**Ek Han Tan**, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

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## Cooperating Faculty

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**Jim Dill**, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

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**James D. McCleave**, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

**Paul Rawson**, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

**Alan M. Rosenwasser**, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

**Walter C. Shortle**, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

**Rebecca J. Van Beneden**, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

**Robert G. Wagner**, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

## Biomedical Engineering

The Masters of Science in Biomedical Engineering prepares students to conduct research involving the application of engineering to biological systems. Examples of research projects are sensors to detect specific biological molecules or pathogens in food or water, understanding cell membranes in terms of signaling and transport of molecules, imaging of cells or proteins, conformation of biological molecules at membrane surfaces, controlling the interaction of bacteria and cells with surfaces as well as environmental risk assessment modeling. Alliances with several governmental agencies and other organizations, such as the Institute of Medicine, the Jackson Laboratory, and Maine Medical Center Research Institute, increase research opportunities related to genetics and biomedical issues in engineering. Cooperation with the Frontier Institute for Research in Sensor Technologies gives access to tools related to surface analysis.

### Research Facilities

Standard equipment for cell growth and characterization, near IR, confocal microscope, mechanical testing of biological materials and other tools are available. Specialized equipment is also available related to individual projects.

### Financial Aid

Graduate Research Assistantships are available on a competitive basis for externally funded research projects.

### Applying

Applications for entry into the program for either the fall or spring semesters must be received at least three months prior to the start of the semester. For fall semester, it is recommended that applications be received by March of that year. Applications are available online at the Graduate School.

### Correspondence:

The Graduate School  
5775 Stodder Hall, Room 42  
University of Maine  
Orono, ME 04469-5755  
207-581-3291  
graduate@maine.edu

Dept. of Chemical and Biomedical Engineering  
117 Jenness Hall  
University of Maine  
Orono, ME 04469-5737  
207-581-2277

thomas.schwartz@maine.edu

### Requirements

The M.S. degree requires 30 semester hours of graduate work which must include two seminars and 18 credits of courses in addition to the thesis. Required core courses are BEN 502 (Advanced Materials in Bioinspired Engineering), BEN 503 (Advanced Instrumentation in Biomedical Engineering) and BEN 580 (Computational

Methods in Biomedical Engineering). Three technical electives courses are required of which one needs to be 500 level or above.

### Graduate Faculty

**Douglas W. Bousfield**, Ph.D. (California at Berkeley, 1986), Calder Professor. Fluid mechanics, rheology, numerical methods, coating processes, modeling of coating and absorption processes.

**Albert Co**, Ph.D. (Wisconsin, 1979), Associate Professor. Transport phenomena, fluid mechanics, polymeric fluid dynamics, rheology, applied numerical methods.

**William J. DeSisto**, Ph.D., (Brown, 1989), Professor. Advanced material, sensors.

**Caitlin Howell**, Ph.D. (University of Heidelberg, Germany, 2011) Associate Professor. Biological interfaces, bacterial biofilm growth and control, surface-mediated tissue engineering, dynamic materials design.

**Andre Khalil**, Ph.D. (Universite Laval, Canada, 2004). Associate Professor. Computational modeling, image analysis, signal processing, radiomics.

**Michael D. Mason**, Ph.D. (California at Santa Barbara, 2000), Professor. Photophysics of nanoparticles and molecular nanoprobes, single molecule imaging, time-resolved single photon spectroscopic imaging techniques.

**David J. Neivandt**, Ph.D. (Melbourne, 1998), Professor. Conformation of interfacial species, surface spectroscopies/microscopies, binary polymer/surfactant solutions and lipid membrane structures.

**Yonghao Ni**, Ph.D. (McGill, 1992), J. Larcom Ober Professor. Nanocellulose chemistry and materials, pulp-and-paper-based biorefinery technology, smart sensors, and packaging materials.

**Hemant P. Pendse**, Ph.D. (Syracuse, 1980), Professor and Chair. Colloidal phenomena, paper manufacture, fluid particle systems, and instrument/sensor development.

**Thomas J Schwartz**, Ph.D. (Wisconsin, 2015), Associate Professor. Heterogeneous catalysis, reaction kinetics, *in situ* spectroscopy, biomass conversion to fuels and chemicals.

**Karissa Tillbury**, Ph.D. (Wisconsin, 2015), Assistant Professor. 2-photon microscopy, second harmonic generation microscopy, auto-fluorescence, extracellular matrix collagen.

**G. Peter van Walsum**, Ph.D. (Dartmouth College, 1998), Associate Professor. Renewable energy, fuels and chemicals, bioprocessing, process engineering.

**Sarah Walton**, Ph.D. (University of Maine, 2009), Lecturer.

**M. Clayton Wheeler**, Ph.D. (Texas at Austin, 1997), Professor. Chemical Sensors, fundamental catalysis, surface science, and selective sensor materials.

## Biomedical Science and Engineering

The Ph.D. in Biomedical Science and Ph.D. in Biomedical Engineering are offered

through the Graduate School of Biomedical Science and Engineering (GSBSE), which



is a multidisciplinary research consortium connecting four external research organizations with the University of Maine as the degree-granting institution. The over 150 affiliated faculty conduct research in a variety of topics, including biomedical engineering, computational biology, bioinformatics, biophysics, bioengineering and nanotechnology, molecular and cell biology, neuroscience, and the molecular mechanisms of disease. The GSBSE contributes to learning and discovery on the emerging frontier of the biological, physical, clinical, and behavioral sciences, preparing new faculty, training scientists and engineers, and furthering Maine's biotechnology and biomedical infrastructure.

The GSBSE is a multi-institutional graduate program connecting two academic institutions of the University of Maine and the University of New England as well as three world-class research institutions of The Jackson Laboratory, the Maine Medical Center Research Institute, and the Mount Desert Island Biological Laboratory. GSBSE Ph.D. students

Students admitted to the GSBSE Ph.D. programs first explore the consortium through a year of laboratory rotations before joining a laboratory and partner site for the duration of their program. In addition, Ph.D. students and faculty instructors utilize distance learning platforms and video conferencing extensively to deliver the core Foundations and supporting coursework.

In addition to the two Ph.D. degrees, the GSBSE also offers a PSM in Bioinformatics.

More information on our program can be found on our website at: [gsbse.umaine.edu](http://gsbse.umaine.edu).

## **Botany and Plant Pathology**

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

### **Doctor of Philosophy**

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

### **Master of Science**

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

### **Research Specializations**

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator- prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

### **Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

### **Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

### **Application**

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**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

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**Robert G. Wagner**, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

## Business Administration

Known as the MaineMBA, the Master of Business Administration (MBA) program is designed to equip the student with the highest level of analytical, strategic, and leadership skills needed in a globally competitive workforce. The MaineMBA is a 30-33 credit program offering concentrations in:

- Accounting
- Business Analytics
- Finance
- Food Technology Industry Management
- Global Policy
- Healthcare Systems
- Human Nutrition Management
- Outdoor Industry Management
- Public and Nonprofit Management
- Sustainability

The MaineMBA also offers joint degrees in:

- MaineMBA/ J.D. (With the University of Maine School of Law)
- MaineMBA/ M.S. Information Systems (With the Department of Information Science)
- MaineMBA/ M.A. Global Policy (With the School of Policy and International Affairs)

Additionally, Undergraduate students at University of Maine System schools may be eligible for Accelerated Pathway entry, allowing them to be admitted to graduate study while still pursuing their undergraduate degree. Students in the Accelerated Pathway are permitted to begin MaineMBA coursework in their senior year of their undergraduate experience.

The MaineMBA is available on campus at locations in Orono and Portland, as well as 100% online. Students may choose to take courses in either format or switch between the two. Most online courses are offered in 8-week asynchronous schedules, with on-campus courses offered in 8-week or full-semester sessions. Students may choose to study full time or part time, with most part-time students completing the program in six semesters.

The Maine Business School (MBS), the GSB and MaineMBA are accredited by AACSB International-The Association to Advance Collegiate Schools of Business-the most significant accreditor of business schools. The MaineMBA is globally ranked by publications such as US News and World Report, Fortune, and CEO Magazine. MaineMBA students enjoy a 93% career placement rate at graduation.

MaineMBA students come from a variety of backgrounds, including areas such as engineering, medical professions, business and industry, the arts, and the humanities. An undergraduate degree in business is not required. The average MaineMBA student has nine years of professional experience prior to entry.

## The Program

All candidates for the MaineMBA degree must complete the following eight core graduate courses:

- BUA 601 - Strategic Data Analysis Credits: 3
- MBA 609 - Financial Statement Analysis Credits: 3
- MBA 626 - Management of Contemporary Organizations Credits: 3
- MBA 637 - Global Supply Chain Management Credits 3
- MBA 651 - Financial Management Credits: 3
- MBA 670 - Marketing Management Credits: 3
- BUA 680 - Foundations of Business Intelligence Credits: 3
- MBA 649 - Strategic Decision Making Credits: 3

**General/Business Concentration (30 Credits):** Students in the general concentration take the MaineMBA Core plus two elective courses, which may include an international field study (MBA 596) which goes to a different part of the world every year and/or an internship (recommended for students with less work experience).

**Accounting Concentration (33 Credits):** Candidates for the MaineMBA Accounting concentration take the 8 MaineMBA Core courses plus three accounting electives

**Business Analytics Concentration (33 Credits):** Candidates for the MaineMBA Business Analytics concentration take the 8 MaineMBA Core courses plus three business analytics electives.

**Finance Concentration (33 Credits):** Candidates for the MaineMBA Finance concentration take the 8 MaineMBA Core courses plus three finance electives.

**Food Technology Industry Management (33 Credits):** Candidates for the MaineMBA Food Technology Industry Management concentration take the 8 MaineMBA Core courses plus three food technology electives.

**Global Policy Concentration (33 Credits):** Candidates for the MaineMBA Global Policy concentration take the 8 MaineMBA Core courses plus three Global Policy courses including:

- Contemporary Issues in World Economies
- Contemporary International Relations
- Global Politics OR Global Policy elective

**Human Nutrition Industry Management (33 Credits):** Candidates for the MaineMBA Human Nutrition Industry Management concentration take the 8 MaineMBA Core courses plus three human nutrition electives.

**Healthcare Systems (33 Credits):** Candidates for the MaineMBA Healthcare Systems concentration take the 8 MaineMBA Core courses plus three healthcare courses including:

- MPH 525 American Healthcare Systems
- Healthcare elective
- Healthcare elective

**Outdoor Industry Management (33 Credits):** Candidates for the MaineMBA Outdoor Industry Management concentration take the 8 MaineMBA Core courses plus three outdoor industry management electives including:

Analytics of Outdoor Industry Management

Managing and Growing Participation in the Outdoor Industry

LAW 635 - Land Use

LAW 633 - Natural Resources

MBA 695 - Internship

**Public and NonProfit Management (33 Credits):** Candidates for the MaineMBA Public and NonProfit Management concentration take the 8 MaineMBA Core courses plus one required and two elective public and nonprofit management courses as follows:

Take one required course:

PPM 535 Managing Governments and Nonprofits

Choose two remaining courses from:

PPM 531 Measuring Performance in the Public and Nonprofit Sectors

PPM 534 Managing Cities, Towns, and Counties

PPM 545 Grant Writing and Development

PPM 553 Volunteer Engagement and Management

PPM 630 Innovation and Change in Nonprofits

PPM 632 Human Resource Management and Policy

PPM 633 Strategic Planning in the Public and Nonprofit Sectors

PPM 640 Public Finance and Budgeting

**Sustainability (33 Credits):** Candidates for the MaineMBA Sustainability concentration take the 8 MaineMBA Core courses plus three sustainability courses including:

- PPM 612 Sustainable Communities
- Sustainability elective
- Sustainability elective

## Foundational Skill Requirements

Applicants seeking entry into the MaineMBA program must have a baccalaureate degree from a U.S. accredited college/university or comparable overseas bachelor's degree. Foundational skills in accounting, economics, statistics,



and finance are required and can be demonstrated through past coursework or work experience. Applicants without these required skills, may fulfill these foundational requirements through online tutorials offered by the GSB prior to starting their MaineMBA coursework.

Students must receive a B- minimum in each prerequisite course or pass tutorials with an 80% or better. Candidates are also expected to be proficient in MS Office applications and have excellent writing and presentation skills.

## Application Process and Requirements

Applications are reviewed on a rolling admission basis, meaning that once the application is complete, the admission evaluation process begins. The application can be completed online at <http://www.umaine.edu/graduate>. The application includes submission of the following items:

- Completed application.
- Current Resume or CV.
- Writing Submission where you answer two short essay questions. This is a chance to share your career goals and aspirations to do your MBA. The piece is no longer than 500 words total. Names and contact information of three recommenders.
- Official college transcripts from all schools attended.
- In some cases, an official score report from the Graduate Management Admission Test (GMAT) or equivalent taken within the last five years is required (see below). When ordering the GMAT report, please use Institution Code 1ZF-RM-18.
- For applicants whose native language is not English, original iBT TOEFL score report is required or comparable of English language proficiency report. When ordering the TOEFL score, please use Institution Code 3916.
- The \$65 online application fee may be paid by credit card (Visa, MasterCard or Discover), or check / money order made payable to the University of Maine. Paper applications require a fee of \$75.

Application materials should be sent to:

The Graduate School

5775 Stodder Hall, Room 42

University of Maine

Orono, ME 04469-5775

[graduate@maine.edu](mailto:graduate@maine.edu)

**Applications Deadlines:** The MaineMBA admits students year round on a rolling basis. Suggested target dates for a completed application are August 1 to be considered for fall admission, December 1 for admission to the spring semester, and April 1 for summer admission. Late applications may be considered once all materials are available or may be considered for a future entry term. Completed applications for students requesting assistantships or other funding should be received by January 15 prior to the fall semester. International students requiring a student visa should apply early.

**Admission Criteria:** Admission to the MaineMBA program is competitive. In the admission process, a series of factors are considered that indicate the potential to successfully complete the MaineMBA program and achieve positions of leadership in the private or public sector. That potential is judged by prior academic performance, GMAT score (if applicable), communication skills, recommendations, and work or military experience. Interviews are not required for admission to the MaineMBA program, but may be requested by either the applicant or the MaineMBA admissions committee.

**Academic Performance:** Applicants must have a bachelor's degree from an accredited college/university with a 3.0 cumulative GPA, with a GPA of 3.5 preferred. Candidates are also expected to have strong analytical, math, writing, and presentation skills. Full admission is based on meeting all foundational skills, the academic standards, and all requirements of admission. Conditional or provisional admission is possible as specified under Graduate School policies.

**GMAT Score:** Unless one of the criteria for a waiver specified in the list below is met, applicants must submit official GMAT scores taken within the last five years. A GMAT score of 550 is preferred; no less than 500. Applicants with GMAT scores less than 500 may be considered for conditional admission providing other strong qualifications are demonstrated in the application. LSAT, MCAT, PCAT, and GRE scores are accepted in place of a GMAT score.

The GMAT is waived for applicants with any one of the following:

1. A PhD, JD, MD, or master's degree from a U.S. accredited program.
2. A CPA, CFA, CFP, or equivalent industry designation.
3. Five or more years of post-graduate demonstrated professional or military experience that includes any one of the following experiences:
  - Management of staff in a direct working relationship
  - Leadership of work teams
  - Financial or budgetary responsibility
  - Job responsibilities that specifically demonstrate applied quantitative and analytical skills
  - Leadership of work teams (e.g., platoon leader, platoon commander, team leader, company commander, and similar military positions).
4. U. S. Military special operations designation (must provide orders) specifically: U.S. Army RANGER, Special Operations, SIPER or Jumpmaster Designator, U.S. Navy SEAL, U.S. Air Force Para Jumper, U. S. Marine Corps Force Reconnaissance designation.
5. Graduate of one of the five Federal Military academies (United States Military Academy, Naval Academy, Air Force Academy, Coast Guard Academy and the Merchant Marine Academy).
6. Three or more years of industry experience in a STEM field or a highly quantitative or analytical environment.
7. A cumulative GPA of 3.0 or above from an undergraduate degree that included coursework in a STEM (e.g., engineering, science, math) or applied quantitative field (business, economics, analytics, etc.) from a U.S. accredited program.
8. Strong test results from the LSAT, PCAT, GRE or MCAT.

**Note:** International applicants must submit a GMAT score. No GMAT waiver is automatic and an approved waiver request does not guarantee admission to the program.

**Recommendations:** Contact information for three recommendations are requested as part of the application process. Recommenders should be from current or former supervisors and current or former professors who can comment on the

candidate's academic strengths, work ethic, responsibilities and accomplishments, career advancement, managerial experience, and predictable success in the MaineMBA program.

**Writing Submission:** Students are required to submit a personal written report of not more than 500 words as part of their application. A prompt is included in the application. The papers are evaluated not only for content, but also for writing style, cohesion, purpose of study, and must be free of grammatical errors.

**Resume or C.V.:** Work experience is not required but encouraged for admission to the MaineMBA program. Significant work experience with management responsibilities is considered to be an advantage.

TOEFL: Applicants whose native language is not English must also provide evidence of the Test of English as a Foreign Language (TOEFL) or comparable English language proficiency score report (e.g., IELTS, ELS Language Report). TOEFL: To be considered for admission, the MBA program requires a minimum score of 80 on the iBT TOEFL or 550 on the paper-based TOEFL. To be considered for a graduate assistantship, applicants must have achieved a 92 on the iBT TOEFL or equivalent (580 paper-based). IELTS: Minimum 6.5 for admission and minimum 7.0 to be considered for a graduate assistantship. A WES or ECE course-by-course report for coursework taken at an overseas college/university may be required.

### **Apply Online at the Graduate School website**

Arrangements for the Graduate Management Admission Test may be made by contacting:

Graduate Management Admissions Test (GMAT) or [www.gmac.org](http://www.gmac.org)

Internet: <http://www.umaine.edu/business/mba>

If you have any questions, please contact us at 207-581-1973 or via email at: [MBA@maine.edu](mailto:MBA@maine.edu)

## **Graduate Faculty**

**Pankaj Agrawal**, Ph.D. (University of Alabama, 1996), Associate Professor of Finance.

**Richard Arend**, Ph.D. (University of British Columbia, 1995) Professor of Strategic Management

**Jean Henri Akono**, Ph.D. (University of Texas at San Antonio), Assistant Professor of Accounting.

**David J. Barrett**, CPA, MSA (Indiana University), Lecturer in Accounting.

**Richard Bilodeau**, M.B.A. (University of Southern Maine, 1998) Lecturer of Entrepreneurship and Marketing

**Muralee Das**, PhD (University of Melbourne, 2016), Associate Professor of Management.

**Jeffrey DiBartolomeo**, Ph.D., (University of Central Florida, 2018) Assistant Professor of Finance

**Faye W. Gilbert**, Ph.D. (University of North Texas, 1988), Executive Dean & Professor of Marketing.

**C. Matt Graham**, M.S.B.E. (Southern New Hampshire University, 2004), Lecturer of Management Information Systems.

**Jason Harkins**, Ph.D. (University of Oklahoma, 2008), Assistant Professor of Management.

**Nory B. Jones**, Ph.D. (University of Missouri, 2001), Professor of Management Information Systems.

**Stephen Jurich**, Ph.D. (University of Mississippi, 2015), Assistant Professor of Finance

**Jie Li**, Ph.D., (University of Cincinnati, 2012) Assistant Professor of Organizational Behavior

**Sebastian Lobe**, Ph.D. (University of Regensburg, Germany, 2004), Assistant Professor of Finance.

**Yonggang "Tim" Lu**, Ph.D.(Texas Tech University, 2007), Harold Alfond Associate Professor of Business Analytics

**Ivan M. Manev**, Ph.D. (Boston College, 1997), Public Policy, and Health, Nicholas Salgo Professor of Business Administration and Professor of Management.

**Ikechukwu Ndu**, Ph.D. (University of London, 2019) Assistant Professor of Accounting

**Dmitri Markovitch**, PhD. (New York University, 2004), Assistant Professor of Marketing.

**Grant Miles**, Ph.D. (Pennsylvania State University) Associate Professor of Management.

**Patti Miles**, Ph.D. (University of Texas at Arlington, 2008), Assistant Professor of Management.

**Susan E. Myrden**, Ph.D. (Saint Mary's University) Assistant Professor of Marketing.

**Bert Smoluk**, Ph.D. (Lehigh University, 1997) Professor of Finance

**James Suleiman**, Ph.D. (University of Georgia, 1998) Associate Professor of Management Information Systems

**Hirotooshi Takeda**, Ph.D. (Universite Paris Dauphine, 2011& Georgia State University, 2010), Assistant Professor of Business Analytics and Information Systems

**Stefano Tijerina**, Ph.D. (University of Maine, 2011), Lecturer in Management

**Cynthia D. Tollerson**, Ph.D. (University of Houston, 2012) Harold Alfond Assistant Professor of Accounting

**Stephanie A. Welcomer**, Ph.D. (Pennsylvania State University, 1997), Professor of Management.

**Rozhin Yousefvand-Mansouri**, Ph.D. (McGill University of Montreal, 2018) Assistant Professor of Accounting

**Qiujie "Angie" Zheng**, Ph.D. (Washington State University, 2010), Associate Professor of Business Analytics

**Additional information is available from:**

Graduate School of Business Office

5723 Donald P. Corbett Business Building, Room 209

The University of Maine

Orono, ME 04469-5723

Phone: (207) 581-1973

E-mail: [mba@maine.edu](mailto:mba@maine.edu)

Web: [www.umaine.edu/business/mba](http://www.umaine.edu/business/mba)

## Business Administration (Certificate)

The graduate business certificate program provides students with advanced level business skill sets rooted in the basic business disciplines (economics, accounting, finance, marketing, information systems, and management). Upon completion, students will be prepared to work effectively in a business environment with high-level core business knowledge.

The certificate consists of 5 courses and is ideal for those working full-time, exploring a second career in business, military personnel, out-of-state or international students, or individuals planning on applying for the MBA Program in the future. To learn more about this program, please contact the Maine Business School at 207-581-1973 or [mba@maine.edu](mailto:mba@maine.edu). To apply, please complete the Graduate School online admission application indicating Business Certificate (check "Graduate

Certificate Program" in Business).

<https://umaine.edu/business/mba/programs/graduate-business-certificate/>

### The Certificate Program (15 credits hours) Consists of:

**BUA 400:** Introduction to Accounting. An accelerated course that provides pre-MBA students with an introduction to managerial and financial accounting. Offered online in the summer.

**ECO 410:** Accelerated Introductory Economics. An accelerated presentation of the fundamental elements of micro and macroeconomic theory. Offered online in the fall.

Plus three 600 level BUA classes selected from the MBA required core. Those classes and when they are offered online are: **Fall semester:**

**BUA 601:** Statistical Analysis and Modeling for Organizational Operations. Familiarizes the student with statistical data analysis and management science techniques as they support decision-making throughout an organization.

Prerequisite is any statistics course.

**BUA 605:** Creating & Capturing Value in the Digital Economy. Represents an integration of concepts and principles from the Marketing and Management Information Science disciplines. Prerequisite: BUA 270 Marketing or equivalent, or successful completion of the MBA Marketing Tutorial.

**BUA 651:** Financial Management. An MBA course that provides a foundation in financial management. Prerequisite is financial and managerial accounting, which can be met by taking BUA 400 or two undergraduate courses in financial and managerial accounting; and a principles of finance course or the MBA program's finance tutorial.

### Spring semester:

**BUA 609:** Financial Statement Analysis. This course is designed to help students understand how to use and analyze 1 of 2  
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financial statements for making valuation and business decisions. Prerequisite is financial and managerial accounting, which can be met by taking BUA 400 or two undergraduate courses in financial and managerial accounting.

**BUA 620:** Business Law and Society. Live Section. Introduces managers to current U.S. laws and regulations that impact on the operations of business. This course has no prerequisites.

Alternative 600 level BUA courses may substitute with permission of the MBA Director.

**BUA 626:** Management of Contemporary Organizations. Explores analytical perspectives to understand how individuals organize themselves in accomplishing organizational goals. Applies a managerial approach with a focus on real-life contemporary organizations. Prerequisite is a basic management course or the MBA program's marketing tutorial.

**Summer term:**

**BUA 620:** Business Law and Society. Online Section. Introduces managers to current U.S. laws and regulations that impact on the operations of business. This course has no prerequisites.

Alternative 600 level BUA courses may substitute with permission of the MBA Director.

**Business Certificate Admission Requirements:**

In general, students will be admitted into the certificate program based on the following criteria:

An undergraduate degree from a regionally accredited college or university with a recommended minimum GPA of 3.0.

1. Official transcripts from all institutions attended
2. Two letters of recommendation.
3. International students must meet Graduate School English Language Proficiency requirements.

If a student later desires to apply for the MBA program, GMAT scores may be required.

For more information please visit the <https://umaine.edu/business/>

## **Business Analytics (Certificate)**

The Graduate Certificate in **Business Analytics** is designed for students interested in gaining essential analytical skills to make data-driven business decisions by capitalizing on rich data resources. This certificate provides professional-level education in leveraging big data through advanced analytical tools such as data visualization, predictive modeling and machine learning/artificial intelligence. This certificate is a stand-alone credential or can be combined with the MaineMBA; graduate-level courses taken in the Certificate may transfer to the MaineMBA, upon admission.

For more information, please visit the program <https://umaine.edu/business/mba/>

## **Chemical Engineering**

The Department of Chemical and Biomedical Engineering has well established programs in Chemical Engineering at both undergraduate (B.S.) and graduate (M.S/Ph.D.) levels. The graduate program is designed to prepare student for

careers in research or education. A choice of courses and research topics allows the student to become specialized in specific areas.

Research projects cover a wide area of chemical engineering and include both fundamental and applied topics. The major active research areas include pulping and bleaching processes, coating flows, flow in porous media, rheology, advanced materials, surface chemistry, molecular biophysics, advanced imaging and spectroscopic techniques, nanotechnology, and heterogeneous catalysis. Significant recent funding has improved laboratories and supported students doing research production of fuels and chemicals from biomass.

One unique aspect of the department is the close contact students get with industrial sponsors. This interaction with industry gives the students real life exposure and good contacts. The Paper Surface Science Program is a consortia of companies that meet regularly to review student research. A number of other research projects receive direct support and input from industrial representatives. In addition to industrial support, the department receives significant funding from governmental agencies such as the National Science Foundation, the Department of Energy, the Department of Agriculture, and the Environmental Protection Agency. Some funding recently has been obtained from foundations interested to produce fuels from biomass as well as to use cellulose nanofibers in various packaging applications.

The Department has well-equipped laboratories that include some specialized facilities such as a two-photon microscope, two custom built confocal microscopes, and a comprehensive analytical chemistry suite. The department also has fully equipped pilot plants linked to paper production and biomass conversion to fuels and chemicals. In addition, students have access to other equipment on campus such as equipment in the Frontier Institute for Research in Sensor Technology and the Advanced Structures and Composites Center.

The M.S. degree requires 30 semester hours of graduate work which must include two seminars and six term courses in addition to the thesis. Students holding a B.S. degree in science or other engineering disciplines are also eligible for admission to the M.S. program, although additional make-up courses may be required. The Ph.D. degree requires a minimum of 45 semester hours, beyond the B.S. level, comprising four seminars and at least eight graduate courses (24 credits) in addition to a research thesis. Ph.D. candidates are also required to pass a qualifying examination on chemical engineering fundamentals and to present and successfully defend a thesis proposal. Students who enter the program with a recognized Master's degree may be allowed to transfer up to 30 course credits towards the Ph.D., subject to approval by the Graduate Committee of the Department. Required core courses for the M.S. and Ph.D. degrees are CHE 510, CHE 540, CHE 561 and CHE 580.

Financial assistance is available in the form of graduate assistantships which provide tuition and stipends. Application for admission should be submitted as soon as possible and at least five months in advance of the proposed starting date. Students applying for the fall semester should have their application in by the first of March of that year. Further details of the program and current research projects can be obtained from the Graduate Coordinator of the Department of Chemical and Biomedical Engineering, on request.

### **Graduate Faculty**

**Douglas W. Bousfield**, Ph.D. (California at Berkeley, 1986), Calder Professor. Fluid mechanics, rheology, numerical methods, coating processes, modeling of coating and absorption processes.

**Albert Co**, Ph.D. (Wisconsin, 1979), Associate Professor. Transport phenomena, fluid mechanics, polymeric fluid dynamics, rheology, applied numerical methods.

**William J. DeSisto**, Ph.D., (Brown, 1989), Professor. Advanced material, sensors.

**Caitlin Howell**, Ph.D. (University of Heidelberg, Germany, 2011) Associate Professor. Biological interfaces, bacterial biofilm growth and control, surface-mediated tissue engineering, dynamic materials design.

**Andre Khalil**, Ph.D. (Universite Laval, Canada, 2004). Associate Professor. Computational modeling, image analysis, signal processing, radiomics.

**Michael D. Mason**, Ph.D. (California at Santa Barbara, 2000), Professor. Photophysics of nanoparticles and molecular nanoprobes, single molecule imaging, time-resolved single photon spectroscopic imaging techniques.

**David J. Neivandt**, Ph.D. (Melbourne, 1998), Professor. Conformation of interfacial species, surface spectroscopies/microscopies, binary polymer/surfactant solutions and lipid membrane structures.

**Yonghao Ni**, Ph.D. (McGill, 1992), J. Larcom Ober Professor. Nanocellulose chemistry and materials, pulp-and-paper-based biorefinery technology, smart sensors, and packaging materials.

**Hemant P. Pendse**, Ph.D. (Syracuse, 1980), Professor and Chair. Colloidal phenomena, paper manufacture, fluid particle systems, and instrument/sensor development.

**Thomas J Schwartz**, Ph.D. (Wisconsin, 2015), Associate Professor. Heterogeneous catalysis, reaction kinetics, *in situ* spectroscopy, biomass conversion to fuels and chemicals.

**Karissa Tillbury**, Ph.D. (Wisconsin, 2015), Assistant Professor. 2-photon microscopy, second harmonic generation microscopy, auto-fluorescence, extracellular matrix collagen.

**G. Peter van Walsum**, Ph.D. (Dartmouth College, 1998), Associate Professor. Renewable energy, fuels and chemicals, bioprocessing, process engineering.

**Sarah Walton**, Ph.D. (University of Maine, 2009), Lecturer.

**M. Clayton Wheeler**, Ph.D. (Texas at Austin, 1997), Professor. Chemical Sensors, fundamental catalysis, surface science, and selective sensor materials.

## Chemistry

The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. A wide range of research projects is available in analytical, inorganic, materials, organic, physical, polymer, and sustainable materials chemistry. In addition, many of our faculty are actively engaged in interdisciplinary research projects.

The general requirements for admission to programs leading to advanced degrees are described in the general section of this catalog. Candidates for advanced degrees in the Department of Chemistry typically are expected to have completed the minimum undergraduate program established by the American Chemical Society Committee on Professional Training.

The graduate program in chemistry may include any chemistry courses numbered above 500, along with certain courses numbered between 400 and 500 if approved by the student's advisory committee, or in the first semester of study, by the graduate executive committee of the department. Graduate courses in chemistry include advanced analytical techniques, synthesis, and reaction mechanisms in organic chemistry, molecular modeling and computer simulation methods, physical inorganic and inorganic reaction mechanisms, organometallics, quantum mechanics, molecular spectroscopy and statistical thermodynamics, and sustainable materials chemistry. Special topics courses and seminar courses are also offered. Suitable courses in other departments such as Biochemistry, Chemical and Biological Engineering, Geology, Mathematics, or Physics may also be included in a student's program of study. Thesis-based research is an integral part of the student's training. Research normally comprises about one-half of the 30 semester hours required in a master's degree program and about two-thirds of the work in a doctoral program.



Placement examinations are given to each entering graduate student and are used as a guide in determining the program of study. Comprehensive examinations are part of the doctoral program as described in the general regulations of the Graduate School.

Graduate assistants usually require two years to complete the requirements for a master's degree. The minimum time for completion of requirements for the doctorate is six semesters of full-time study and research beyond the bachelor's degree. Four to five years usually are required.

Graduate assistantships are available to qualified students.

The Five-Year BS-MS degree program allows highly qualified undergraduates of The University of Maine to earn Bachelor of Science and Master of Science degrees in five years instead of the normal six-year period. It is designed for a small number of very able students who wish to prepare for graduate school or medical school, or for direct employment where a master's degree has become a distinct advantage in seeking professional positions in industry. Some electives for the bachelor's degree are replaced by courses in chemistry, which count toward the graduate degree. Further information about research projects and curriculum requirements is available from the Chair of the Chemistry Department and the department web site: <http://www.umaine.edu/chemistry/>

## Graduate Faculty

**François G. Amar**, Ph.D. (Chicago, 1979), Professor of Chemistry and Member of the Honors faculty (former Dean of Honors College and past Chair of Chemistry). Physical chemistry; computer simulation of reaction dynamics in molecular, ionic, and metallic clusters, theory of photoelectron spectra of clusters; gas-surface dynamics; biofuel catalysis; optical and elastic properties of microspheres. Chemical education research: analogical reasoning in chemistry; role of gesture in student and teacher interactions; active learning strategies for large classes and laboratories; differentiated instruction in chemistry teaching. Honors: collaborative and community engaged undergraduate research; international collaborations; fostering the liberal arts core.

**Matthew Brichacek**, Ph.D. (Cornell Univ., 2010), Associate Professor. Design, synthesis, and evaluation of biologically active compounds. Development of new reaction methodologies to enable the facile synthesis of complex biomolecules.

**Alice E. Bruce**, Ph.D. (Columbia Univ., 1985), Professor and Chair. Inorganic, organometallic and bioinorganic chemistry; synthesis, structure and reactivity of gold(I) clusters; thiolate-disulfide exchange; detection of environmental mercury(II) using nanostructured supports.

**Mitchell R. M. Bruce**, Ph.D. (Columbia Univ., 1985), Professor. Inorganic, bioinorganic, and organometallic chemistry involving synthesis and reaction mechanisms; zinc and gold mediated thiol-disulfide exchange; metal-protein chemistry; electrochemical redox processes; calculations; reactivity of mercury and late transition metals; active learning strategies in class and laboratory.

**Barbara J. W. Cole**, Ph.D. (Washington, 1986), Professor, Chemistry of sustainable materials including wood and paper, carbohydrates, lignin, and biologically active plant extracts; high-value bioproducts.

**Scott Collins**, Ph.D. (Brigham Young Univ., 1980), Professor, Chemistry; Professor, Graduate School for Biomedical Sciences and Engineering; Professor and Member, Frontier Institute for Research in Sensor Technologies (FIRST); Co-Director, MicroInstruments and Systems Laboratory (MISL). Micro and Nano Fabrication, nanoscience, electrochemistry of semiconductors, BioMEMS, fractal phase transitions, embryology.

**Brian G. Frederick**, Ph.D. (Cornell, 1991), Associate Professor, and Member, Frontier Institute for Research in Sensor Technologies (FIRST) and FBRI (Forest BioProducts Research Institute). Physical chemistry, surface science and catalysis, biofuels and value-added chemical, materials characterization, spectroscopy, reaction mechanisms, quantum

mechanical modeling.

**William M. Gramlich**, Ph.D. (University of Minnesota, 2012), Associate Professor and Graduate Program Coordinator. Synthesis and characterization of polymers and materials that are used as renewable materials and composites, modular and stimuli responsive hydrogels for drug delivery and tissue engineering, and coatings to prevent and detect biofouling and infections.

**Howard Patterson**, Ph.D. (Brandeis, 1968), Professor Emeritus. Physical/inorganic and analytical/environmental Chemistry. Light-induced photochemical changes and optical memory in mixed metal systems. Development of inorganic chemical sensors for the detection of harmful compounds. Synthesis and characterization of novel catalysts which convert low molecular weight hydrocarbons into usable high molecular weight products. Photo-destruction and detection of organic pollutants in water using photocatalysts.

**Jayendran C. Rasaiah**, Ph.D (Pittsburgh, 1965). APS fellow (2006), Professor Emeritus. Theory and simulation of liquids, electrolyte solutions, polar fluids and ion mobility. Water structure and flow in carbon nanotubes and confined systems. Dynamics of electron and proton transfer. Helix formation of polypeptides in tunnels. ab-initio and DFT calculations of molecular energy, structure and dynamics.

**Carl P. Tripp**, Ph.D. (University of Ottawa, 1988), Professor of Chemistry and Member of FIRST (Frontier Institute for Research in Sensor Technologies). Surface chemistry of materials, infrared and Raman spectroscopy, chemical sensors, thermoelectric devices, sol-gel synthesis of metal oxides, polyelectrolyte/surfactant adsorption on surfaces, silane reactions on metal oxides, photocatalysts for water purification, molecular studies of paper coatings, supercritical fluids.

## Civil Engineering

The Department of Civil and Environmental Engineering offers Master of Science (M.S., thesis and non-thesis options), and Doctor of Philosophy (Ph.D.) degrees. Areas of study and concentrations include Environmental Engineering, Geotechnical Engineering, Structural Engineering and Mechanics, Water Resources Engineering and Transportation Engineering at the masters and doctoral levels. In addition, the Department offers an accelerated Master of Engineering (M.E.) degree program (4 + 1, non-thesis) with a concentration in Water and Environment. Areas of study/concentration within Civil and Environmental engineering are aligned with University of Maine's Signature Research Areas (Marine Sciences, Climate Change, Advanced Materials in Infrastructure and Energy, Sustainability Solutions and Technologies).

### Environmental and Water Resources Engineering

The Environmental and Water Resources Engineering areas focus on qualitative and quantitative aspects of marine and inland surface waters, groundwater and wetland environments within the broad context of environmental sustainability. The programs allow for study in environmental engineering including biological and chemical aspects of water quality and remediation; water resources engineering including surface and groundwater hydrology, hydroclimatology, and adaptive environmental management; and coastal engineering including river and estuarine mixing and transport processes, and the hydrodynamic and morphodynamic impact of waves, tides and storm surge on estuaries and coasts. Interdisciplinary approaches incorporating environmental and water resources engineering course work and content, and intersecting with other departments' related programs are encouraged.

The University of Maine is fortunate to be located in a region having an extensive and diverse system of lakes, streams, and rivers, providing one of the finest outdoor laboratories in the world for research on water quality and quantity. The Environmental Chemistry, Environmental Microbiology and Water Resources Laboratories are equipped with essential

sample preparation, analytical chemistry, anaerobic cultivation, molecular biology and computing equipment. State of the art low detection level analytical capabilities, microscopy and sequencing facilities are also available on campus.

A program of study can be planned in one of the following areas:

*Environmental engineering:* Physical, chemical and biological processes affecting water quality; freshwater and marine pollution control; water and wastewater treatment; environmental nanotechnology; hazardous wastes; solid waste management; pollutant, element and nutrient cycling.

*Water resources engineering:* Surface and groundwater hydrology, hydroclimatology, coastal engineering, river and estuarine mixing and transport processes, wave, tide and sediment dynamics in estuaries, hydrologic response to climate change and adaptive environmental management and policy.

### **Geotechnical Engineering**

The geotechnical engineering graduate program provides opportunities for specialized training and research in soil mechanics, unsaturated/gassy soil mechanics, thermal soil mechanics, slope stability, soil-structure interaction, and design of foundations and earth retention structures. Students in the program may choose either a thesis option, conducting fundamental research or research applied to practical engineering problems, or a professional practice option without a thesis.

Graduate courses are offered in advanced soil mechanics, thermal soil mechanics, rock mechanics, advanced laboratory and in situ testing methods, slope stability, shallow and deep foundations, earth retaining structures, and ground improvement techniques, soil erosion, and geosystems modeling. Additionally, students have the opportunity to incorporate coursework across disciplines, such as structural and environmental engineering courses offered by the department, Earth Sciences, and other disciplines.

Research opportunities are available to study: behavior of soft and stiff clays; investigation of natural hazards in land, coastal, and near-shore environments related to formation, failure, improvement, prevention, and engineering; soil structure interaction using full scale installations and/or modeling of scaled systems, specifically for offshore foundations and piled systems; onshore and offshore site characterization employing in situ, geophysical, and laboratory methods; dynamic behavior of soils during impact and advanced modeling of geosystems using the finite element method and the material point method. thermal behavior of soils related to energy transfer, permafrost vulnerability and cold regions engineering; and application of reliability in geotechnical engineering.

### **Structural Engineering and Mechanics**

The program offers graduate courses and opportunities for advanced research in several areas of structural mechanics and design. These include the development of innovative materials and structural systems to solve problems in traditional civil infrastructure, marine facilities, building structural systems, and non-traditional applications. Particular areas of strength are composite materials, including wood-based, polymer matrix, and cement-based systems, as well as innovative computational modeling approaches.

Research opportunities are available in structural systems for offshore wind power, the development of lightweight modular blast-resistant structural systems, bio-based materials and renewable systems, characterization and processing techniques for composite materials, the use of composite materials in civil infrastructure, structural health monitoring, experimental micromechanics, bridge engineering, and timber engineering. Projects are often inter-disciplinary, and closely integrate experimental and analytical/computational research. Many student projects are conducted in the Advanced Structures and Composites Center ([composites.umaine.edu](http://composites.umaine.edu)), a state-of-the-art facility for material processing and fabrication, small scale testing and characterization, and large scale structural testing.

Required and elective graduate courses and seminars are offered in the Civil and Mechanical Engineering departments that cover the areas of structural design, structural mechanics, structural dynamics, numerical methods, composite materials, bridge engineering, fracture mechanics, experimental mechanics, and related topics. The program is research oriented and sufficiently flexible to permit students to develop their interests and individual objectives.

### **Transportation Engineering**

The Transportation engineering graduate program provides opportunities for specialized training and research in Transportation Engineering, highway safety and operations, and Transportation systems and planning. Graduate courses are offered in Engineering Systems and Optimization, Advanced Transportation Planning, Transportation Operations and Highway Safety. Additionally, students have the opportunity to incorporate coursework across disciplines, such as Geographic information system (GIS), Statistics, Econometrics and Machine Learning.

Research opportunities are available to study include but not limited to traffic safety and operations, analysis of crash data, transportation data and data analytics, transportation planning and connected and automated vehicles.

## **General Information**

Applicants for the M.S. and M.E. degree programs should normally have a B.S. degree in Civil Engineering from an accredited institution. Applicants who do not meet this requirement may find it necessary to take certain courses without receiving graduate credit. A grade point average of at least 3.0 is usually required for admittance. Candidates with a grade point average less than 3.0 can be accepted based on sufficient evidence of satisfactory performance.

Candidates for the M.S. (thesis option) degree are required to take 24 credit hours of coursework, 12 of which must be 500-level and higher. A thesis is required for which at least six credit hours can be awarded. Candidates for the M.S. (non-thesis option) degree are required to take 30 credit hours of coursework, 12 of which must be 500-level and higher.

The M.E. degree is offered only with a concentration in Water and Environment. Candidates for the M.E. degree are required to take 30 credit hours of approved coursework, 12 of which must be 500-level and higher. Up to nine credits of approved senior-level undergraduate engineering or science courses counted toward the B.S. degree requirements may also be counted toward the 30-credit M.E. degree requirement for students who have been formally admitted to and successfully complete the M.E. degree. Three hours of M.E. or M.S. (non-thesis) course work can be replaced by a project with a written technical report. An M.S. thesis student is typically not allowed to change to the M.E. program. A student changing programs within the Department must have the approval of all members of the student's advisory committee and the Graduate Coordinator.

The Ph.D. degree is granted in recognition of high scholastic attainment in some area of civil engineering in concert with a demonstrated ability for independent research. The preparation and defense of a thesis embodying the results of an original investigation in a specialized area of civil engineering are essential features of the program. The program for the Ph.D. carries a minimum residency requirement of two academic years and a course credit requirement of 42 credit hours, at least 12 of which must be 500-level and higher, or the equivalent, beyond the B.S. degree. Transfer credit of up to 24 credit hours and one academic year of residency may be accepted. In view of the wide variety of specialized areas embodied in Civil and Environmental Engineering, the student's program of study will be established in consultation with the graduate committee. Before admission to candidacy for the Ph.D., a student must successfully complete a qualifying examination designed to test the student's area of expertise. The qualifying examination will normally be taken as soon as possible after the student has completed the graduate school requirement of one and one-half years of study beyond the bachelor's degree. No foreign language requirement is included in the program.

All students matriculating into M.S (thesis option) or Ph.D. programs must pass one credit of Responsible Conduct of Research (RCR) training prior to completing the degree, preferably prior to commencing the research. At the advisory committee's or Graduate Coordinator's discretion, this credit may be substituted for one of the 6 required thesis/dissertation credits (CIE 699).

The following table summarizes credit requirements:

Degree program	Total credits	Course credits (min.)*	Thesis credits (min.)
M.S. (thesis)	30	24	5 Thesis + 1 RCR
M.S. (non-thesis)	30	30	0
M.E. (Water and Environment)	30	30, incl. 9 carried over from the B.S. degree	0
Ph.D.	48	42	5 Thesis + 1 RCR

\* At least 12 credits must be 500-level and higher

Financial assistance is available for graduate students from several sources, including teaching and research assistantships. Additional information regarding the graduate program is available at:  
<https://civil.umaine.edu/graduate-students/>

## Graduate Faculty

**Onur G. Apul**, Ph.D., P.E. (Clemson University, 2014) Assistant Professor. Environmental engineering; water treatment, environmental nanotechnology, adsorption of synthetic organic compounds by carbon adsorbents, environmental organic chemistry, aquatic chemistry.

**Dana N. Humphrey**, Ph.D., P.E. (Purdue University, 1986), Professor and Dean. Geotechnical engineering, reinforced embankments, soil stabilization, behavior of stiff clay, use of waste materials in construction.

**Habib J. Dagher**, Ph.D., P.E. (University of Wisconsin, 1985), Professor. Probabilistic mechanics, timber structures, advanced wood composites, concrete structures, bridges.

**Bill Davids**, Ph.D., P.E. (University of Washington, 1998), Bodwell University Distinguished Professor. Structural engineering and computational mechanics; numerical modeling and finite element analysis; inflatable structures; bridge engineering; application of composites in civil infrastructure.

**Aaron Gallant**, Ph.D., P.E. (Northwestern University, 2014), Assistant Professor. Geotechnical engineering; ground improvement, soil-structure interaction, fundamental behavior of saturated and unsaturated/gassy soils, full-scale instrumentation & modeling.

**Per Garder**, Ph.D., P.E. (Lund University, 1982), Professor. Transportation planning; forecasting, design & evaluation with emphasis on traffic safety & environmental aspects.

**Kimberly Huguenard**, Ph.D. (University of Florida, 2013), Associate Professor. Coastal engineering, coastal physical oceanography, estuarine physics and aquaculture with emphasis on turbulent processes.

**Shaleen Jain**, Ph.D., P.E. (Utah State, 2001), Professor and Chair. Hydrology and water resources engineering, hydroclimatology, environmental sustainability, adaptive management.

**Eric N. Landis**, Ph.D., P.E. (Northwestern University, 1993), Frank M. Taylor Professor. Experimental mechanics, nondestructive evaluation, fracture, microstructure-property relationships for construction materials.

**Roberto Lopez-Anido**, Ph.D., P.E. (West Virginia University, 1995), Malcolm G. Long Professor. Mechanics of polymer matrix composites for infrastructure; modeling, design and experimental characterization of advanced composite systems; fatigue and durability of composite materials for construction; engineered wood composites; methods of structural analysis.

**Jean MacRae**, Ph.D. (University of British Columbia, 1997), Associate Professor. Biological treatment of wastes, resource recovery, food waste management, bioremediation, nutrient cycling, environmental microbiology.

**Edwin Nagy**, Ph.D., P.E., S.E. (University of Maine, 2010), Lecturer. Structural engineering, structural steel design, wood structures.

**Lauren Ross**, Ph.D. (University of Florida, 2014), Assistant Professor. Estuarine, fjord and coastal hydrodynamic processes, marine renewable energy, analytical and numerical modeling of flow and sediments in semi-enclosed basins, physics of internal waves and tides.

**Ali Shirazi**, Ph.D. (Texas A&M University, 2018) Assistant Professor. Transportation engineering, transportation safety, transportation data and data analytics, fundamental work in traffic safety, transportation systems.

**Luis E. Zambrano-Cruzatty**, Ph.D. (Virginia Tech, 2021), Assistant Professor. Geotechnical engineering; soil-structure interaction, constitutive modeling of soils, advanced modeling of geosystems, material point method, riverine and coastal erosion.

## Classroom Technology Integrationist (Certificate)

### Certificate in Classroom Technology Integration

*A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine*

Educators are increasing their use of technology across curriculum areas; and this certificate is designed to provide the knowledge and skills to integrate technology into teaching and learning. Learner outcomes will be around advancing student learning, creativity, and innovation in both face-to-face and virtual environments; design, development and evaluation of authentic learning experience and assessment using contemporary tools; and finally learner outcomes will include global societal issues and responsibilities in the digital age.

### Required for the Certificate in Classroom Technology Integration

- EDT 520 Digital Age Teaching and Learning Methods
- 9 credits of approved EDT electives, check here for options.

For more information: <https://online.umaine.edu/contact-us/> or [umaineonline@maine.edu](mailto:umaineonline@maine.edu)

## **Climate Change Institute (Interdisciplinary Climate Studies) (Certificate)**

The Climate Change Institute graduate certificate in **Interdisciplinary Climate Studies** is designed to provide interdisciplinary climate expertise to people from various disciplines. The educational objectives of this graduate certificate are for students to gain an understanding of the Earth's physical and chemical climate system; gain an understanding of the relationships among climate, ecosystems, and humans; develop basic proficiency with climate analysis tools; strengthen key professional skills in interdisciplinary science, including communication to various audiences, collaborative skills, and proposal development.

The CCI graduate certificate in Interdisciplinary Climate Studies has 9 credits of required courses:

1. **ERS 542 Atmosphere, Ocean, Ice & Climate Change** (3 credits)
2. **ANT 501/BIO 501 Climate, Culture, and the Biosphere** (3 credits) or **ANT 530 Human Dimensions of Climate Change**
3. **INT 500 Interdisciplinary Applications of Climate Science** (3 credits)

For more information on the certificate program contact the Climate Change Institute. Applications can be made through the Graduate School.

## **Climate Change Institute (Quaternary and Climate Studies)**

The Quaternary Period, the most recent in Earth's history, witnessed numerous climatic fluctuations, glaciations, sea-level changes, and shifts in organism distribution. These changes shaped our contemporary environments and strongly influenced human evolution. A knowledge of Quaternary events facilitates understanding of current environmental changes and may enable anticipation of future changes. Maine was particularly affected by Quaternary events because its landscape was shaped largely by glaciation and its biota was influenced strongly by climatic change.

Quaternary and Climate Studies commonly are interdisciplinary and thus require cooperation between several academic departments. To facilitate such cooperation, the Climate Change Institute, dedicated to teaching and research, was established at The University of Maine in 1972. The Institute is staffed by members of the Departments of Anthropology, Computer Science, History, and the School of Earth and Climate Sciences, School of Biology and Ecology, and School of Marine Sciences. The Institute is not a formal academic department. Rather, it is a research unit and serves to organize and promote interdepartmental teaching and research related to Quaternary and Climate Studies.

The Climate Change Institute offers a Master of Science degree in Quaternary and Climate Studies. The program provides students with training in the anthropology/archaeology, biology, climatology and/or geology of the Quaternary Period and contributes to an appreciation of the interaction of these fields towards a better understanding of Quaternary paleoclimatology, paleoecology, and prehistoric archaeology. Many of the courses pertinent to the

Quaternary Period are listed under offerings by cooperating departments. Graduate thesis credits are arranged by the staff.

The Certificate of Interdisciplinary Climate Studies is a three-course sequence that addresses the needs and interests of graduate students both in CCI as well as those in programs outside of CCI. Currently, many graduate students in CCI obtain degrees in our affiliated departments; they have requested a way to distinguish their climate expertise on their diploma. In addition, there are many graduate students outside of CCI who have expressed an interest in developing interdisciplinary climate expertise.

The certificate benefits current graduate students in CCI by providing formal recognition of their interdisciplinary climate training.

Research interests of staff members focus on historically oriented problems of the Quaternary Period. These interests overlap and complement each other to a degree which insures cooperation, and encourages interdisciplinary approaches and joint research projects. Graduate students may pursue interdisciplinary thesis projects and will be supervised jointly by several staff members. Although much Institute research is conducted in New England and adjacent Canada, projects are also current in the western and northeastern United States, Canada, India, Nepal, China, the Arctic, New Zealand, Sweden, Norway, Chile, Antarctica, Peru, and Cuba.

### **Financial Aid**

Research assistantships are available on a competitive basis through both the Climate Change Institute and the Graduate School.

### **Graduate Faculty**

**Katherine Allen**, Ph.D. (Columbia, 2013), Assistant Professor of Earth and Climate Sciences. Paleooceanography.

**Daniel F. Belknap**, Ph.D. (Delaware, 1979), Emeritus Professor of Earth Sciences, Center for Marine Studies, Quaternary and Climate Studies, and Oceanography. Marine geology, quaternary stratigraphy, and sedimentology.

**Sean Birkel**, Ph.D. (Maine, 2010), Research Assistant Professor of Earth and Climate Science. Climatology.

**Fei Chai**, Ph.D. (Duke, 1995), Professor of Marine Sciences and Quaternary and Climate Studies. Ecosystem modeling, tropical oceanography, El Niño, ocean carbon cycle.

**Sudarshan S. Chawathe**, Ph.D. (Stanford, 1999), Associate Professor of Computer Science. Semistructured data, streaming data, peer-to-peer systems, autonomous environments, data exploration and mining, differencing, and change management.

**George H. Denton**, Ph.D. (Yale, 1965), Professor of Earth Sciences and Quaternary and Climate Studies. Paleoecology of lakes and glacial geology.

**Ann Dieffenbacher-Krall**, Ph.D. (Maine, 1998), Associate Research Professor of Quaternary and Climate Studies. Paleoecology.

**James L. Fastook**, Ph.D. (Maine, 1976), Professor of Computer Sciences. Numerical modeling of glaciers and ice sheets.

**Ivan J. Fernandez**, Ph.D. (Maine, 1981), Professor of Soil Science, Biogeochemistry and forest ecosystems.

**Jacquelyn Gill**, Ph.D. (Wisconsin, 2012), Associate Professor of Paleoecology and Plant Ecology. Paleoecology, biogeography, vegetation, extinction, climate change, plant-herbivore interactions.

**Brenda Hall**, Ph.D. (Maine, 1997), Professor of Earth Sciences and Quaternary and Climate Studies. Glacial geology, geomorphology, geochronology.



**Cindy Isenhour**, Ph.D. (Kentucky, 2010), Associate Professor of Anthropology. Climate policy, embodied energy, consumption.

**George L. Jacobson Jr.**, Ph.D. (Minnesota, 1975), Professor Emeritus of Plant Biology and Quaternary and Climate Studies. Paleocology and plant ecology.

**Shaleen Jain**, Ph.D. (Utah State, 2001), Professor of Civil and Environmental Engineering. Hydroclimatology, water resources engineering, climate variability and change, adaptive environmental management and decision making.

**Alice Kelley**, Ph.D. (Maine, 2006), Associate Research Professor, Geoarchaeology, surficial geology, and geomorphology.

**Joseph T. Kelley**, Ph.D. (Lehigh, 1980), Professor of Earth Sciences. Marine geology, sea level change.

**Peter O. Koons**, Ph.D., (Swiss Federal Institute of Technology, 1983), Professor of Earth Sciences. Geodynamics.

**Karl Kreutz**, Ph.D. (New Hampshire, 1998), Professor of Earth and Climate Sciences. Paleoclimate, glaciology, geochemistry.

**Andrei Kurbatov**, Ph.D. (SUNY Buffalo, 2001), Associate Research Professor of Quaternary and Climate Studies. Explosive volcanism, tephrochronology, glaciochemistry.

**Bradfield Lyon**, Ph.D. (MIT, 1991), Associate Research Professor of Earth and Climate Studies. Climate analysis, climate extremes, climate change, impacts of climate variations.

**Kirk A. Maasch**, Ph.D. (Yale, 1989), Professor of Earth Sciences and Quaternary and Climate Studies. Theory of climate.

**Paul Andrew Mayewski**, Ph.D. (Ohio State, 1973), honorary Ph.D. (Stockholm University, 2000), Director and Professor, Climate Change Institute and Professor of Earth Sciences. Climate change and atmospheric chemistry.

**Steve A. Norton**, Ph.D. (Harvard, 1967), Professor Emeritus of Earth Sciences and Quaternary and Climate Studies. Paleolimnology, environmental chemistry, isotope geochemistry.

**Brian Olsen**, Ph.D. (Virginia Tech, 2007), Associate Professor of Biology and Ecology. Evolutionary ecology and ornithology.

**Aaron Putnam**, Ph.D. (Maine, 2010), Associate Professor of Earth and Climate Sciences. Glacial geomorphology and geochronology, climate dynamics.

**Paul "Jim" Roscoe**, Ph.D. (Rochester, 1983), Professor of Anthropology. Anthropology of climate change, warfare, social and political evolution.

**Daniel H. Sandweiss**, Ph.D. (Cornell, 1989), Professor of Anthropology and Quaternary and Climate Studies. Prehistoric and historic archaeology, coastal adaptations, climate change.

**David Sanger**, Ph.D. (Washington, 1967), Professor Emeritus of Anthropology and Quaternary and Climate Studies. Prehistoric archaeology, coastal adaptations, hunter-gatherers.

**Jasmine Saros**, Ph.D. (Lehigh University, 1999), Professor of Biological Sciences and Quaternary and Climate Studies. Paleocology.

**Molly Schaffler**, Ph.D. (Maine, 2003), Assistant Research Professor of Quaternary and Climate Studies. Paleocology, environmental science education.

**Marcella H. Sorg**, Ph.D. (The Ohio State University, 1979), Research Associate Professor in the Margaret Chase Smith Policy Center, Department of Anthropology, and Climate Change Institute. Adjunct Professor of Anthropology

and Consultant to the Office of Chief Medical Examiner in Maine. Forensic Anthropology, taphonomy of human remains.

**Gregory Zaro**, Ph.D. (New Mexico, 2005), Associate Professor of Anthropology and Quaternary and Climate Studies. Archaeology, historical ecology, agricultural intensification, urbanism, Mesoamerica, Andes, Eastern Adriatic.

#### **Associated Faculty**

**Robert W. Kates**, Ph.D. (University of Chicago, 1962), Presidential Professor of Sustainability Science. Sustainability transition, global and local climate change, prevalence and persistence of hunger, long-term population dynamics, theory of the human environment, sustainability science.

**David Keefer**, Ph.D., (Stanford, 1977), Adjunct Research Professor. Earthquake-induced landslides, geomorphology and hillslope processes, Quaternary Geology, Engineering Geology, Geoarchaeology.

**Bruce Smith**, Ph.D. (Michigan, 1973), Curator, North American Archaeology, Senior Research Scientist, Archaeobiology Program, National Museum of Natural History, Washington D.C. Archaeobiology, domestication, niche construction, archaeology.

**J. Curt Stager**, Ph.D. (Duke University, 1985), Professor, Natural Sciences, Paul Smith's College, NY. Tropical climate changes of the last millennium.

**Melinda Zeder**, Ph.D. (Michigan, 1985), Curator of Old World Archaeology and Archaeozoology, Senior Research Scientist, Archaeobiology Program, National Museum of Natural History, Washington D.C. Domestication, agricultural origins, archaeozoology, Near Eastern archaeology.

#### **External Faculty**

**Nancy Bertler**, Ph.D., Assistant Research Professor, Climate Change Institute, University of Maine.

## **Communication**

The Department of Communication and Journalism offers a M.A. and Ph.D. in Communication. Doctoral students also choose an external concentration from areas such as English, History, Psychology, Women's Studies, and more. Both degrees provide students with a) a broad understanding of historical and contemporary theories; b) the research skills necessary to explore and contribute knowledge; and c) the ability to apply their knowledge in varied settings. All students are expected to demonstrate a holistic understanding of theory and research and to be competent analysts of literature appropriate to their program of study. Both degrees encourage the integration of knowledge from among diverse approaches. The Master's program provides students with a broad foundation for doctoral study and for employment as communication professionals. The doctoral program prepares students to a) become a faculty member or join an appropriate profession; b) conduct research utilizing theories and methods blended from different disciplines; and c) make linkages between disciplines and professions.

Our faculty expect students to develop active research independent of class projects, and to rigorously, creatively challenge knowledge presented by instructors and other students in class. Master's students may choose to pursue either a thesis or a research paper option as part of their program of study. Doctoral students complete a dissertation and comprehensive exam as part of their program. UMaine faculty support graduate students in producing research, whether it is challenging or revising accepted theory or creating new knowledge.

# Program Requirements

The curriculum is designed to provide students with both a central grounding and the flexibility to develop individual interests in Communication. The program of study in each area is designed to be completed over two years of full-time enrollment for Master's students, and at least three years for doctoral students, but may also be completed on a part-time basis over a longer time period. Each course is typically offered once in a two year cycle.

## Financial Information

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the Department offers graduate assistantships to qualified students. Graduate assistants teach six credit hours a semester (three hours during the first semester of teaching) in interpersonal communication, public speaking, storytelling, or journalistic writing and editing courses. Teaching assistants are carefully supervised and must take a course in communication pedagogy so that they develop instructional skills useful in later careers.

Assistantships are nine-month appointments that include tuition waiver and monthly stipends. Applicants interested in an assistantship should so indicate in their initial application for admission. Additional information about departmental graduate work can be found in the CMJ Graduate Student Handbook, also available by contacting the department's Graduate Coordinator, Dr. Laura Rickard ([larura.rickard@maine.edu](mailto:larura.rickard@maine.edu)).

## MASTER OF ARTS

### Requirements

A student completes required "core" courses, courses relevant to an area of emphasis, and electives. Students must complete 32 credit hours total (or 33 if they are Teaching Assistants).

1. Core (20 or 21 credits, contingent on Teaching Assistant status):
  - a. Required Courses (11 credits):
    - CMJ 515 Mass Communication Theory (Credits: 3)
    - CMJ 600 Introduction to Graduate Study in Communication (Credits: 2)
    - CMJ 601 Seminar in Research Methods (Credits: 3)
    - CMJ 608 Communication Theory (Credits: 3)
  - b. One additional research methods course selected from below (3 credits):
    - CMJ 503 Critical Historiography of Rhetoric (Credits: 3)
    - CMJ 603 Seminar in Rhetorical Criticism (Credits: 3)
    - CMJ 604 Qualitative Communication Research Methods (Credits: 3)
  - c. Two CMJ seminars in a Communication or Mass Communication "area of emphasis" (6 credits): See list of courses under "Electives" below. Tracked courses to be approved by Advisory Committee.
  - d. Teaching Pro-seminar [required only for CMJ Teaching Assistants] (1 credit)
    - CMJ 602\* Teaching Communication in College (Credit: 1)

\*All Graduate Teaching Assistants are required to enroll in CMJ 602 in their first Fall semester.

2. Electives (12 credits):

a. Departmental Electives

- CMJ 503 Critical Historiography of Rhetoric (Credits: 3) [if not used as methods requirement]
- CMJ 506 Rhetorical Theory: Civic Tradition (Credits: 3)
- CMJ 510 Critical Studies in Mass Communication (Credits: 3)
- CMJ 520 Media History (Credits: 3)
- CMJ 525 Propaganda and Political Communication (Credits: 3)
- CMJ 540 Social Media and Digital Cultures (Credits: 3)
- CMJ 545 Media Ecology (Credits: 3)
- CMJ 580 Environmental Communication (Credits: 3)
- CMJ 593 Topics in Communication (Credits: 3) [may be repeated with new content]
- CMJ 602 Teaching Communication in College (Credit: 1) [if not used as a TA requirement]
- CMJ 603 Seminar in Rhetorical Criticism (Credits: 3) [if not used as methods requirement]
- CMJ 604 Qualitative Communication Research Methods (Credits: 3) [if not used as methods requirement]
- CMJ 605 Communication in Organizations (Credits: 3)
- CMJ 606 Rhetorical Theory: Critical Tradition (Credits: 3)
- CMJ 610 Risk Communication (Credits: 3)
- CMJ 695 Graduate Internship (up to 3 credits; approval required)
- CMJ 698 Contemporary Issues in Human Communication (Credits: 3)

b. Outside Electives: Up to 6 credits of elective course work outside of CMJ may replace Departmental electives:

- if the courses are applicable to the student's research interests, and
- if the student receives unanimous approval from the student's Advisory Committee

3. Thesis Credits (Optional): If the MA thesis option is selected, 6 credits replace Elective course work.

- CMJ 699 Graduate Thesis (1-6 credits per term, repeatable for 6 credits total)

4. Final Project: Students' thesis or research paper will reflect their area of emphasis.

## DOCTORATE

Doctoral students have flexibility in designing their program of study. A student must take a minimum of 90 hours of graduate coursework (including approved transfer credits from his or her Master's degree), with at least 60 hours beyond the Master's. At least 48 of those 90 hours must be in primary Communication graduate courses, and at least 18 hours must be in an external concentration area. Across the major and concentration, students are also required to take a minimum of 12-15 credit hours each in appropriate theory and methods coursework, to complete a comprehensive examination, and to write a dissertation that draws on and synthesizes the program coursework.

There are two ways to break down the credit hours for the doctorate. The first way is by major and concentration. Note that the 66 minimum hours of coursework includes up to 30 hours from the MA degree.

## Coursework by Degree & Discipline

Credits from MA

30 maximum

Hours in Communication

48 minimum (including MA)

Hours in Concentration Area	18 minimum (including MA)
Sub-total of Degree & Discipline Hours	66 credit hours minimum
Dissertation Hours	12-24 credit hours
Total Hours in the Ph.D. Program	90 credits minimum

The second way to break down the credit hours for the doctorate is by course type. Note that students are required to take an appropriate number of theory and methods courses in their concentration so as to be conversant and competent in the forms of research particular to that concentration. The student's advisory committee will help determine what "appropriate" means in his or her case.

## Coursework by Course Type

Methods:	Communication	12-15 credit hours
Theory:	Communication	12-15 credit hours
Content:	Communication	36-42 credit hours
Sub-total of Method, Theory and Content Hours		66 credit hours minimum
Dissertation Hours		12-24 credit hours
Total Hours in the I.Ph.D. Program		90 credit hours minimum

## General Information

In the first semester, a temporary advisor will be appointed; for all MA students, this advisor is the Graduate Coordinator. Students work with this faculty member in developing their plans for their program of study. The official program must be turned in to the Graduate School after completing 12 hours of course work or prior to the third registration (i.e., during the second semester of a two-year or four-semester program). During the first year (semesters one and two) students select their official advisory committee for either a thesis or non-thesis program. For Master's students, three faculty members are required for the official committee; at least two must be members of the Graduate Faculty in Communication. For doctoral students, five faculty members are required for the official committee; three Graduate Faculty in Communication are required, as well as two Graduate Faculty from the student's external concentration. All members of a student's official committee must approve the program of study. The official committee must also approve changes to the program of study once it has been submitted. Students may change members of the committee as necessary and appropriate.

## Master's Program Research Options

### Research Paper Option.

The student must prepare and present a research project. Although the non-thesis project is not as extensive as the thesis, the research paper must evidence critical thinking. The student defends the research paper in an oral examination.

**Thesis Option.** Students electing the thesis option enroll in CMJ 699 for a maximum of six (6) hours. The student's official advisory committee must approve a thesis prospectus prior to the student undertaking the research. After the thesis is completed, the student defends the research in an oral examination with the official advisory committee.

## Doctoral Program Research Option

**Dissertation.** After completing a comprehensive examination, doctoral candidates enroll in CMJ 699 for a maximum of twenty-four (24) hours. The comprehensive exam is a timed essay exam based on questions developed by the committee in consultation with the student. Post-exam, the student's official advisory committee must approve a dissertation prospectus prior to the student undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

### Graduate Faculty

**Amelia Couture Bue**, Ph.D. (University of Michigan, 2020), Assistant Professor. Media psychology, body image, empowerment, eye-tracking and psychophysiological methods.

**Paul Grosswiler**, Ph.D. (University of Missouri, 1990), Professor. International mass communication, culture and technology, media ecology

**Liliana L. Herakova**, Ph.D. (University of Massachusetts, 2014), Assistant Professor and Graduate Teaching Coordinator. Health communication, food studies, pedagogy, social justice.

**Bridie McGreavy**, Ph.D. (University of Maine, 2012), Associate Professor and Undergraduate Coordinator. Environmental communication, argument and critical thinking, communication research, sustainability science.

**Laura N. Rickard**, Ph.D. (Cornell University, 2012), Associate Professor and Graduate Coordinator. Risk communication, strategic communication, environmental communication, sustainability, policy.

**Judith E. Rosenbaum**, Ph.D. (Radboud University, The Netherlands, 2007), Associate Professor and Department Chair. Social media, media entertainment, selection and enjoyment, media psychology, health communication.

**Michael J. Socolow**, Ph.D. (Georgetown University, 2001), Associate Professor. History of mass communication, broadcast journalism, sports broadcasting, propaganda.

**Nathan E. Stormer**, Ph.D. (University of Minnesota, 1997), Professor. Rhetorical theory and criticism, medical rhetoric, visual communication.

**Claire F. Sullivan**, Ph.D. (University of Washington, 1991), Associate Professor. Interpersonal communication, health communication, sport communication.

## Communication Sciences and Disorders

The MA program (thesis or non-thesis) provides students with the academic and clinical training associated with the delivery of high quality services in speech-language pathology. Our program extends over a two-year period for regular, full-time students (September entry only). Supervision of clinical experiences is accomplished by experienced clinical faculty and a faculty-student ratio that permits considerable individual attention. In addition to weekly observation of the student's practicum, the supervisor and student have one-hour meetings each week to discuss various aspects of the student's clinical work. Clinical experiences are provided in a variety of settings, with individuals across the lifespan who have a wide range of communication disorders. The Communication Language and Hearing Center is the primary facility where students obtain their first clinical experiences. Additional clinical placements are in hospitals, centers, public and private schools, and community speech and hearing centers. The program welcomes applications from students whose undergraduate degree does not include coursework in communication sciences and disorders. These students are admitted on a Provisional basis, and complete undergraduate courses (along with some graduate courses) during the first year of the graduate program. The Master's program at the University of Maine is accredited by the Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA) of the American Speech-Language-Hearing Association (ASHA), 1015 North 17th Avenue, Suite 100, Rockville, Maryland 20850, 800-498-2071 or 301-296-5700. **Applicants who wish to be considered for Fall admission must submit their application submitted by January 15.** Applicants are typically notified of a decision in early March.

A complete application includes:

- Graduate School Application form (online),
- transcripts of all undergraduate and graduate coursework,
- letters of recommendation from three persons familiar with your academic and/or clinical abilities (preferably from professors with whom you have taken multiple courses), and
- official GRE scores.

Applicants are responsible for monitoring the completion of their application by the above deadline.

### Financial Information

In addition to University fellowships and scholarships listed elsewhere in this catalog, graduate students in Communication Sciences and Disorders may be eligible for graduate assistantships, pending the availability of funds. Assistantships include a partial tuition waiver and a monthly stipend. Applicants interested in these positions are invited to apply once they are admitted to the graduate program. Additional information about the graduate program can be obtained from the Graduate Coordinator, Dunn Hall (Mailing address, 5724 Dunn Hall, Orono, ME 04469-5724, web site: <https://umaine.edu/comscidis/graduate-information/>)

### Graduate Faculty

**Amy E. Booth**, MA, CCC-A (Kent State University, 1987), Lecturer & Staff Audiologist. Audiological assessment, hearing aid fitting, hearing loss rehabilitation.

**Christopher M. Grindrod**, PhD (McGill University, 2004). Assistant Professor & Graduate Coordinator. Aphasia, neurogenic communication disorders, neurolinguistics.

**Nancy E. Hall**, PhD, CCC-SLP (Case Western Reserve University, 1992), Professor & Department Chair. Fluency disorders, developmental language disorders.

**Paige A. Lane**, MA, CCC-SLP (University of Cincinnati, 2001). Lecturer & Staff Speech-Language Pathologist. Early intervention, school-based services.

**Jessica Lewis**, MA, CCC-SLP (University of Maine, 2004). Lecturer & Staff Speech-Language Pathologist. Augmentative and alternative communication, AAC-based therapy.

**Jane Puhlman**, PhD, CCC-SLP (Florida State University, 2015). Assistant Professor. Child language disorders.

**MaryBeth Richards**, MA, CCC-SLP (Marquette University, 1989). Lecturer & Staff Speech-Language Pathologist. Telepractice delivery of speech services.

**Jennifer M. Seale**, PhD, CCC-SLP (State University of New York at Buffalo, 2016). Assistant Professor. Augmentative and alternative communication.

**Judith L. Stickles**, MA, CCC-SLP (University of Maine, 1982). Lecturer, Staff Speech-Language Pathologist & Clinic Director. Language and school-based therapy.

**Judy P. Walker**, PhD, CCC-SLP (University of Massachusetts at Amherst, 1994). Associate Professor. Aphasia, telepractice delivery of speech therapy.

#### **External Faculty**

**Lori Edwards**, MS, CCC-SLP (Northeastern University). Swallowing disorders, motor speech disorders.

**Michael Towey**, MA, CCC-SLP (University of Maine). Voice disorders.

### **Program Requirements in Communication Sciences and Disorders**

#### Core Course Work (44 credits)

- CSD 581 - Articulation and Phonology Disorders (3 credits)
- CSD 582 - Voice Disorders (3 credits)
- CSD 583 - Fluency Disorders (3 credits)
- CSD 584 - Language Disorders in Children: Preschool (3 credits)
- CSD 585 - Language Disorders in Children: School-Age (3 credits)
- CSD 588 - Aural Rehabilitation (3 credits)
- CSD 601 - Seminar in Research Methods (3)
- CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia (3 credits)
- CSD 683 - Seminar in Clinical Procedures (1 credit)
- CSD 684 - Seminar in Clinical Procedures II (1 credit)
- CSD 685 - Diagnostic Process in Speech-Language Pathology (3 credits)
- CSD 686 - Clinical Practicum
- Audiology (1 credit)
- Speech-Language Pathology (5 credits)
- CSD 687 - Swallowing Disorders (3 credits)
- CSD 688 - Neurocognitive Disorders in Adults (3 credits)
- CSD 689 - Motor Speech Disorders (3 credits)

#### Additional Course Work (6 credits)

In addition to the core course work, non-thesis students must complete six credits in elective graduate courses from the department or related disciplines: Education, Psychology, Social Work, Sociology, Nursing, Gerontology, and Special Education. These courses must be approved by the student's advisor. Thesis students will take six credits of CSD 699 instead (see below).

Department policies concerning residency requirements and other matters pertaining to part-time students will be those policies in effect when the student enters his/her program or subsequent policies if elected by the student.

#### Non-Thesis Option

In addition to the course work outlined above, non-thesis students must pass a comprehensive examination. More detailed information on the preparation and evaluation of the comprehensive examination are available in the department's Graduate Program Handbook.

#### Thesis Option



Students electing a thesis option must enroll for thesis credits (CSD 699, minimum six credits required). A thesis prospectus must be approved by the Advisory Committee prior to undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

- CSD 699 - Graduate Thesis/Research (6 credits)

## Program Requirements in Communication Sciences and Disorders

Core Course Work: (41 core credits)

- CSD 581 - Articulation and Phonology Disorders Credits: 3
- CSD 582 - Voice Disorders Credits: 3
- CSD 583 - Fluency Disorders Credits: 3
- CSD 584 - Language Disorders in Children: Preschool Credits: 3
- CSD 585 - Language Disorders in Children: School-Age Credits: 3
- CSD 586 - Current Issues in Clinical Practice Credits: 3
- CSD 588 - Aural Rehabilitation Credits: 3
- CSD 601 - Seminar in Research Methods Credits: 3
- CSD 682 - Current Issues in Aphasia, Right Hemisphere Deficits and Dementia Credits: 3
- CSD 683 - Seminar in Clinical Procedures Credits: 1
- CSD 684 - Seminar in Clinical Procedures II Credits: 1
- CSD 685 - Diagnostic Process in Speech-Language Pathology Credits: 3
- CSD 686 - Clinical Practicum Credits: 1-2  
Audiology Credits: 1  
Speech-Language Pathology Credits: 5
- CSD 687 - Swallowing Disorders Credits: 3
- CSD 688 - Neurocognitive Disorders in Adults Credits: 3
- CSD 689 - Motor Speech Disorders Credits: 3

## Additional Course Work: (6 credits)

In addition to the core course work, non-thesis students must complete six credit hours in elective graduate courses from the department or related disciplines, such as Anthropology, Education, Psychology, Computer Science, Social Work, Philosophy, Communication or Sociology. These courses must be approved by the student's advisory committee. Thesis students will take six credits of CSD 699 instead (see below).

Department policies concerning residency requirements and other matters pertaining to part-time students will be those policies in effect when the student begins his/her program or subsequent policies if elected by the student.

## Non-Thesis Option

In addition to the course work outlined above, non-thesis students must pass a written comprehensive examination. More detailed information on the preparation, procedures and evaluation of the comprehensive examination are available in the department's Graduate Student Handbook.

## Thesis Option

Students electing a thesis option must enroll for thesis credit hours (CSD 699, minimum six credit hours required). A thesis prospectus must be approved by the student's Advisory Committee prior to undertaking the research. After the thesis is completed, the student defends the research in an oral examination.

- CSD 699 - Graduate Thesis/Research Credits: Ar

## Composite Materials and Structures (Certificate)

The University of Maine understands there is a growing demand for engineers and scientists with strong fundamental knowledge and skills necessary for analysis, design, manufacturing, and testing of composite materials and structures. In a collaboration between the College of Engineering and the School of Forest Resources, the **Composite Materials and Structures graduate certificate** builds that knowledge and skills giving students a competitive advantage in the job market.

Through this 12-credit certificate, students will:

- Be introduced to modern composites made of different constituent materials
- Develop skills necessary for analysis, design, fabrication, and testing of modern composite materials and structures
- Establish the suitability of composite materials and structures for various applications

### Curriculum

The courses completed for the graduate certificate may be counted towards a graduate degree per the guidelines of the respective graduate degree program.

Graduate students must complete 12 credits with a minimum grade of C in no more than one course. At least three courses (9 credits) must be at 500 or 600 level.

### Core Courses

The following courses are required (6 credits):

- MEE 441/541: Manufacturing and Testing of Composites (3 credits)
- MEE 450: Mechanics of Composite Materials (3 credits) **OR** CIE 543: Introduction to Composite Materials in Civil Engineering (3 credits)

### Electives

Select two of the following courses (6 credits):

- MEE 550: Mechanics of Laminated Composite Structures (3 credits)
- CIE 644: Advanced Composite Materials in Civil Engineering (3 credits)
- SFR 531: Mechanics of Wood and Wood Composites (3 credits)
- SFR 545: Adhesion and Adhesives Technology (3 credits)
- SFR 550: Wood-Polymer Hybrid Composites (3 credits)
- SFR 570: Cellulose Nanomaterials and Their Composites (3 credits)

For more information please contact the Program Coordinators, Masoud Rais-Rohani ([masoud.raisrohani@maine.edu](mailto:masoud.raisrohani@maine.edu)) and Douglas Gardner ([douglasg@maine.edu](mailto:douglasg@maine.edu)).

## Computational Thinking for Educators

## Computational Thinking for Educators Certificate

*A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine*

The **Graduate Certificate in Computational Thinking for Educators** is a 100% online program that prepares educators to integrate computational thinking education strategies into learning environments and understand its cultural and contextual implications.

The program incorporates the International Society of Technology in Education (ISTE) Computational Thinking Competencies standards to engage learners in authentic and active learning. Students in this program will learn how to:

Improve and expand their practice by understanding the core concepts of computational thinking

Explore strategies to integrate computational thinking using multiple and effective instructional strategies

Design, develop, and implement activities to support creative and innovative problem-solving

Understand the impact of equity and access to computational thinking and computing resources and practices in a global society

### **Required for the Certificate in Classroom Technology Integration**

EDT 571: Methods of Integrating Inclusive Computational Thinking

EDT 572: Programming in Multiple Paradigms

Six Credits of Approved Electives:

EDT 520: Digital Age Teaching and Learning Methods\*

EDT 531: Studio in Computing

EDT 573: Introduction to Web Development and Mobile Application Development for Educators \*\*

EDT 574: Computational Thinking in Early Childhood and Elementary Contexts \*\*

EDT 575: Computational Thinking in Middle Level and Secondary Contexts \*\*

EDT 598: Special Topics \*

Students may also request to enroll in up to six graduate-level credits from the Spatial Information Science and Engineering program (SIE courses at the 500-level or above such as SIE 504, SIE 507, SIE 515 or SIE 525). Your advisor can help you choose which electives outside of the program will best help you meet your goals.

\*With permission from the Program Advisor or Program Coordinator

\*\*These courses may appear as 598 in Mainstreet.

New title: Integrating Computational Thinking for Diverse Learners

Course is approved (remove asterik) Title is Computational Thinking in Early Childhood and elementary

Course approved (remove asterik) Title is Integrating Computational Thinking in Middle and High School

# Computer Science

The School of Computing and Information Science offers the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.) degrees in computer science. The M.S. degree provides an intensive course of study in areas of faculty research interest. It provides the student with an excellent understanding of computer science that provides a solid foundation for many advanced jobs in the field.

The Ph.D. is granted to highly-qualified students who have completed a rigorous course of study and research training resulting in the preparation and defense of a dissertation describing original computer science research. The Ph.D. is the highest academic degree. It confers the right to use the title "doctor" and opens the door to rewarding and fulfilling careers in academia and industry.

The doctoral student will obtain a broad and deep graduate-level background in computer science, with particular depth in a chosen area of specialization. The student will engage in research from almost the beginning of the program and will receive extensive training in computer science research over the course of the program under the direction of a faculty advisor.

## Requirements for the M.S. Degree

An M.S. student has one of three options: preparing and defending a master's thesis, completing and presenting a master's project, or a courses-only set of requirements. The thesis option is the traditional route to an M.S. degree. Although the thesis requires substantially more work by the student than the project, it allows a more in-depth examination of a problem. The thesis option prepares the student for a career in research and development or for further graduate work in a Ph.D. program. The master's project is more targeted and applied than the thesis and has more course work. A courses-only option is primarily for students seeking jobs in industry.

All three options require thirty (30) credit hours of course work, twenty-four (24) credit hours from among the approved Computer Science graduate curriculum, mostly COS courses at the 500 level and above, and six (6) credit hours possibly from outside computer science at the 400 level and above:

1. Required core courses (6 hours; must be passed with a grade of B or better):
  1. Research ethics (1 credit hour) INT 601 - Responsible Conduct of Research.
  2. Professional communications (public speaking, professional writing, online resource development). These will be offered as two one-credit courses. (2 credit hours) SIE 501 - Introduction to Graduate Research, SIE 502 - Research Methods.
  3. One graduate-level Computer Science Theory course. (3 credit hours) either COS 550 - Theoretical Computer Science or COS 554 - Algorithms
2. Breadth requirements - three graduate-level Computer Science courses selected from four *breadth* categories (at least three categories must be selected) (9 hours). Breadth categories including representative courses include:
  1. Artificial Intelligence
    - COS 580 - Topics in Artificial Intelligence
    - COS 573 - Computer Vision
    - COS 575 - Machine Learning
    - COS 576 - Interpretability and Explainability in Machine Learning
  2. Data and Information
    - DSE 501 - Statistical Foundations of Data Science
    - COS 535 - Information Privacy Engineering
    - COS 565 - Data Visualization
    - COS 580 - Topics in Database Management
    - COS 582 - Introduction to Data Science
  3. Applications
    - COS 515 - Simulation and Modeling

4. Systems
  - COS 520 - Software Engineering
  - COS 530 - Cybersecurity
  - COS 540 - Computer Networks
  - COS 541 - Cloud Computing
3. Two COS course electives (6 credit hours). This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.
4. One additional elective course (3 credit hours) approved by the M.S. Advisory Committee, not limited to computer science, however the course must be at the 400 level or above and cannot be satisfied with research credits or independent study.
5. Six (6) additional credit hours:  
EITHER

An M.S. thesis, usually a research effort executed under six (6) thesis research credit hours of COS 699.

OR

An applied M.S. project executed under three (3) research credit hours of COS 699 and a COS course elective (3 credit hours) of a formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above (cannot be satisfied with research credits or Independent study).

OR

A course-only option: a COS course elective (3 credit hours) of a formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above (cannot be satisfied with research credits or Independent study) and an elective course (3 credit hours) approved by the M.S. Advisory Committee, not limited to computer science, however the course must be at the 400 level or above (cannot be satisfied with research credits or independent study).

As per Graduate School requirements, students will form an advisory committee consisting of a minimum of three members, at least two of whom are from the computer science graduate faculty. The student's advisor must be a member of the computer science graduate faculty, or UMaine faculty approved by a 2/3rds majority vote of the computer science graduate faculty, or co-advised by a member of the computer science graduate faculty.

Courses from outside the COS catalog may be added to the computer science graduate curriculum by a formal petition by the student and 2/3rds majority vote of the Computer Science Graduate Faculty. Students who complete the M.S. curriculum are urged to consider continuing on to the Ph.D. program; the M.S. requirements are a subset of the Ph.D. program.

For students choosing the thesis option, a thesis must be prepared as required by the Graduate School and defended publicly. For the project option, the student must give a public presentation of the project.

#### Requirements for the Ph.D. Degree

The Ph.D. program is designed to prepare the student to conduct research in computer science and to hold positions in academia and industry. The student is required to carry out in-depth, independent, publishable research that is an original contribution in the field. He or she will be involved in research soon after entering the program.

There are several steps for earning a Ph.D.:

- Coursework, Computer Science Primary Doctoral Curriculum (see below)

- Preparing a dissertation proposal and passing the Proposal Defense and Doctoral Comprehensive Examination (see below)
- Admission to candidacy
- Completing the dissertation research and any research-directed coursework
- Dissertation preparation and Pre-defense (see below)
- Successful defense of a dissertation

At all stages of their work, the student is guided by their advisor and an advisory committee. The student is urged to choose an advisor as early in the program as possible. The advisor must be a member of the computer science graduate faculty, or UMaine faculty approved by a 2/3rds majority vote of the computer science graduate faculty, or co-advised by a member of the computer science graduate faculty. The advisor will help the student form their advisory committee. The Graduate School requires that the advisory committee consist of five (or more) members at least three of whom should be members of the Computer Science Graduate Faculty, including the student's advisor, and it highly recommends that one committee member be selected from the graduate faculty of another program other than the student's. The computer science graduate faculty allows this external member to be from another university as well.

### Coursework

The student is required to complete 43 credit hours in an approved program of study. If the student completed an M.S. thesis, they may count their thesis toward three (3) credit hours of their doctoral coursework. The program of study will be developed in consultation with the student's advisory committee. The *Computer Science Primary Doctoral Curriculum* will comprise:

1. Required core courses (7 hours; must be passed with a grade of B or better):
  1. Research ethics (1 credit hour) INT 601 - Responsible Conduct of Research.
  2. Professional communications (public speaking, professional writing, online resource development). These will be offered as three one-credit courses. (2 credit hours) SIE 501 - Introduction to Graduate Research, SIE 502 - Research Methods, SIE 693 - Graduate Seminar.
  3. One graduate-level Computer Science Theory course. (3 credit hours) either COS 550 - Theoretical Computer Science or COS 554 - Algorithms
2. Breadth requirements - three graduate-level Computer Science courses selected from four *breadth* categories (at least three categories must be selected) (9 hours). Breadth categories including representative courses include:
  1. Artificial Intelligence
    - COS 580 - Topics in Artificial Intelligence
    - COS 573 - Computer Vision
    - COS 575 - Machine Learning
    - COS 576 - Interpretability and Explainability in Machine Learning
  2. Data and Information
    - DSE 501 - Statistical Foundations of Data Science
    - COS 535 - Information Privacy Engineering
    - COS 565 - Data Visualization
    - COS 580 - Topics in Database Management
    - COS 582 - Introduction to Data Science
  3. Applications
    - COS 515 - Simulation and Modeling
  4. Systems
    - COS 520 - Software Engineering
    - COS 530 - Cybersecurity
    - COS 540 - Computer Networks
    - COS 541 - Cloud Computing
3. Elective coursework with an optional M.S. thesis:

## EITHER

Two COS course electives (6 credit hours) AND a COS M.S. thesis. This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.

## OR

Three COS course electives (9 credit hours). This requirement represents formal COS course or courses formally accepted in the Computer Science graduate curriculum at the 500 level or above and cannot be satisfied with research credits or Independent study.

After completion of the Computer Science Primary Doctoral Curriculum the student may prepare and defend their Dissertation Proposal as part of their comprehensive examination and admission to candidacy. Additional coursework, tailored to the dissertation topic and doctoral research will be required:

1. Two course electives (6 credit hours) approved by the student's Ph.D. Advisory Committee, not limited to computer science, however the courses must be at the 400 level or above (cannot be satisfied with research credits or independent study). It is expected that these electives will be directly related to the Ph.D. dissertation research.
2. A minimum of twelve (12) credit hours of Thesis/Research credits (COS 699).

Students admitted from the University of Maine who have taken one or more of these courses as an undergraduate must take an approved substitute course in those areas. Students from elsewhere who have had similar courses may ask for a waiver for one or more breadth courses and provide the Graduate Coordinator with sufficient documented evidence of expertise in the area. This will be evaluated on a case-by-case basis. Except in rare cases the student will be required to take the breadth courses as stated.

The 1-credit hour research ethics course should generally be taken the first semester that the student is in the program, followed by the other required courses on graduate research, research methods, and the graduate seminar. During this sequence, the student will be introduced to what it means to be a Ph.D. student, and they will be introduced to the program, the computer science graduate faculty, and their research.

### Proposal defense and Oral Comprehensive Examination

Somewhere between 1.5 and 2.5 years after entering the program, the student will provide to the committee a written dissertation proposal describing the proposed research topic, the research performed to date, a complete review of relevant literature, and plans for carrying out the proposed research. The student's proposal will then be subject to examination by the Ph.D. committee during an oral defense. This oral examination constitutes the student's Ph.D. Comprehensive examination, and the committee can pass the student, ask for modifications, or require a new proposal presentation (see Admission to Candidacy below).

### Admission to Candidacy

Once the student has completed the Computer Science Primary Doctoral Curriculum (the research ethics seminar, the research methods sequence, the theory requirement, all required breadth requirements, and the initial elective coursework or M.S. thesis), and has prepared their dissertation proposal and passed the Proposal defense and Oral Comprehensive Examination, then by a vote of the computer science graduate faculty they can be admitted to candidacy for the degree.

As stated above, this oral examination constitutes the student's Ph.D. Comprehensive examination, and will include both a review of the topic, groundwork, and planning of the dissertation as well as an examination of the student's

preparation to embark on the proposed research program. The committee can pass the student, ask for modifications, or require a new proposal presentation.

The combined proposal defense and candidacy exam is an oral presentation and interview attended by the Ph.D. advisory committee and is not open to the public.

If the student should not pass their combined proposal defense and candidacy exam, they are permitted a second attempt at this Ph.D. Comprehensive examination no sooner than 3 months but not more than 1 year after the initial exam.

#### Dissertation Preparation and Pre-Defense

The student will complete their dissertation research and any research-directed coursework. Under the direction of their advisor and with consultation of their committee, they will prepare a draft of their doctoral thesis.

Six (6) to twelve (12) months before the final dissertation defense, the student will give a *pre-defense* presentation to the committee. It is expected that a draft of the thesis will be largely completed at this time. The pre-defense dissertation presentation is an oral presentation and interview attended by the Ph.D. advisory committee and is not open to the public.

#### Dissertation

The dissertation is a major written work that describes the student's original, publishable contribution to the field of computer science research. The student's advisory committee guides the student's work on the dissertation. Upon completion, the dissertation is defended at a public presentation. The candidate will present their research and be subjected to cross examination not only by their advisory committee but also by the members of the audience.

The Ph.D. Advisory Committee will confer and vote in private on the results of the Ph.D. dissertation defense. At its discretion, the committee may also invite other non-voting members into the conference including but not limited to the COS Graduate Program Coordinator, members of the COS Graduate Program Committee, and the SCIS Director. For the candidate to successfully pass their examination, only one dissenting vote of the advisory committee is allowed. The Ph.D. Advisory Committee can pass the student, ask for modifications to the dissertation, or require a new presentation of the dissertation defense.

If the candidate should not pass their Ph.D. dissertation defense, they are permitted a second attempt of their Ph.D. dissertation defense no sooner than 3 months but not more than 1 year after the initial defense.

#### Petitions

In order to request an exception to the limitation of two attempts at an oral examination or defense, or other rules outlined here, the student (or candidate) should petition the COS Graduate Program Committee by submitting a written explanation of their request to the COS Graduate Program Coordinator with justifications of why such an exception should be granted. The petition should be endorsed by at least three members of their Ph.D. Advisory committee.

#### Other Policies

The Computer Science Graduate Program is inherently part of the UMaine Graduate School and is governed under its rules and policies. For the resolution of any policies, procedures, or rules not covered here, students and faculty are referred to the *UMaine Graduate School Policies and Regulations*.

#### Graduate Faculty

**Sudarshan S. Chawathe**, Ph.D. (Stanford University, Computer Science, 1999). Associate Professor. Areas of interest: autonomous and semistructured databases. (chaw@cs.umaine.edu)



**Chaofan Chen**, Ph.D. (Duke University, Computer Science, 2020). Assistant Professor. Areas of interest: interpretable machine learning and applications of machine learning in high-stakes decision making. (chaofan.chen@maine.edu)

**Phillip M. Dickens**, Ph.D. (University of Virginia, Computer Science, 1993), Associate Professor. Areas of interest: high-performance computing, grid computing, distributed systems, distributed simulation, networking protocols, performance modeling. (dickens@cs.umaine.edu)

**James L. Fastook**, Ph.D. (University of Maine, Physics, 1975), Professor. Areas of interest: glacial modeling, finite elements, non linear differential equations, vector and parallel processing, supercomputers. (fastook@maine.edu)

**Sepideh Ghanavati**, Ph.D. (University of Ottawa, Computer Science, 2013), Assistant Professor. Areas of interest: privacy and security in software engineering, privacy and security for Internet of Things (IoT), regulatory compliance software engineering, usable privacy, machine learning and deep learning for privacy policy analysis, privacy by design and privacy requirements analysis, goal-oriented requirements modeling and requirements engineering (sepideh.ghanavati@maine.edu)

**Torsten Hahmann**, Ph.D. (University of Toronto, Computer Science, 2013). Associate Professor. Areas of interest: artificial intelligence (knowledge representation, logic, automated reasoning), spatial informatics, spatial AI, knowledge and ontology engineering, theoretical computer science. (torsten.hahmann@maine.edu)

**Penny Rheingans**, Ph.D. (University of North Carolina Chapel Hill, Computer Science, 1993). Director SCIS, Professor. Areas of interest: visualization of spatial and non-spatial data, including the visualization of predictive models, data with associated uncertainty, and data about student success. Visualization based on perception and illustration. Dynamic and interactive representations and interfaces, and the experimental validation of visualization techniques. Computer science pedagogy and gender issues in technology education. (penny.rheingans@maine.edu)

**Roy M. Turner**, Ph.D. (Georgia Institute of Technology, Computer Science, 1989), Associate Professor. Areas of interest: artificial intelligence (problem solving, planning, context -sensitive reasoning), cooperative distributed problem solving, multiagent systems, control of autonomous underwater vehicles, computational ecology, applications of AI to biology. (rmt@cs.umaine.edu)

**Manuel Woersdoerfer**, Ph.D. (Goethe University, Germany, Business Ethics, 2011). Assistant Professor. Areas of interest: engineering and computer ethics (especially big data ethics and information privacy), business (ethics) and human rights, (political) Corporate Social Responsibility (CSR) and corporate citizenship, multi-stakeholder CSR-initiatives (especially equator principals framework and U.N. guiding principles on business and human rights), sustainable finance and finance ethics, climate ethics/justice (with special focus on financial institutions and climate change mitigation), constitutional economics, neoliberalism and social market economy, behavioral and happiness economics, economic psychology and neuroeconomics, economic policy (with a special focus on European integration and politics). (manuel.woersdoerfer@maine.edu)

**Salimeh Yasaei Sekeh**, Ph.D. (Ferdowsi University of Mashhad, Iran, Inferential Statistics, 2013). Assistant Professor. Areas of interest: machine learning algorithms design and analysis, data science and developing theory and algorithms for data analysis. applications of machine learning approaches in real-time problems, design, improvement, and analysis of deep learning techniques, data mining and pattern recognition, statistical machine learning and signal processing, network structure learning with applications in biology. (salimeh.yasaei@maine.edu)

**Terry S. Yoo**, Ph.D. (University of North Carolina Chapel Hill, Computer Science, 1996). Associate Professor. Areas of interest: open source software project management, large data initiatives, data Science, 3D multiscale medical image analysis and data visualization, computer graphics, image-based search, computational geometry, 3D printing, high-resolution 3D electron microscopy, Computer vision. (terry.yoo@maine.edu)

## Computing for Educators

# Computing for Educators

The graduate certificate in Computing for Educators is for those desiring to teach computational thinking, computer coding, and computer science skills problem-solving courses primarily in grades 9-12. The 15-credit certificate is available completely online and on-campus. Most courses are taught with simultaneous on campus and online sections. The online section is typically asynchronous but distance students may attend live online at their choosing.

The certificate, designed to educate teachers with little to no or moderate current computer science and programming skills, prepares students with foundational coding and database knowledge enabling them to teach dedicated computer coding and computer science problem-solving courses.

Graduate students completing the certificate acquire the requisite knowledge and skills preparing them to teach both of the Computer Science Advanced Placement (AP) courses recommended to be taught in high schools.

While this graduate certificate program has been designed specifically for teachers and other educators, the individual courses within it are germane for students across many disciplines. The courses strive to serve the substantive content computing needs of graduate students in many domains.

## Program Requirements

The Graduate Certificate in Computing for Educators (CfE) consists of 15 credits, all earned in course work. If some required courses are duplicative of courses that may have been taken in the student's undergraduate or another graduate program, those courses need not be repeated. The student and Graduate Coordinator would then select replacement courses for approval.

## Required Courses

The fifteen credits of coursework must include:

- the following three core courses:

SIE 504 The Beauty and Joy of Computing

SIE 507 Information Systems Programming

SIE 508 Object Oriented Programming

- one course from among the following courses:

SIE 509 Principles of Geographic Information Systems

SIE 516 Interactive Technologies for Solving Real-World Problems

SIE 557 Database Applications

SIE 558 Real Time Sensor Databases

COS 465/565 Data Visualization

COS 470/570 Topics in Artificial Intelligence

- one course from among the following pre-approved electives:

Any previously listed course above not yet taken

SIE 550 Design of Information Systems

SIE 505 Formal Foundations for Information Science

SIE 510 Geographic Information Systems Applications

SIE 512 Spatial Analysis

SIE 515 Human Computer Interaction

SIE 517 Spatial Interaction Design

Any other 500 level SIE course

EDT 520 Digital Age Teaching and Learning Methods

EDT 571 Methods of Integrating Inclusive Computational Thinking

Any other 500 level COS course

Only courses in which the student obtains a grade of B or higher count toward the completion of the Computing for Educators Graduate Certificate.

### **Computing for Educators Graduate Certificate Admission**

Students to be admitted into the Computing for Educators Graduate Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, an essay, and a current resume that includes contact information for three references. Admissions are rolling.

Students may apply to transfer up to 3 credits of graduate course work (that has not counted toward another degree) into the Computing for Educators Graduate Certificate. While a course may be waived to avoid substantial repetition of course material, the total of 15 credits in course work must still be acquired. The Graduate Coordinator must approve transfer credits after assessing whether they are appropriate and will as well assess proposed waivers and substitution courses on the program of study. No more than one 400 level course, if any, may be approved for inclusion on the Program of Study. Apply at [Apply Now](#).

### **Continuation of Computing for Educators Graduate Certificate to M.S. in Information Systems or Alternative M.S.**

Before or upon completion of the Computing for Educators Graduate Certificate, students may apply for and continue through the complete MS Information Systems (MSIS) degree. Students may have accepted into the MS only those courses in which they received a grade of B or higher. If aspiring to both credentials, it is typically less work to apply for both graduate programs at the same time when initially applying to grad school although the two also may be pursued consecutively. Alternatively, the successful candidate might apply the graduate certificate credits in pursuit of a MS Data Science and Engineering, MS Spatial Informatics, or MS Spatial Information Science and Engineering [Project Option] degree.

### **Additional Information**

Graduate Certificate in Computing for Educators [SCIS Website](#)

Curriculum for MS Information Systems, MS Spatial Informatics [Online Only], and MS Spatial Information Science and Engineering [Project Option]

Course Descriptions: See SIE course descriptions

Program of Study Forms: Find at [Forms and Documents](#)

## Spatial Computing and Information Systems Graduate Faculty

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Qualitative reasoning, spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, Ph.D. (Toronto, 2013), Associate Professor. Ontologies, especially spatial ontologies with application to earth and geoscience applications, ontology engineering, knowledge representation, automated reasoning, information extraction, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## Conservation Biology (Emphasis)

Biological sciences and natural resource conservation are cornerstones for The University of Maine with many programs covering various aspects of these disciplines. Because of this breadth, Conservation Biology-the applied science of maintaining the earth's biological diversity-is an interdepartmental activity at The University of Maine. There are about thirty faculty members in five units (Department of Wildlife, Fisheries, and Conservation Biology, School of Forest Resources, School of Marine Sciences, and School of Economics) who constitute a conservation biology interest group. The University funds Conservation Biology activities specifically with an interdepartmental Conservation Biology Seminar Series, with monies for travel to Conservation Biology conferences, and with an endowed chair, the Libra Professorship of Conservation Biology. The forest, wetland, freshwater, and marine ecosystems of Maine offer a diverse biota near campus for conservation biology research.

## Degrees

Graduate students studying Conservation Biology at The University of Maine can earn any one of the following degrees depending on their specific interests:

### Doctor of Philosophy

Biological Sciences, Ecology and Environmental Sciences, Forest Resources, Marine Biology, Oceanography, Plant Sciences, Wildlife Ecology, Zoology

## **Master of Science**

Resource Economics and Policy, Ecology and Environmental Sciences, Entomology, Forestry, Marine Biology, Marine Policy, Oceanography, Botany and Plant Pathology, Plant, Soil and Environmental Sciences, Resource Utilization, Wildlife Ecology, Zoology

## **Other Master Degree Options**

Master of Forestry, Master of Wildlife Conservation

## **Courses in Conservation Biology**

A wide variety of courses related to Conservation Biology are available. A small sample would include: Advanced Conservation Biology, Tropical Deforestation, Coral Reefs, Evolutionary Biology of Plants, Community Ecology, Population Biology, Evaluation of Wildlife Habitats, Tropical Field Ecology, and Modeling Sustainability.

# **Application**

To inquire about specific opportunities and the availability of graduate assistantships, contact any of the faculty members listed below whose interests are close to yours. For general information about Conservation Biology at The University of Maine, write to Malcolm Hunter, Department of Wildlife, Fisheries, and Conservation Biology, Nutting Hall, preferably by e-mail ([mhunter@maine.edu](mailto:mhunter@maine.edu))

# **Graduate Faculty**

**Andrei Alyokhin**, Ph.d. (University of Massachusetts, 1999), School of Biology and Ecology. Invasion biology, non-target effects of biological control.

**Kathleen P. Bell**, Ph.D. (University of Maryland, 1997), School of Economics. Land management, land-use change; environmental economics, geographic information systems, spatial econometrics

**Erik Blomberg**, Ph.D. (University of Nevada, Reno, 2012), Department of Wildlife, Fisheries, and Conservation Biology. Animal demographics, population dynamics, and habitat relationships. Ecology and conservation of birds and bats.

**Susan H. Brawley**, Ph.D. (University of California, Berkeley, 1978), School of Marine Sciences. Ecosystem structure and function in estuaries and rocky intertidal zones.

**Aram Calhoun**, Ph.D. (University of Maine, 1996), Department of Wildlife, Fisheries, and Conservation Biology, wetland ecology and conservation with a special interest in wetland functions in the landscape.

**Stephen M. Coghlan Jr.**, Ph.D. (SUNY-ESF 2004), Department of Wildlife, Fisheries, and Conservation Biology. Aquatic ecology, applied fisheries ecology, land-use effects, biotic interactions, bioenergetics.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), School of Biology and Ecology. Biogeochemistry and

plant ecology, resource sustainability in forest ecosystems, effects of air pollution and global change on natural resources.

**Shawn Fraver**, Ph.D. (University of Maine, 2004), Forest ecology, dendrochronology, forest carbon dynamics.

**Allison M. Gardner**, PhD (University of Illinois, 2016). School of Biology and Ecology. Disease ecology, vector-borne disease, medical entomology, landscape change, climate change, socio-ecological systems.

**Jacquelyn L. Gill**, Ph.D. (University of Wisconsin, 2012). School of Biology & Ecology, Climate Change Institute. Paleoecology, biogeography, community ecology, vegetation dynamics, herbivory, extinction, climate change.

**Hamish S. Greig**, Ph.D. (University of Canterbury, 2008). School of Biology & Ecology. Community ecology, environmental gradients, global change, food webs, aquatic ecology, freshwater invertebrates.

**Daniel J. Harrison**, Ph.D. (University of Maine, 1986), Department of Wildlife, Fisheries, and Conservation Biology. Wildlife habitat relationships, interactions among forest management practices and wildlife populations, predator ecology.

**David D. Hart** (University of California, Davis, 1979) School of Biology and Ecology, Senator George J. Mitchell Center for Environmental and Watershed Research. Stream ecology, watershed science and management, restoration ecology, adaptive management.

**Rebecca L. Holberton**, Ph.D. (State University of New York at Albany, 1991), School of Biology and Ecology. Endocrinology, ecology, and behavior of birds, ecophysiology of migrating birds; biology of Arctic - and temperate breeding birds; conservation biology.

**Malcolm L. Hunter, Jr.**, D. Phil. (Oxford University, 1978), Department of Wildlife, Fisheries, and Conservation Biology. Conservation biology, forest wildlife management, landscape ecology, international conservation.

**Pauline Kamath**, Ph.D. (University of California - Berkeley, 2011), School of Food and Agriculture. Wildlife disease ecology and evolution, epidemiology, One Health, molecular ecology, conservation genetics.

**Michael T. Kinnison**, Ph.D. (University of Washington, 1999), School of Biology and Ecology. Fish ecology, contemporary evolution, conservation genetics.

**Jessica Leahy** (University of Minnesota, 2005), School of Forest Resources. Social psychological aspects of natural resources management, environmental attitudes and behavior, information effects.

**Heather M. Leslie**, PhD (Oregon State University, 2004), School of Marine Sciences. Marine ecology, coupled social-ecological systems; ecosystem-based management; conservation planning.

**Danielle Levesque**, Ph.d. (University of KwaZulu-Natal, 2014), School of Biology and Ecology. Evolutionary and ecological physiology, and energetics of mammals (and the occasional bird) in relation to climate.

**Anne Lichtenwalner**, DVM Ph.D. (Oregon State University DVM 1989; University of Idaho, 1995), School of Food and Agriculture, infectious diseases at the wildlife/livestock interface, with emphasis on environmental and anthropogenic effects on health (One Health and the Environment).

**Cynthia S. Loftin**, Ph.D. (University of Florida, 1998), Cooperative Fish and Wildlife Research Unit/Department of Wildlife, Fisheries, and Conservation Biology. Wetlands, landscape, and systems ecology; GIS applications.

**Brian J. McGill**, Ph.D. (University of Arizona 2003) School of Biology & Ecology, Sustainability Solutions Initiative. Large-scale ecology. Species ranges, climate change, measuring biodiversity, spatial ecology, community structure.

**Alessio Mortelliti**, Ph.D. (University of Rome "La Sapienza", 2008), Department of Wildlife, Fisheries, and Conservation Biology. Conservation biology, effects of land-use change on vertebrates, mammalogy, quantitative modelling, wildlife surveys & monitoring.

**Brian Olsen**, Ph.D. (Virginia Tech., 2007). Department of Wildlife, Fisheries, and Conservation Biology. Avian ecology, behavior, demography, mating systems, and life history evolution.

**Amber M. Roth**, Ph.D. (Michigan Technological University, 2012), Department of Wildlife, Fisheries, and Conservation Biology and School of Forest Resources. Forest wildlife ecology, habitat management, and conservation with a focus on migratory birds.

**Frederick A. Servello**, Ph.D. (Virginia Polytechnic Inst. and State University, 1985), Department of Wildlife, Fisheries, and Conservation Biology. Vertebrate nutrition and physiology, habitat relationships of birds and mammals.

**Carly Sponarski**, Ph.D. (Memorial University of Newfoundland, 2010), Department of Wildlife, Fisheries, and Conservation Biology. Human dimensions of wildlife and fisheries conservation, social and conservation psychology, human cognition modeling, quantitative social science methods, risk perception and management decision-making processes.

**Robert Steneck**, Ph.D. (Johns Hopkins University, 1982), School of Marine Sciences. Marine benthic ecology, fisheries management.

**Tim M. Waring**, Ph.D. (University of California, Davis, 2010), School of Economics. Experimental approaches to human culture and cooperation as determinants of conservation behavior.

**Joseph Zydlewski**, Ph.D. (University of Massachusetts, Amherst, 1998), Maine Cooperative Fish and Wildlife Research Unit/Department of Wildlife, Fisheries, and Conservation Biology. Physiology, behavior and ecology of migrating fish, impacts of invasive fish species, ecological responses to habitat fragmentation.

## **Data Science and Engineering**

**Graduate Catalog Description for Data Science and Engineering**

Return to: Graduate Programs, Certificates, Specializations, Emphases

The Data Science and Engineering programs offered at the University of Maine are intended to meet the growing demand for graduates with core skills in managing and analyzing complex data and analytics challenges. The graduate programs provide a pathway for students from diverse fields to transition to multiple data science and engineering career paths by providing them with core graduate-level courses across the entire spectrum of the data lifecycle.

In support of the interdisciplinary spirit of data science and engineering, the program is designed to accommodate students from a wide range of undergraduate degrees or other graduate degree backgrounds with options for specialization in different domains. A collection of courses with a variety of in-class and online options support students in residence as well as meet the needs of people currently in the workforce or who are otherwise place-bound and need training or retraining in the area of Data Science and Engineering.

Graduate programs offered include the Master of Science in Data Science and Engineering (thesis and coursework-only options) and the Graduate Certificate in Data Science and Engineering. For high-performing qualifying undergraduate students that may be pursuing any degree program, an Accelerated Four-Plus-One option exists allowing completion of an undergraduate degree and the MSDSE in five years.

### **Program Objectives**

Graduates of the master's program achieve the following learning objectives and outcomes:

- an appreciation of data sources, the data acquisition process, data types, data quality, and methods for cleaning.
- an understanding of issues impacting the efficient processing, representing, storing, managing, and retrieval of large amounts of data.
- an understanding of how to leverage modern computational infrastructures and software tools to perform large-scale data analysis and machine learning.
- an understanding of common analytical tools, their methods, their effective use, and the strengths and limitations of each.
- the skills to effectively explore and present data to different audiences through visual and multimodal methods.
- a familiarity with data security, curation, and preservation strategies
- the ability to form questions for analysis from an understanding of the characteristics and goals of different application domains
- an understanding of artificial intelligence and its applications
- an awareness of the ethical issues, risks, and responsibilities related to data science.

### **Master of Science in Data Science and Engineering**

The University of Maine offers both thesis and course-work only options in the Master of Science in Data Science and Engineering. All work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Data Science and Engineering.

The thesis option is the scientific track, typically requiring a strong engineering, computer science, human-computer interaction, or mathematics undergraduate background. Prospective master's students with other disciplinary backgrounds are expected to make up the requisite math and engineering courses that would allow them to succeed in the graduate curriculum. The thesis option includes a substantial piece of individual research as a basis for a master's thesis.

The coursework-only option is aimed at students who desire to focus primarily on coursework rather than research at the master's level. The formal coursework is complemented by an internship requirement or a one-semester project in



which the student must demonstrate that he or she can apply acquired knowledge for implementing a particular solution.

### **Degree Requirements**

Applicants to the data science and engineering program should have at least one college level statistics course in their backgrounds. Admitted students have the opportunity to become familiar with various data science, data mining, data engineering, business analytics, machine learning, and artificial intelligence topics. Computer programming, statistics germane to data science, and systems knowledge may be picked up as part of the program if applicants don't already have these foundations. Applicants with undergraduate degrees in computer science, engineering, math, and similar fields (i.e., those with two semesters of calculus and calculus-based statistics) have the opportunity to pursue higher level machine learning and artificial intelligence fundamentals and theory courses along with applications of advanced AI methods addressing real-world problems. The multiple paths to graduation and multi-disciplinary course opportunities make the program highly flexible in meeting individual student needs.

### **Master (Coursework-Only Option)**

A candidate must complete 30 graduate course credits on-campus or online on a program of study approved by advisors that includes:

- A specified foundation course in each of statistics, programming, and systems unless waived based on previous coursework
- DSE 510 Practicum in Data Science and Engineering (3cr)
- 12 course credits drawn from at least four of the five Theme Areas
- At least one course must include a substantial practical experience. Options include SIE 589 Graduate Project, SIE 590 Information Systems Internship, or a course from an approved list.
- Further course credits from within the Foundation Courses, Theme Areas, or Domain Specializations to bring the total to 30 credits
- No more than 6 course credits, if any, at the 400 level

#### *Foundation Courses*

Statistics Foundations

Programming Foundations

Systems Foundations

#### *Theme Area Courses*

### **Theme 1: Data Collection Technologies**

### **Theme 2: Data Representation and Management**

### **Theme 3: Data Analytics**

## **Theme 4: Data Visualization and Human Centered Computing**

## **Theme 5: Data Security, Preservation, and Reuse**

### *Domain Specialization Courses*

#### **Domain A: Spatial Informatics**

#### **Domain B: Bioinformatics / Biomedicine**

#### **Domain C: Business Information**

#### **Domain D: Social and Behavioral Data Science**

#### **Domain E: Engineering Analytics**

### **Master (Thesis Option)**

A candidate must complete 30 graduate course credits on a program of study approved by advisors that includes:

- Specified foundation courses in each of statistics, programming, and systems unless waived based on previous coursework
- DSE 510 Practicum in Data Science and Engineering (3cr)
- SIE 501 Introduction to Graduate Research (1cr)
- SIE 502 Research Methods (1cr)
- INT 601 Responsible Conduct of Research (1cr)
- 12 course credits drawn from at least four of the five theme areas
- 6 credits of *thesis*
- Further course credits from within the foundation courses, theme areas, or domain specializations to bring the total to 30 credits
- No more than 6 course credits, if any, may be at the 400 level

For either master's degree option, a maximum of six credit hours of graduate course work taken prior to enrollment in the master's program, whether at this university or another, may be counted toward the master's degree assuming that the course(s) did not count toward a completed undergraduate or graduate degree and if the student's graduate advisory committee formally approves acceptance of the courses on the student's Program of Study.

### **Admission Requirements**

Admission to the MS Data Science and Engineering is competitive. In the admission process, the graduate faculty considers the potential of applicants to complete a program successfully and achieve a position of leadership in the private, public or research sectors.

Students with undergraduate degrees in any field may apply. The bachelor's degree should be from an accredited four-year U.S. accredited college or university with a 3.0 cumulative or higher GPA, or equivalent international university degree with comparable academic performance (exceptions considered on case-by-case basis)

Applications are accepted on a rolling basis and no strict deadlines apply. Thesis-based MS students applying for campus-wide research assistantships or scholarships should take and submit the GRE and complete their application packets by January 1 for fall admission. We generally seek students that score at the mean or above on the verbal, quantitative and analytical segments of the GRE exam and in the 50th percentile or above on the exam overall. Exceptions are considered on a case-by-case basis.

Required information in the MSDSE online application should include transcripts from previous institutions, test scores (if required), current resume that includes contact information for three references, an essay, and the application fee. For detailed instructions, see Further Admission Information.

### **Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students**

Undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the *MS Spatial Information Science and Engineering (Coursework-Only Option)* graduate degree program. Applications for conditional "early admission" should be received preferably by the middle of the first semester of the junior year and are not accepted after the senior year has commenced. The final year in completing the Master's degrees may be taken either on-campus or online.

By taking a course overload of three credits in the second semester of the Junior year and course overloads in each of the semesters of the Senior year, a motivated student typically may acquire 9 credits (but no more than 12) for graduate school (at undergraduate tuition rates) prior to acquiring their undergraduate degree assuming that they receive a B or better in the courses. These courses, if chosen appropriately, may double count toward both the undergraduate and graduate degree. By taking a 3-credit Information Systems Internship graduate course with a corporation, agency or non-profit organization during the summer, a student may readily complete the coursework master's degree in a single year after their undergraduate degree. This master's degree will be highly complementary to an undergraduate degree in almost any field and attractive to employers.

To apply for early admission before or during the junior year, an applicant should expect to have an overall minimum undergraduate grade point average of 3.25, must have completed the University of Maine General Education Requirement in Math and must have three letters of recommendation from current or previous university instructors. Apply using the Application for Admission to the DSE Four Plus One Program. Continuation in the graduate program is based primarily on performance in the graduate courses and overall grade point average upon graduation from the undergraduate program. Accepted *Four Plus One* students must complete the full graduate application in their senior year. The GRE exam is typically waived for these accepted high performing students. Below a 3.0 accumulated undergraduate grade point average should be assumed cause for discontinuation in the graduate program.

Students with two or fewer semesters remaining to complete their undergraduate degree program do not qualify for the accelerated "four-plus-one program" but their applications will be considered as applications within the regular graduate admissions process. In this case, one may transfer up to two graduate courses prior to formal admission assuming those courses did not count toward another degree.

### **Financial Assistance**

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the advising professor or other DSE graduate faculty may offer graduate research assistantships to qualified students on externally funded research projects. A very limited number of teaching assistantships may be available. Consult as well Funding at the Graduate School web site.

### **Data Science and Engineering Graduate Faculty**

Ali Abedi

Professor, Electrical and Computer Engineering

Kate Beard-Tisdale

Professor, Spatial Computing

Kathleen P. Bell

Professor, Economics

Sudarshan Chawathe

Associate Professor, Computer Science

Phillip Dickens

Associate Professor, Computer Science

Matthew Dube

Assistant Professor, Computer Information Systems

Richard Eason

Associate Professor, Electrical and Computer Engineering

Max Egenhofer

Professor, Spatial Computing

Keith Evans

Associate Professor, Economics

Sepidah Ghanavati

Assistant Professor, Computer Science

Nicholas Giudice

Professor, Spatial Computing

Ramesh C. Gupta

Professor, Mathematics and Statistics

Pushpa Gupta

Professor, Mathematics and Statistics

Torsten Hahmann

Associate Professor, Spatial Computing

Daniel Hayes

Associate Professor, Forest Resources

David Hiebeler

Professor, Mathematics and Statistics

Raymond Hintz

Professor, Surveying Engineering Technology

Don Hummels

Professor, Electrical and Computer Engineering

Jon Ippolito

Professor, New Media

Shaleen Jain

Professor, Civil and Environmental Engineering

Tora Johnson

Environmental and Biological Sciences, University of Maine at Machias

Nory Jones

Professor, Maine Business School

Andre Khalil

Professor, Chemical and Biological Engineering

Benjamin King

Assistant Professor, Bioinformatics

Anne Kelly Knowles

Professor, History

Cyndy Loftin

Associate Professor, Wildlife, Fisheries, and Conservation Biology

Yonggong (Tim) Lu

Associate Professor, Maine Business School

Jonathan Malacarne

Assistant Professor, Economics

Craig Mason

Professor, Education and Applied Quantitative Methods

Brian McGill

Professor, Biological Science

Silvia Nittel

Associate Professor, Spatial Computing

Harlan Onsrud

Professor, Spatial Computing

Nigel Pitt

Professor, Mathematics and Statistics

Parinaz Rahimzadeh-Bajgiran

Assistant Professor, Forest Resources

Nimesha Ranasinghe

Assistant Professor, Spatial Computing

Andrew Reeve

Professor, Earth and Climate Sciences

Penny Rheingans

Professor, Computer Science

Judith Rosenbaum

Associate Professor, Communication and Journalism

Mike Scott

Lecturer, New Media

Bruce Segee

Professor, Electrical and Computer Engineering

Salimeh Yasaei Sekeh

Assistant Professor, Computer Science

Ali Shirazi

Assistant Professor, Civil and Environmental Engineering

Andrew Thomas

Professor, School of Marine Sciences

Roy Turner

Associate Professor, Computer Science

Vince Weaver

Associate Professor, Electrical and Computer Engineering

J. Michael Weber

Professor, Maine Business School

Zheng (David) Wei

Assistant Professor, Mathematics and Statistics

Aaron Weiskittel

Professor, School of Forest Resources

Thomas Wiesen

Assistant Professor, Economics

Manuel Woersdoerfer

Assistant Professor, Maine Business School

Terry S. Yoo

Associate Professor, Computer Science

Yifeng Zhu

Professor, Electrical and Computer Engineering

## **Data Science and Engineering (Certificate)**

### **Data Science and Engineering Graduate Certificate**

[Return to: Graduate Programs, Certificates, Specializations, Emphases](#)

The Data Science and Engineering programs offered at the University of Maine are intended to meet the growing demand for graduates with core skills in managing and analyzing complex data and addressing data analytics challenges. Students from diverse backgrounds may advance their career potential by building knowledge in the domain. The graduate certificate begins this process as either a stand-alone graduate credential or leading to a full graduate degree. Practitioners across business, industry and government acquire base skills in order to keep up with changing information technology and data challenges in their work environments. The Graduate Certificate in Data Science and Engineering (GCDSE) consists of 15 credits and is designed to provide a foundation in key aspects of the field.

A candidate must complete 15 graduate course credits on-campus or online on a program of study approved by advisors that includes:

- A specified foundation course in each of statistics, programming, and systems unless waived based on previous coursework
- DSE 510 Practicum in Data Science and Engineering (3cr)
- 9 course credits drawn from at least three of the five **Theme Areas**
- further elective course credits from within the **Foundation Courses, Theme Areas, or Domain Specializations** as needed to arrive at the total of 15 credits

If none of the foundation courses are waived, the graduate certificate may require up to 21 credits to complete. If all are waived based on previous coursework, at least one elective course will be necessary to complete the 15 credit requirement.

Students in consultation with their adviser should not select courses that are duplicative of courses that may have been taken in the student's undergraduate degree program. For instance, if a previously taken course is duplicative of a course in one of the five core theme areas, simply select another course in that area or another theme area so that the total is still 9 course credits in three of the five core Theme Areas.

Typically, distance students view class sessions over the internet that have been recorded with the on-campus students although some sessions may be pre-recorded. Students in both class sections accomplish the same assignments and exams. Online students may, at their option, participate in most classes live over the internet. Work sessions and/or office hours are typically offered at times convenient for online students.

### **Course Descriptions**

Titles and prerequisites for courses in the program as well as alternative more advanced courses if some courses are waived may be found at Data Science and Engineering Graduate Course Groupings. For more detailed course descriptions and sample syllabi see the DSE Program Course Descriptions.

### **Student Eligibility and Admission Criteria**

Students desiring to acquire the Graduate Certificate in Data Science and Engineering should apply by completing the Graduate Certificate Application. The entire application packet including transcripts, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. The time limit for completion of the Graduate Certificate is the same as that set by the Graduate School for completion of a master's degree.

### **Continuation of DSE Certificate to M.S. in Data Science and Engineering**

When nearing or upon completion of the DSE Graduate Certificate, students may apply for the MS Data Science and Engineering or another closely related MS degree such as the MSIS or MSSI. They must meet all the master's requirements for admission. Students may transfer most or all of the courses in which they received a grade of B or higher from the DSE Certificate to the MS degree.

### **Additional Information**



For additional information on application and program requirements, see Advising Notes.

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Environmental and Biological Sciences, University of Maine at Machias

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Manuel Woersdoerfer

Assistant Professor, Maine Business School

Terry S. Yoo

Associate Professor, Computer Science

Yifeng Zhu

Professor, Electrical and Computer Engineering

## Digital Curation (Certificate)

The Digital Curation program is a one to two-year graduate certificate, taught online, intended for professionals looking to work in museums, archives, libraries, laboratories, studios, offices, and anywhere else that people need to manage digital files. The program walks students through the phases of managing digitized or born-digital artifacts and data including acquisition, representation, access, and preservation.

### **Educational Objectives:**

Students develop expertise in the following areas:

- Identifying analog and born- digital objects that merit short-term or long-term preservation, from individual audiovisual files such as videotapes to complex multimedia objects such as Web sites.
- Digitizing and preserving selected materials, including using metadata and databases to catalog objects.
- Improving access to public material and managing access to restricted digital material.
- Understanding the cultural context and technical skills required to develop, present, and promote digital exhibitions and interpretations of this material, on the Web and in real or mobile space.

### **Required Courses:**

1. Acquisition (digitization, recording, selection, law)

DIG 500: Introduction to Digital Curation

2. Representation (documentation, metadata)

DIG 510: Metadata

3. Access (database, collection, presentation, network)

DIG 540 Digital Collections and Exhibitions

4. Preservation (obsolescence, conservation, media formats)

DIG 550: Digital Preservation

**Optional courses:**

5. Internship

DIG 580: Digital Curation Internship

6. Elective

See list of Certificate website.

Students who choose the "fast-track" option may complete the four required courses within two semesters plus a summer term.

To make things easier for students currently working in collecting institutions, we have designed DIG 580 as an internship that may take place in the student's own workplace.

For up-to-date information, please visit <http://DigitalCuration.UMaine.edu>.

## **Disability Studies (Specialization)**

The Graduate Interdisciplinary Specialization in Disability Studies provides the opportunity for advanced study of theory, research, policy, and practice relevant to the lives of individuals and groups with disabilities. Located within the larger discourse of human diversity, disability is analyzed as an economic, social, cultural, political, and individual phenomenon.

Disability Studies curricula are offered at the University of Maine through the Center for Community Inclusion and Disability Studies (CCIDS), Maine's University Center for Excellence in Developmental Disabilities Education,

Research, and Service (See Research Resources page). Graduate students may obtain a specialization in Disability Studies in conjunction with several master's degree programs across campus, or in conjunction with the Interdisciplinary Ph.D. Through coursework, independent studies, or research, and in collaboration with the students' disciplinary departments, students examine a range of issues confronting local, state, national and global communities in which people with disabilities live. The faculty involved in curriculum development represent diverse departments and academic disciplines at the University of Maine.

## Master's Specialization in Disability Studies

Master's level students would enroll and successfully complete the following courses:

- **DIS 500** Contemporary Disability Theory
- **DIS 520** Disability: Advanced Interaction of Human Diversity and Global Environments
- **DIS 530** Disability Policy
- **DIS 550** Research Seminar in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator)
- **DIS 570** Master's Interdisciplinary Project in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator)

## Doctoral Specialization in Disability Studies

Doctoral level students would enroll in specialization courses: **DIS 500**, **DIS 520**, **DIS 530**, and **DIS 500**, which may also be taken in their departments if cross-listed. Doctoral students would complete the following:

**DIS 670** Interdisciplinary Project in Disability Studies (or a course in student's discipline considered under collaborative guidance of interdisciplinary disability studies faculty and student's home discipline faculty, approved by disability studies coordinator).

## Graduate Faculty

**Alan B. Cobo-Lewis**, Ph.D. (University of Wisconsin, 1992), Director, Center for Community Inclusion and Disability Studies; and Associate Professor of Psychology

**Elizabeth DePoy**, Ph.D. (University of Pennsylvania, 1988), Professor of Interdisciplinary Disability Studies, Center for Community Inclusion and Disability Studies; and Professor, School of Social Work.

**Stephen Gilson**, Ph.D. (University of Nebraska Medical Center, 1991), Coordinator and Professor of Interdisciplinary Disability Studies, Center for Community Inclusion and Disability Studies; and Professor, School of Social Work.

## Early Childhood Teacher (Certificate)

### **Early Childhood Teacher (Certificate)**

Maine has established a new requirement that teachers working in public school Pre-K classrooms must hold, or be working toward, Endorsement 081: Early Childhood Teacher.

K-8 certified teachers can apply the four required courses in this certificate in partial fulfillment of the State's requirements for the 081 endorsement.

#### **Objectives:**

1. Teachers will be prepared to work with young children and their families across a range of early childhood settings. Teachers may apply courses from this Certificate to State's Early Childhood Endorsement (081). The certificate supports teachers' eligibility to teach in a variety of early childhood settings, including inclusive pre-kindergarten classrooms located in public schools.
2. Teachers will learn about early child development - both in the classroom and through hands-on learning experiences - and use this knowledge to design, develop, and evaluate authentic learning experiences for young children.
3. Teachers will recognize that learning in early childhood environments lays a critical foundation for the young child's later success in school, work, citizenship, and personal fulfillment.
4. Teachers will understand that through play in a content-rich environment, children begin to make sense of the world around them, building the foundations they will need to become capable, enthusiastic learners and responsible, healthy adults.

(All work is based on the state MDOE and NAEYC standards.)

#### **Courses:**

CHF 450: Early Childhood Special Education

HUD 521: Teaching Science for Young Children

HUD 529: Teaching Numeracy for Young Children

HUD 505: Infant and Toddler Development - Has been proposed

Contact: Dr. Julie DellaMattera, [julie.dellamattera@maine.edu](mailto:julie.dellamattera@maine.edu)

## **Earth and Climate Sciences**

### **Introduction**

The School of Earth and Climate Science awards both Master's (M.S.) and Doctoral (Ph.D.) degrees. Student applicants to our graduate program commonly have a Bachelor's degree in Earth Sciences or closely related discipline, but the multidisciplinary nature of our program allows for entry from other backgrounds as well. Students entering the graduate program in Earth and Climate Sciences typically have completed at least one year of chemistry, physics, and calculus, as well as several courses in the Earth/environmental sciences beyond the introductory level. Students who have not completed these basic requirements may be admitted, but may be required to complete specific courses to fulfill deficiencies.

We admit students to our program only if we have identified an advisor and if a financial plan is in place to fund the student and the research. Therefore, it is critical that prospective students contact potential advisors before submitting an application. We occasionally are able to admit students who have not contacted potential advisors, but this is uncommon. Students who wish to be considered for teaching assistantships should have a complete application submitted by January 15. Most students are supported through Research Assistantships, which are administered by the faculty members that have received external grant funding. The January 15 deadline is not firm for prospective Research Assistants, but we ask that applications be submitted by then in case partial funding will derive from a Teaching Assistantship.

## **Research Groups**

### **Geodynamics, Crustal Studies and Earth Rheology**

Rocks and landforms at Earth's surface, potentially hazardous volcanic and seismic activity, the response of Earth's surface to icecaps that come and go with changing climate, and the slow but inexorable movement of continents all result from the interaction of physical and chemical processes taking place throughout Earth's crust and mantle. With international interest and funding directed towards addressing both basic research questions and applied problems, the broad fields of geodynamics, structural geology, mineralogy, geochemistry, and petrology are mainstays of geoscience research. Our ongoing and new capacity for microanalysis, including optical microscopy, energy- and wavelength-dispersive spectrometry, cathodoluminescence, electron backscatter diffraction, and laser ablation inductively coupled plasma mass spectrometry, along with experimental petrology and grain- through orogen-scale numerical modeling and supercomputer applications, allow us to develop groundbreaking ideas related to coupled physical and chemical processes that shape Earth's surface and drive the evolution of its lithosphere. Our research program spans spatial scales from micrometers in individual mineral grains (deformation mechanisms, mineral chemistry, microstructures) to hundreds of kilometers in mountain belts (tectonic history, magmatism, structural development, and coupling of surface and deep processes). We study events that occurred from 4.5 billion years ago at the dawn of Earth's history to those active today. We make observations of the natural world, using field, analytical, geochemical, and geophysical datasets, and explain these observations using basic physical and chemical principles. We employ numerical and analogue modeling to test our explanations and conceptual predictions. Our most active research threads center on relating strain to surface evolution, mountain-scale dynamics, mid- to lower-crustal rheology, elastic anisotropy, earthquake geology, physical and chemical processes in subduction zones, microstructural evolution, magma dynamics, pressure-temperature and chemical evolution of metamorphic rocks, stable isotope fractionation, and mineral paragenesis.

### **Climate Change, Glacial Geology, Glaciology, Paleooceanography, and Quaternary Studies**

As concern about the timing, magnitude, and rate of future climate change increases, developing a comprehensive understanding of the relevant mechanisms governing climate variability is crucial. The identification of several abrupt climate shifts in the paleoclimatic record greater in magnitude than those experienced by modern society has served to highlight the potential risks associated with continued increases in atmospheric greenhouse gas emissions. A variety of techniques, including modern observations, process studies, acquisition of paleoclimate proxy data, and model-based data synthesis and prediction, are used to study modern climate, document past climate change, and identify mechanisms of climate change that trigger abrupt climate change. These studies, in turn, serve to improve our ability to estimate future changes. Models that explain observed climate variability on all timescales are still inadequate, in part due to a lack of information on fundamental relationships between climate and environmental responses. Hypotheses that relate changes in climate forcings and associated responses are critical, particularly for the Southern Hemisphere, where long high-resolution paleoclimate records and detailed glaciological observations are limited. Additionally, an understanding of human response to past climate change provides an opportunity to understand the societal impact of major environmental events, such as changing weather patterns and rising sea levels. The interdisciplinary field of geoarchaeology provides the opportunity to examine such events in a human context, leading to a better understanding how future events may shape our cultural response. The School of Earth and Climate Sciences and Climate Change Institute have long been recognized as leaders in these areas, and have been involved in defining and refining several paradigms associated with global and abrupt climate change. Over the next decade, School and Institute faculty will



have integral and often leadership roles in several climate research initiatives ranging from deep ice core recovery and geologic sampling to satellite remote sensing and examining human culture/climate linkages.

### **Environmental Geosciences and Watershed Systems**

Near-surface Earth processes control water movement, surface erosion, sediment and nutrient transport into and through major rivers, and the chemical alteration of earth materials. Ecosystem management, water resource protection, and the supply of clean drinking water are all intertwined with near surface physical and chemical processes. These processes impact the lives of people whenever they drink from Maine's abundant water resources or cast a fishing line into one of the many lakes and rivers in the state, and they have direct bearing on the structure and viability of ecosystems in both rural and urban settings. Environmental geoscience faculty are involved in studies of watershed geomorphology, peatland hydrology and geochemistry, groundwater movement in fractured bedrock, chemical weathering of bedrock, and geochemistry related to carbon sequestration and greenhouse gas emissions. Examples of questions that inspire research undertaken within the group include:

What is the timing and magnitude of sediment movement through watersheds?

How does groundwater flow within peatland ecosystems interact with carbon cycling?

What chemical reactions control the weathering of important rock types?

How do biota affect rock weathering?

How do watersheds respond to changes in climate, vegetation and urbanization?

Our studies involve field measurements, laboratory experiments, and computer simulations. Collaborators in environmental geoscience activities at the University of Maine share our goal of improving our understanding of the environment to develop adaptive natural resource management strategies essential to environmental sustainability. These groups, as well as state and federal agencies, provide many exciting opportunities for multidisciplinary interaction.

### **Marine/Coastal Geology and Sedimentary Processes**

The response of shorelines and their inhabitants to rising sea level and associated coastal processes has been a major research focus of near shore Marine Geology for many years. With the recent explosion of human populations in coastal areas, such as barrier islands, deltas and landslide-prone bluffs, there is a growing need to develop quantitative measurements and models to understand how coastal environments have changed, are changing and will likely change as the level of the sea rises and storms frequently alter the shore. Sea-level change is driven by both glacial expansion and contraction, as well as by land level changes associated with loading/unloading of ice on the land; processes that link marine geology to climate change and geodynamics. As the shoreline rises and falls, processes dominated by waves, wind and tides have swept over what is now the seafloor, as well as terrestrial regions and lakes. Our focus on sea-level change has involved the development of indices to record sea-level change over the past 20,000 years from locations above and below the present shoreline, including mapping the seafloor and lake bottoms. We interact with State agencies, such as Maine Geological Survey and Department of Marine Resources and federal agencies, including the U.S. Geological Survey and National Park Service. Our expertise and research results affect state and national policies on mitigation and prevention of coastal hazards and sound shoreline construction planning. Marine records of past environmental change are also essential to understanding long-term ocean and climate dynamics. We analyze the geochemical, faunal, and physical properties of both coastal and offshore sediments to gain insight into the drivers and feedbacks involved in Earth's climate system.

### **Facilities**

School research facilities are extensive and modern. Facilities available for solid-Earth research include a Cameca SX-100 electron microprobe, Tescan Vega XMU scanning electron microscope (with integrated energy-dispersive spectrometry, electron backscatter diffraction and full-color cathodoluminescence systems), ESI NWR193<sup>UC</sup> excimer laser ablation systems coupled to an Agilent 8900 inductively coupled plasma mass spectrometer (LA-ICP-MS/MS), experimental petrology equipment, powder x-ray diffraction, stable isotope laboratory, computational geodynamics facility, mineral separation, rock preparation, polishing and thin section laboratories, and high resolution photomicroscopy.

Marine Geology equipment and facilities include a suite of digital electronic geophysical equipment for sidescan sonar, seismic reflection and single and multibeam bathymetry, current meters and tide gauges and ground penetrating radar. We have a marine electric vibracorer, a portable coastal vibracorer and hand-operated corers as well as an underwater videocamera. The sedimentology laboratory is fully equipped for core analysis, photography, microscopy, micropaleontology, weighing, centrifuging, drying, muffle furnace, sieving, and automated textural analysis with a settling tube for sand and an X-Ray sedigraph for mud. GIS capability is supported with computer workstations mounting ArcView and ArcInfo software. A clean room for trace metal analysis equipped with a fume hood and boron-free laminar flow bench is under construction.

The glacial and surficial geology group maintains laboratories in the Sawyer Environmental Building. Facilities include preparation areas (including a clean room) for radiocarbon, uranium-thorium, and cosmogenic isotope dating. We also have facilities and equipment for satellite and air photo interpretation and sediment-core analysis.

The environmental geology group maintains a wet chemistry laboratory and a hydrogeology laboratory. The wet chemistry laboratory includes a shaking water bath, pH meters, stirring hot plates, water filtration system and DI water dishwasher, visible light spectrophotometer, as well as other supplies for sample preparation equipment. The hydrogeology laboratory houses a computer workstation, acoustic Doppler and electromagnetic flow meters, Darcy tube, function generator with voltage potential data loggers (for laboratory experiments), and surveying equipment (GPS Units, total station, autolevel). These labs also store extensive field sampling equipment including soil augers (hand and power auger), several submersible pumps, peristaltic pump, field portable pH and conductance meters, field spectrophotometer, field filters, Hach digital titrator, several water-level indicators, data-logging pressure transducers, and dedicated field laptop. Computer modeling and data analysis is supported with computer workstations utilizing Geochemist's Workbench, MIKE SHE, and various open source software (Modflow, FiPy, Python).

### **Graduate Faculty**

**Katherine Allen**, Ph.D. (Columbia, 2013) Assistant Professor. Paleooceanography, marine geology and geochemistry.

**Sean Birkel**, Ph.D. (Maine, 2010), Research Assistant Professor. Climate and ice sheet modeling.

**Seth Campbell**, Ph.D. (Maine, 2014), Assistant Professor. Radar, ice geophysics and dynamics.

**Alicia Cruz-Uribe**, Ph.D. (Penn State, 2014), Associate Professor. Metamorphic petrology and geochemistry.

**George H. Denton**, Ph.D. (Yale, 1965), Professor. Quaternary and Glacial Geology.

**Christopher C. Gerbi**, Ph.D. (Maine, 2005), Professor. Rheology, geodynamics, ice dynamics and geophysics.

**Edward S. Grew**, Ph.D. (Harvard, 1971), Research Professor. Metamorphic petrology, mineralogy and geochemistry.

**Brenda L. Hall**, Ph.D. (Maine, 1997), Professor. Quaternary and Glacial Geology, millennial-scale climate change and ice sheet stability.

**Scott E. Johnson**, Ph.D. (James Cook, 1989), Professor. Structural geology, microstructural processes, Earth rheology, tectonics, coupling of deformation and metamorphism.

**Alice R. Kelley**, Ph.D. (Maine, 2007), Instructor. Geoarcheology, surficial processes.

**Joseph T. Kelley**, Ph.D. (Lehigh, 1980), Professor. Marine geology, sedimentology.

**Peter O. Koons**, (E.T.H., 1983), Professor. Mechanics of mountain building, interaction of surface processes and plate tectonics, the evolution of active continental margins, mantle deformation, atmosphere-topography interactions.

**Karl J. Kreutz**, Ph.D. (New Hampshire, 1998), Professor. Stable isotope geochemistry, paleoceanography, ice core geochemistry.

**Andrei Kurbatov**, Ph.D. (SUNY Buffalo, 2001), Associate Professor. Explosive volcanism, tephrochronology, glaciochemistry.

**Kirk A. Maasch**, Ph.D. (Yale, 1989), Professor. Climate Modeling.

**Paul A. Mayewski**, Ph.D. (Ohio State, 1973), Professor. Glaciology, paleoclimatology, ice core geochemistry.

**Stephen A. Norton**, Ph.D. (Harvard, 1967), Professor Emeritus. Environmental geochemistry.

**Amanda A. Olsen**, Ph.D. (Virginia Tech, 2007), Associate Professor. Environmental geochemistry.

**Aaron Putnam**, Ph.D. (Maine, 2011), Associate Professor. Quaternary and glacial geology.

**Andrew S. Reeve**, Ph.D. (Syracuse, 1996), Professor. Hydrogeology.

**Kristin Schild**, Ph.D. (Dartmouth, 2017), Assistant Professor. Geomatics, remote sensing, ice-ocean interactions, physical glaciology.

**Sean M.C. Smith**, Ph.D. (Johns Hopkins University, 2011), Associate Professor. Geomorphology and Watershed Processes.

**Martin G. Yates**, Ph.D. (Indiana, 1987), Associate Scientist. Electron beam and X-ray facilities, ore deposits.

## Ecology and Environmental Sciences

The University of Maine offers a comprehensive graduate training program in ecology and environmental science (EES). The interdisciplinary graduate program in Ecology and Environmental Science includes faculty members in 14 departments and schools who collectively represent a broad spectrum of expertise in the analysis of the physical, chemical, biological, ecological, societal, environmental policy, and paleoecological aspects of terrestrial, freshwater, and marine ecosystems. Specific areas of program emphasis at The University of Maine include: conservation biology, community and landscape ecology, population ecology and environmental physiology, agricultural ecology, ecosystems analysis of watersheds, wetland ecology, forest ecology, marine and estuarine ecology, paleoecology, soil chemistry, biogeochemistry, environmental chemistry, environmental engineering, environmental measurements and remote sensing, geographic information systems, global change, environmental pollution, environmental economics, environmental policy, population genetics, and freshwater ecology.

## Degrees

Graduate students focusing in ecology and environmental science can earn either a Doctor of Philosophy or a Master of Science Degree (thesis or non-thesis).

# Application

To inquire about specific opportunities and the availability of graduate assistantships, write to any of the faculty members listed at our website whose interests are close to yours. For more information about the Graduate Program in Ecology and Environmental Science, visit our web site at [www.umaine.edu/ecologyandenvironmentalsciences](http://www.umaine.edu/ecologyandenvironmentalsciences) or write to Graduate Program in Ecology and Environmental Sciences, 101 Nutting Hall, University of Maine, Orono, ME 04469, or e-mail: [ees@maine.edu](mailto:ees@maine.edu)

## Graduate Faculty

### **Climate Change Institute**

Daniel Dixon, global climatology, environmental sustainability

### **Department of Anthropology**

Christine Beitzl, coastal and marine resources, environmental governance, human ecology

Samuel Hanes, cultural and historical geography, environmental anthropology, agriculture, fisheries

Cindy Isenhour, environment policy, climate, commodity chains, waste

Darren Ranco, cultural anthropology, indigenous communities, and environmental justice, climate change adaptation

Paul Roscoe (cultural anthropology, ecological anthropology)

### **Department of Chemistry**

Barbara J.W. Cole, plant and wood chemistry

### **Department of Civil and Environmental Engineering**

Shaleen Jain, hydroclimatology, water resources sustainability

Jean D. MacRae, nutrient and metal cycling in natural and engineered systems, including aquaculture waste, wastewater, and solid waste, energy extraction from waste

### **Department of Communication and Journalism**

Bridie McGreavy, environmental communication, communication studies, climate change communication and, resilience, sustainability science

Laura Rickard, risk communication, strategic communication, environmental communication, sustainability, policy

### **Department of Mathematics and Statistics**

David Hiebeler, spatial population ecological and epidemiological dynamics

### **Department of Spatial Information Science Engineering**

Kate Beard-Tisdale, GIS

**Department of Wildlife, Fisheries, and Conservation Biology**

Erik J. Blomberg, wildlife population ecology

Aram Calhoun, wetland ecology

Stephen M. Coghlan, Jr., conservation and management of native fishes and their supporting ecosystems

Daniel J. Harrison, mammal ecology

Malcolm L. Hunter, Jr., conservation biology, landscape ecology

Cynthia S. Loftin, systems and wetlands ecology, hydrology, GIS

Carly Sponarski, human dimensions of wildlife

Joseph D. Zydlewski, fish ecology, behavior, and physiology

**School of Biology and Ecology**

Andrei Alyokhin, applied insect ecology, behavior and management

Seanna Annis, applied and basic research of fungi, particularly plant-pathogenic fungi

Christopher Cronan, ecosystem ecology, biogeochemistry

Allison Gardner, medical entomology, vector-borne disease ecology, epidemiology

Jacquelyn Gill, paleoecology, community ecology, biogeography, extinction, biotic interactions

Hamish Greig, stream ecology

David Hart, stakeholder-engaged, solutions-driven, sustainability science; boundary spanning

Rebecca Holberton, endocrine physiology and behavioral ecology of migratory birds

Michael T. Kinnison, Contemporary evolution and eco-evolutionary dynamics, aquatic ecology and of fish biology, environmental DNA

Amanda Klemmer, cross-ecosystem food-webs, landscape ecology, aquatic ecosystems

Danielle Levesque, mammalogy, ecophysiology, mammalian health

Joyce E. Longcore, diversity, systematics and phylogeny of the Chytridiomycota

Brian McGill, large scale ecology and global change

Brian Olsen, conservation biology and avian evolutionary ecology

Katharine Ruskin, conservation, breeding biology, avian ecology and biogeography

Jasmine Saros, paleoecology and aquatic ecology

Ek Han Tan, plant genetics and genomics, genome elimination, potato breeding, chromothripsis

**School of Earth and Climate Sciences**

Alice Kelley, Climate Change Institute

Joseph Kelley, coastal geology

Amanda Olsen

Andy Reeve, groundwater geochemistry, hydrology, wetlands, modeling

Sean Smith, Watershed and Fluvial Geomorphology, Land-Sea Connections, Watershed Sustainability Solutions

### **School of Economics**

Kathleen Bell, environmental and resource economics, environmental policy, land-use change, climate change, community resilience, social-ecological systems

Travis Blackmer

Keith Evans

Sharon Klein, Renewable Energy, Sustainable Energy Economics & Policy, Environmental Impacts of Energy, Thermal Energy Storage, Energy Poverty, Multi-Criteria Decision Making

Caroline Noblet

Jonathan Rubin, energy and environmental policy, light-duty transportation, greenhouse gas emissions and alternative fuels

Mario Teisl, environmental labeling, resource economics

Timothy Waring, sustainability, cooperation, culture, evolution

### **School of Food and Agriculture**

M. Susan Erich, soil and environmental chemistry

Eric Gallandt, sustainable agriculture, weed ecology and management

Jianjun (Jay) Hao, Plant disease epidemiology, microbiomes associated with soil health and disease management, screen potato germplasm for tolerance and resistance to seed borne and soilborne diseases, signaling molecules in Phytophthora erythrorepetic, Mediating pathogen biology, biological control, fungicide resistance

Pauline Kamath, One Health, disease ecology and evolution, wildlife conservation, molecular ecology, genomics

Anne Lichtenwalner, Diseases at the domestic and wildlife interface

Bryan Peterson, ornamental horticulture

Tsutomu Ohno, soil chemistry, organic matter-mineral associations

### **School of Forest Resources**

John Daigle, forest recreation management

Adam Daigneault, Climate change impacts and implications; catchment-level sedimentation mitigation; sustainable energy pathways

Sandra De Urioste-Stone, nature-based tourism

Ivan Fernandez, Climate Change Institute

Shawn Fraver, forest ecosystems

Laura Kenefic, forest ecology and management

Jessica Leahy, human dimensions of natural resources

William Livingston, forest pathology

### **School of Marine Sciences**

Damian Brady, biogeochemistry, environmental oceanography

Kristina Cammen, molecular ecology, ecological genomics, ocean health

Yong Chen, fisheries science, fisheries ecology, stock assessment, and fisheries management

William Ellis

Teresa Johnson, human ecology, marine policy, fisheries and aquaculture

Heather Leslie, ecology, policy, and management of coastal marine systems

Joshua Stoll

Gayle Zydlewski, oceanography, fish ecology

## **Economics**

**The Master of Arts in Economics** and **Master of Science in Economics** degrees emphasize practical economic applications. Students enrolled in these programs combine core training in microeconomic and macroeconomic theory and quantitative methods with economics courses covering a wide range of topics. Graduate students acquire the skills and knowledge to apply economic theory and tools to address interesting problems. The School of Economics creates numerous opportunities for students to expand their horizons by involving them in ongoing research projects, partnering them with public and private sector institutions, and connecting them with innovative internship experiences.

Graduates from both programs acquire strong analytical, quantitative, and communication skills, which prepare them for Ph.D. programs in Economics and related fields and employment with government agencies, consulting firms, businesses, and non-profit organizations. The main difference between the two programs is the M.S. provides advanced technical and quantitative training, while the M.A. provides the opportunity for exploring more electives. Both degrees offer thesis and non-thesis options and prepare students for positions requiring advanced analytical skills, knowledge of economic systems and methods, and practical experience conducting economic analyses of policy issues.

### **Admission Requirements:**

Admission to the School of Economics is competitive. An undergraduate degree in economics or a related field is desirable but not essential for admission. The School of Economics is much more concerned with the applicant's capacity for graduate study, quantitative reasoning and the quality of previous work. Below is a list of **required** and **recommended courses**. Applicants seeking *admission* generally achieve a B or better in these courses. Applicants seeking *funding* (see below for more information) generally achieve an A- or better in most of the required courses listed below AND have a **3.5 GPA** or higher. Applicants with lower grades/GPA may be admitted/funded, especially if they have unique experiences that demonstrate strong knowledge, skills, determination, and ability to be successful in a rigorous graduate program and make a unique contribution to the School of Economics.

Required Courses (UMaine equivalent\*):

- Intermediate Microeconomic Theory (ECO 350)

- Intermediate Macroeconomic Theory (ECO 321)
- Statistics (STS 215 or 232)
- Calculus I (MAT 126)

Strongly Recommended but Not Required (UMaine equivalent\*):

- Calculus II (MAT 127)
- Calculus III (MAT 228)
- Linear Algebra (MAT 262)
- Mathematical Economics (ECO 480)
- Econometrics (ECO 485)
- Computer Programming experience (e.g., R, Matlab, Python)

*\*Descriptions for UMaine equivalent courses can be found in the UMaine Undergraduate Catalog:*

*<http://catalog.umaine.edu/>*

In addition to the required and recommended courses listed above, we expect: 1) a strong, well-written personal **essay** that clearly communicates why the applicant is a good fit for our program and why our program is a good fit for the applicant in the context of a set of clear academic and professional goals; the essay should also demonstrate the potential for the applicant to succeed when faced with challenges; 2) strong **letters of recommendation** from faculty that taught courses included in our admission requirements and/or other mentors of related work (e.g., thesis/research advisor, job supervisor, etc.), which demonstrate the applicant's ability to be successful in a rigorous graduate program; 3) a well-written and clear **resume/CV** that demonstrates a strong work ethic and interest in gaining applicable skills/knowledge outside of the classroom.

GRE scores may help faculty evaluate applications where there is uncertainty about potential success in the program. They are recommended but not required. GRE scores of admitted students in the past have been around 160 for each of the Verbal and Quantitative sections and 4 for the Analytical section.

Official English proficiency examination scores are required unless you received a degree from an English-speaking institution. For more information, visit the Graduate School website or the Admission section of this catalog. For **admission**, the School of Economics requires TOEFL scores to be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher. To obtain **funding**, scores should be higher: TOEFL above 98, 247 or 597 respectively, and the IELTS equal to 7.6 or higher.

Other general admission criteria are described in the Admission section of this catalog.

\*Descriptions for all UMaine Graduate level courses can be found in the UMaine Graduate Catalog:<http://gradcatalog.umaine.edu/>

### **Degree Requirements**

Successful completion of 30 credit hours of course work is required for both the M.A. and M.S. degrees in Economics. Students on a thesis track also must pass an oral examination and have their written thesis approved by their Advisory Committee. The thesis offers students an opportunity to complete an independent research project under the guidance of an economics faculty member. The non-thesis option is designed for students who wish to obtain greater breadth in their coursework and job experience through internships, independent studies, and/or additional electives.



The following table outlines the degree requirements for the M.A. and M.S. degree programs with Thesis and Non-Thesis options. The core required ECO courses provide students with tools and problem-solving skills applicable to the economic analysis of a wide variety of public policy issues. Elective courses allow students flexibility in designing programs to meet their needs.

<b>DEGREE REQUIREMENTS</b>	<b>M.A.</b>	
	<i>Thesis</i>	<i>Non-Thesis</i>
ECO 511 - Macroeconomic Theory	3	3
ECO 514 - Microeconomic Theory	3	3
ECO 530 - Econometrics	3	3
ECO 531 - Advanced Econometrics and Applications		
ECO 532 - Applied Time Series Econometrics		
ECO 699 - Graduate Thesis	6	
ECO elective credits	9	12
Additional elective credits	6	9
<b>Total Credits</b>	<b>30</b>	<b>30</b>

Elective coursework, independent studies, and thesis work are developed in consultation with the student's advisor(s). The areas of interest, background, and future needs of the student will be considered in planning the program of study.

### **Funding Support**

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for assistance with research, teaching, or administration. Efforts are made to match the student's interests and background with the needs of the School. Scholarship funding is also available. The faculty nominates top-ranking applicants for these award. Funding support includes a stipend, tuition costs, and subsidized health insurance coverage. Additional funds are provided to students on a competitive basis to cover research expenses. Graduate assistantships require 20 hours of work per week. For details on funding opportunities, visit the School of Economics Graduate Program website: <https://umaine.edu/soc/graduate/>

### **Dual Degree in Global Policy and Economics**

The School of Policy and International Affairs and the School of Economics offer an interdisciplinary dual degree program in Global Policy and Economics (via the Economics M.A., M.S., or Resource Economics and Policy M.S.).

The dual-degree program is intended for students interested in the application of economics and policy in an international setting. The course of study is normally three years. It leads to two master's degrees: one in Global Policy (with a concentration in either *International Trade and Commerce* or *International Environmental Policy*) and one in one of our Economics or Resource Economics and Policy degrees.

Students are required to complete the requirements for a master's degree in one of the economic sciences (Economics; Resource Economics and Policy) and the requirements for either the Trade and Commerce or International Environmental Policy concentrations within the Global Policy degree.

Six hours of each degree can be counted as electives for the other (i.e., a total of 12 credits can be double counted); as a result, a total of only 51 hours is required to complete both degrees (rather than the 63 usually required for two completely independent master's degrees).

#### **Thesis / Internship options for the dual degree:**

- 1. For thesis students in the Economics program: a thesis is written for the economics degree; an internship is completed for the Global Policy degree.*
- 2. For non-thesis students in the Economics program: six credit hours in coursework replace the thesis requirement for the economics degree; an internship is completed for the Global Policy degree.*
- 3. A separate thesis may be written for the economics degree and for the Global Policy degree.*

Students in the dual-degree program will have two graduate coordinators, one from SPIA and one from SOE. Graduate advising committees, whether thesis or non-thesis, must comply with the rules outlined for each graduate degree. Two separate programs of study, one for each degree, must be developed and approved by the respective unit's committee (SPIA and SOE) and the respective graduate program coordinators by the end of the second semester of the student's tenure in the program. The student may choose to have 2 separate committees with separate SPIA and SOE chairs or one integrated SPIA/SOE committee with two co-chairs (one from SPIA and one from SOE).

The programs of study will be designed to meet the requirements of BOTH degrees in which they are enrolled. However, the dual degree program gives the student and his or her committee additional flexibility to devise a program that supports their specific needs.

#### **Graduate Faculty**

The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy and human ecology expertise.

**Mario Teisl**, Ph.D. (University of Maryland), Professor and Director. Information economics, food safety, environmental and social marketing, and environmental economics.

**Christine Beitzl**, Ph.D. (University of Georgia) Cooperating Assistant Professor of Anthropology, Ecological and Environmental Anthropology. Intersections of socio-political, ecological, and economic systems.

**Kathleen Bell**, Ph.D. (University of Maryland), Professor. Environmental economics, public economics, and spatial economics.

**James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

**Andrew Crawley**, Ph.D. (University of Glamorgan) Associate Professor in Regional Economic Development. Economic impact, economic modeling.

**Adam Daigneault**, Ph.D. (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. Freshwater management, climate change mitigation and adaptation, invasive species control, valuing ecosystem services.

**Angela Daley**, Ph.D. (Dalhousie University) Associate Professor of Health Economics and Policy. Health and labor economics, poverty and inequality, social policy, children and families, rural and remote communities including aboriginal people.

**Keith S. Evans**, Ph.D. (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery management; nonmarket valuation; applied econometrics

**Todd Gabe**, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance

**Sharon Klein**, Ph.D. (Carnegie Mellon University), Associate Professor. Technical, economic, environmental, and social/policy impacts of renewable energy and energy efficiency, community-based sustainable energy adoption.

**Jessica Leahy**, Ph.D. (University of Minnesota) Cooperating Professor of Human Dimensions of Natural Resources. Environmental attitudes and behaviors towards forests, forestry, and other natural resource management topics.

**Jonathan Malacarne**, Ph.D. (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

**Caroline Noblet**, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

**Jonathan Rubin**, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

**Philip Trostel**, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

**Tim Waring**, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

**Tommy Wiesen**, Ph.D. (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics

## EDUCATION (All Degrees)

### EDUCATION (All Degrees)

#### About the College

The College of Education and Human Development is the largest provider of undergraduate and graduate professional education programs and educational policy research in Maine. The College's graduate programs prepare teachers and other specialists to apply research-based knowledge, field-tested experience and the latest technology to help address the changing needs of schools, colleges, children and families. As the home of statewide, regional and national research and professional development programs, the College's work is informed and innovative. Graduate programs are designed to enrich and extend theory, practice and leadership. The hallmark of graduate work at the College is mentoring-working closely with a faculty advisor whose goal is to ensure that student programs meet unique needs. Small classes, led by widely recognized faculty, encourage debate, inquiry, and discussion based on real experiences and current issues. Flexibility is built into individual programs to allow the greatest impact in specific areas of need. This same commitment to individual growth and inquiry is ingrained in outreach and distance education. A number of graduate programs are offered online, and others that are not completely online, typically utilize a variety of hybrid approaches to make graduate education more accessible. In addition, all synchronous graduate courses, online and on campus, are offered in the evenings making them convenient for working educators.

**Accreditation**

All of the College's initial teacher certification programs are fully accredited by the Council for the Accreditation of Education Preparation (CAEP) and approved by the Maine Department of Education.

**Financial Aid**

A number of College of Education and Human Development graduate assistantships are available for qualified students from the master through the doctoral levels. A decision on financial aid is made only after a completed application for admission has been received and approved. The College administers the Linda N. Lancaster Fund, which is designated to help cover some professional development expenses of graduate students, such as travel to conferences. Graduate Assistantships in various student affairs offices, based on application to the specific office, serve a number of students especially in our programs in Higher Education and Student Development. This catalog describes other financial aid opportunities elsewhere.

**Overview of Degrees**

The College offers a variety of graduate programs leading to the Master of Education, Master of Arts, Master of Arts in Teaching, Master of Science, the Education Specialist, Doctor of Education, and Doctor of Philosophy. The Doctor of Education and Doctor of Philosophy degrees require a dissertation. The Master of Arts and Master of Science degrees require a thesis; the Education Specialist, Master of Education, and Master of Arts in Teaching are non-thesis programs. A number of specialty areas or concentrations are available for each degree program. Graduate students, in consultation with their advisors, plan their programs based on Graduate School and College requirements, certification guidelines, professional association recommendations, and individual goals. More information about specific graduate programs is available on the College of Education and Human Development website <https://umaine.edu/edhd/graduate/>

**Master of Education**

The Master of Education (M.Ed.) is intended to enhance the preparation of educational professionals in specialty areas. The degree is granted on completion of a planned program of study that includes a minimum of 33-36 semester hours, depending on the discipline. Those semester hours may include up to 6 hours of approved transfer coursework from a fully accredited college or university which would be acceptable at that institution in partial fulfillment of its requirements for a graduate degree, or up to 12 hours of approved transfer coursework from the University of Maine. In lieu of a thesis, M.Ed. programs require completion of a comprehensive paper, project, portfolio, or oral examination, or internship generally during the final semester or year of study. The purpose of this requirement is to enable demonstration of learning that has taken place across the program as a whole. All work for the M.Ed. program must be completed within six years of matriculation.

Eligibility for admission to M.Ed. programs is based on completion of prerequisites for the specific program. Some PreK-12 programs require prior teacher certification. However, an applicant from another undergraduate program may establish eligibility by meeting essential prerequisites. Applicants may be required to take the Miller Analogies Test or the Graduate Records Exam, if required by their specific program. Applicants should allow up to six weeks for scores to be sent to the Graduate School.

**Education Specialist**

The Education Specialist (Ed.S.) provides a cohesive program of professional development beyond the master's level for practicing educators. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S.. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be

completed within six years.

### **Master of Arts**

The Master of Arts degree requires a thesis and a minimum of 30 credit hours including credit given for the thesis. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. A graduate student working toward a Master of Arts degree must successfully complete a minimum of 12 hours (exclusive of thesis) of 500- and/or 600- level coursework.

### **Master of Science**

The Master of Science degree requires a thesis and a minimum of 30 credit hours including credit given for the thesis. The minimum amount of credit for the thesis is 6 hours and in no case may it exceed 15 hours. A graduate student working toward a Master of Science degree must successfully complete a minimum of 12 hours (exclusive of thesis) of 500- and/or 600- level coursework.

### **Master of Arts in Teaching**

The Master of Arts in Teaching (MAT) degree is an accelerated teacher licensure program in secondary education that leads to initial teacher certification in a designated content area and a master's degree. It is designed for those already holding an undergraduate degree in a relevant content area and interested in becoming a secondary school teacher. Content areas include: Math, Life Science, Physical Science, English, Social Studies, and World Languages.

### **Doctor of Education and Doctor of Philosophy**

Doctor of Education (Ed.D.) in and/or concentrations within the Doctor of Philosophy in Education (Ph.D.) are offered in the specialty areas of, Educational Leadership (Ed.D.), Higher Education (Ph.D.), Literacy (Ph.D.), Prevention and Intervention Studies (Ph.D.), and STEM Education (Ph.D.). Standardized test scores, such as the graduate records exam, are determined by the faculty of each program and meet other admissions requirements of the Graduate School and the specific program. Potential candidates should contact the Program Coordinator for each concentration or the Department Chair prior to submitting an application because some programs are offered only to cohorts and are not open to new students every year. In addition, program requirements, application deadlines, and admissions criteria vary by area (see program descriptions below). Candidates wishing to be considered for Graduate School awards should apply no later than January 15.

### **Graduate Faculty**

**Richard Ackerman**, Ed.D. (Harvard, 1989). Professor, Educational Leadership. Leadership formation, school organization, professional development.

**Elizabeth J. Allan**, Ph.D. (The Ohio State University, 1999). Professor, Higher Education. Equity policy, gender and education, policy discourse analysis.

**Courtney Angelosante**, M.S., BCBA, (University of Southern Maine, 2011). Lecturer, Special Education. Positive Behavior Interventions and Supports, School-wide climate.

**A. James Artesani**, Ed.D. (West Virginia University, 1992). Associate Dean of Graduate Education, Research, and Outreach and Associate Professor, Special Education. Positive Behavior Interventions and Supports, Emotional and Behavioral Disorders.

**Victoria Bennett-Armistead**, Ph.D. (Michigan State University, 2006). Associate Professor, Early Literacy. Language and literacy acquisition in young children; Literacy instruction in Pre- K and kindergarten; Informational text.

**Catherine Biddle**, Ph.D. (Pennsylvania State University, 2015). Associate Professor, Educational Leadership. Rural school and community response to social and economic change.

**Margo Brown**, M.Ed., CAS (University of Maine, 2001). Lecturer, Human Development and Family Relations and Coordinator, Katherine Miles Durst Child Development Learning Center.

**Rebecca Buchanan**, Ph.D. (University of California Santa Cruz, 2017). Assistant Professor, Curriculum, Assessment, and Instruction. Intersection of personal identity, professional development, school reform, literacy, and language.

**Ian Cameron**, M.S. Lecturer, Human Development and Family Studies. Adolescence and emerging adulthood. Adult development and aging.

**Sandra Caron**, Ph.D. (Syracuse, 1986). Professor, Family Relations. Human sexuality, AIDS and families, sexuality education and curriculum development.

**Theodore Coladarci**, Ph.D. (Stanford, 1980). Professor Emeritus, Educational Psychology. Statistics, research methodology.

**Melissa Cuba**, Ph.D. (Virginia Commonwealth University, 2020). Visiting Assistant Professor of Special Education

**Julie DellaMattera**, Ed.D. (University of Maine, 2006). Associate Professor, Early Childhood Education. Leadership in early education and policies affecting early education teachers.

**Justin Dimmel**, Ph.D. (University of Michigan, 2015). Associate Professor, Mathematics Education and Instructional Technology. Communication practices in mathematics education; virtual reality in mathematics education.

**Janet Fairman**, Ph.D. (Rutgers, 1999), Associate Professor, Public policy, school reform, and assessment.

**Sara Flanagan**, Ph.D. (Purdue University, 2012). Assistant Professor, Special Education. Literacy and secondary students with and without high incidence disabilities, with a specific focus on written expression.

**Maria Frankland**, Ph.D. (University of Maine, 2020). Lecturer, Educational Leadership.

**Kathleen Gillon**, Ph.D. (Iowa State University, 2015). Assistant Professor, Higher Education. Access and equity in higher education. Role of geography in the facilitation of college-going for marginalized student populations.

**Michelle McAnuff Gumbs**, Ph.D. (Ohio University, 2006). Associate Professor of Literacy Education.

**Leah Hakkola**, Ph.D. (University of Minnesota, 2015). Associate Professor, Higher Education. Diversity discourses in higher education; recruitment and admissions

**Sarah Howorth**, Ph.D., BCBA (State University of New York at Buffalo, 2015). Assistant Professor, Special Education.

**Elizabeth Hufnagel**, Ph.D. (The Pennsylvania State University, 2014). Associate Professor, Science Education. Emotional expressions and teaching and learning about science topics in classrooms and other science settings. Climate change and other environmental topics.

**Diane Jackson**, Ed.D. (University of Maine, 2000). Lecturer, Special Education. Adapting instruction for students with special needs, math methods in special education.

**Lauren Jacobs**, M.S. (University of Maine, 2017). Lecturer, Kinesiology and Physical Education. Outdoor sport opportunities.

**Jesse Kaye-Schiess**, M.Ed. (University of Maine, 2016). Lecturer, Kinesiology and Physical Education and Academic Advisor.

**Richard Kent**, Ph.D. (Claremont, 2002). Emeritus Professor, Literacy. Portfolio pedagogy, adolescent male underachievement in literacy, innovative middle school and high school classrooms.

**Vanessa Klein**, Ph.D. (Kent State University, 2015). Assistant Extension Professor, 4-H STEM Specialist, and Assistant Professor, Education. Educational programming, leadership for applied research focused 4-H STEM programming, environmental education, and teacher education.

**Robert A. Lehnhard**, Ph.D. (Ohio State, 1984). Professor, Kinesiology and Physical Education. Exercise physiology. Cardiovascular physiology; metabolic support of exercise and growth.

**Mary Ellin Logue**, Ed.D. (University of Massachusetts, 1984). Associate Professor Emerita, Early Childhood Education. Parent involvement in children's learning and schooling, prevention of learning and social difficulties, teacher education, and application of child development research to practice.

**Craig Mason**, Ph.D. (University of Washington, 1993). Professor, Education and Applied Quantitative Methods. Research methodology, developmental epidemiology, behavioral informatics.

**Jennifer McNulty**, M.Ed. (University of Maine, 2010). Lecturer, Kinesiology and Physical Education. Health methodology and curriculum development.

**Ian Mette**, Ph.D. (University of Missouri, 2012). Associate Professor, Educational Leadership. School reform; instructional leadership; educational supervision.

**Tammy Mills**, Ph.D. (Montclair State University, 2016). Assistant Professor of Curriculum, Assessment, and Instruction. Explore the complexities of teaching and learning and using non-linear theoretical perspectives of teaching and learning to better understand practice.

**Sidney Mitchell**, Ph.D. (McGill, 2001). Associate Professor, Educational Psychology. Child development, childhood socialization, family violence, and trauma and resilience.

**Mia Morrison**, M.Ed. (University of Maine, 2014). Lecturer, Instructional Technology.

**William Dee Nichols**, Ph.D. (Texas A&M University, 1995). Professor, Literacy Education. Literacy; comprehension; vocabulary; fluency

**Christopher Nightingale**, Ed.D. (Boston University, 2009). Associate Professor, Kinesiology and Physical Education. Athletic training; mentoring; physical education pedagogy.

**Eric A. Pandiscio**, Ph.D. (University of Texas at Austin, 1994). Associate Professor, Math Education. Secondary math education, geometric construction software.

**Daniel Puhlman**, Ph.D. (Florida State University, 2013). Assistant Professor, Family Studies.

**Timothy Reagan**, Ph.D. (University of Illinois, Champaign-Urbana, 1982). Professor, Literacy Education. Educational and applied linguistics, educational policy studies, educational reform, comparative education, and philosophy of education.

**Asli Sezen-Barrie**, Ph.D. (Pennsylvania State University, 2011). Associate Professor, Curriculum, Assessment, and Instruction. Goal of improving science teacher education.

**Bryan Silverman**, Ph.D. (Kent State University, 2014). Lecturer, Curriculum, Assessment, and Instruction. Education and identity, specifically how culture, in a broad understanding, operates on identity. Ideas of rooted cosmopolitanism.

**Joshua Taylor**, Ph.D. (Virginia Commonwealth University, 2021). Assistant Professor of Special Education.

**Shihfen Tu**, Ph.D. (University of Washington, 1994). Professor, Education and Applied Quantitative Methods. Cognition and perception, cognitive development, research methodology

# Educational Leadership

Return to: Graduate Programs, Certificates, Specializations, Emphases

## **(M.Ed., Ed.S., Ed.D.)**

Study in Educational Leadership provides both a theoretical and practical understanding of educational organizations, leadership, educational program planning and evaluation, and management functions. M.Ed. and Ed.S. programs prepare leaders primarily for PK-12 public and private schools, but also encompass other education agencies as well. The Ed.D. program serves as a vehicle for scholarly-practitioners to study a problem of practice that informs the analysis of organizational, leadership, and educational practices within PK-12 school settings. Coursework is offered in the late afternoon using a synchronous platform in the Fall, Spring, and Summer semesters.

**M.Ed.:** The Master of Education program in Educational Leadership requires a minimum of 37 credit hours. Students enroll in a sequence of 9 required courses which total 28 credits. Students may choose 3 additional elective courses. Students may choose to take electives before, during, or after the three year program that can be used for certification purposes. The M.Ed. is designed primarily to prepare school-level leaders such as principals, assistant principals, and teacher leaders.

For further information about the program, see <https://umaine.edu/edhd/graduate/educational-leadership-masters-cas/> or contact Dr. Maria Frankland at [maria.frankland@maine.edu](mailto:maria.frankland@maine.edu).

## **Try on Leadership Certificate Program**

Students may elect a 15-month Try on Leadership program that leads to Assistant Building Administrator (045) certification applied through the Maine Department of Education. Students typically meet once a week online using a synchronous platform that allow aspiring administrators to apply coursework in action. Students who successfully complete the Try on Leadership Certificate Program can apply for and be accepted to the M.Ed. program and can use this coursework as the required three electives necessary to graduate with the M.Ed. in Educational Leadership. For further information about the program, see <https://umaine.edu/edhd/><https://umaine.edu/edhd/graduate/educational-leadership-masters-cas/> or contact Dr. Betsy Webb at [betsy.webb@maine.edu](mailto:betsy.webb@maine.edu).

**Ed.S.:** The Education Specialist in Educational Leadership offers opportunities for study beyond the master's degree toward leadership roles, such as district superintendent, curriculum coordinator or to develop research capacities. A minimum of 33 credit hours is required for those with a master's degree in Educational Leadership; 39-45 hours for those with a master's degree in a related field.

**Ed.D.:** The UMaine Ed.D. program is designed to support scholarly practitioners who intend to address a problem of practice. The program supports educators in PK-12 leadership positions through a four year sequence of course, wherein students take two 8-week classes in the fall, two 8-week classes in the spring, and one 8-week class in the summer. The Ed.D. Program in PK-12 Educational Leadership seeks to admit post-master's students who: 1) have leadership experience in PK-12 education and who wish to grow professionally and academically; 2) intend to make substantial contributions to the leadership of PK-12 education and are committed to making a positive difference in their leadership practice and workplace; 3) demonstrate the self-direction necessary for advanced graduate study and independent research; and 4) possess the ability and motivation to succeed in the rigorous interpersonal and academic demands of doctoral study. Students accepted into the program may elect to enroll in a superintendent internship. For further information about the program, see <https://umaine.edu/edhd/graduate/educational-leadership-edd/> or contact Dr. Maria Frankland at [maria.frankland@maine.edu](mailto:maria.frankland@maine.edu).



## **Graduate Faculty**

**Catharine Biddle, Ph.D.**, Associate Professor of Educational Leadership

**Maria Frankland, Ph.D.**, Lecturer of Educational Leadership; Program Coordinator, Graduate Programs in Educational Leadership

**Ian Mette, Ph.D.**, Associate Professor of Educational Leadership

## **Electrical and Computer Engineering**

The Electrical and Computer Engineering Department offers the following graduate degrees:

- the Master of Science degree in Electrical Engineering,
- the Master of Science degree in Computer Engineering and
- the Ph.D. degree in Electrical and Computer Engineering.

## **General Information on the M.S. Degrees**

Thesis and non-thesis options are available for the M.S. degrees. For a non-thesis degree, a minimum of 30 semester hours of course work is required. Thesis options require 30 credit hours of which six credits of ECE 699 shall be devoted to individual study with a member of the graduate faculty. This work must culminate in the preparation of a written thesis on a significant problem of common interest and an oral defense of the thesis. In both the non-thesis and thesis options, at least 15 credit hours must be ECE credit hours. To obtain a M.S. degree in Electrical Engineering or Computer Engineering, a student must have at least a GPA of 3.0 for all courses taken as a graduate student.

## **Requirements for the M.S. Degree in Electrical Engineering (MSEE)**

A completed Bachelor of Science degree in Electrical Engineering is normally required to become a candidate for the Master of Science degree in Electrical Engineering. Qualified students from other disciplines may become candidates for a Master of Science degree in Electrical Engineering by demonstrating high scholastic competency in all the required undergraduate Electrical Engineering courses. This may be done by actually enrolling in the undergraduate Electrical Engineering courses or by passing an equivalency examination, which covers the material appropriate to the undergraduate Electrical Engineering course.

Students must complete at least three of the five core course, including Mathematical Methods (ECE523), Electromagnetic Theory (ECE550), Random Variable and Stochastic Processes (ECE515), Advanced Microprocessor-Based Design (ECE 571), and Solid State Electronics (ECE565). Approval from the student's advisory committee (if the committee has been established) or the graduate coordinator should be obtained by students prior to taking a non ECE 400 level course. In addition to the core curriculum, students may enroll in state-of-the-art courses offered by the Electrical Engineering graduate program. Normally no more than 6 credits of ECE 400 level course work will be acceptable for graduate credit. In addition, no more than one ECE 599 and two ECE 598 courses may be taken toward fulfilling the requirements for a Master of Science degree in Electrical Engineering. Degree candidates may also choose to take courses in Mathematics, Physics, Chemistry, Computer Science and other disciplines, which are consistent with his/her program goals.

# Requirements for the M.S. Degree in Computer Engineering (MSCE)

A completed Bachelor of Science degree in Computer Engineering is normally required to become a candidate for the Master of Science degree in Computer Engineering. Qualified students from other disciplines may become candidates for a Master of Science degree in Computer Engineering by demonstrating high scholastic competency in all the required undergraduate Computer Engineering courses. This may be done by actually enrolling in the undergraduate Computer Engineering courses or by passing an equivalency examination, which covers the material appropriate to the undergraduate Computer Engineering course.

Students must complete at least three of the five core courses, including Advanced Microprocessor Based Design (ECE 571), Microprogramming (ECE 573), Mathematical Methods (ECE523), Random Variable and Stochastic Processes (ECE515), and Database (COS 580 or SIE 550). All students must complete at least one graduate-level (500 or above) course in Computer Science. In addition to the core curriculum, students may enroll in state-of-the-art courses offered by the Electrical Engineering, Computer Engineering and Computer Science graduate programs. Normally no more than 6 credits of ECE or COS 400 level course work will be acceptable for graduate credit. In addition, no more than one ECE 599 and two ECE 598 courses may be taken toward fulfilling the requirements for a Master of Science degree in Computer Engineering. Degree candidates may also choose to take courses in Mathematics, Physics, Chemistry and other disciplines, which are consistent with his/her program goals.

# Requirements for the Ph.D. Degree in Electrical and Computer Engineering

A doctoral student must complete at least 42 credits of coursework beyond the BS degree requirements. (Thesis and dissertation credits do not count toward this requirement.) Nine credits out of the 42 are to be completed in an area outside of Electrical & Computer Engineering, to constitute a minor. At least 24 credits out of the 42 must be ECE courses. Normally, no more than 6 credits of ECE 400 level course work will be accepted for graduate credit. Additionally, PhD candidates must complete four of the five core course requirements for either the MSEE or MSCE degree. Candidates are required to maintain a GPA of 3.3 for all graduate coursework, pass a qualifying exam on Electrical and Computer Engineering fundamentals and pass a comprehensive exam in the student's area of research. The Ph.D. candidate must complete a program of study, which has obtained the approval of the student's advisory committee and the Graduate Coordinator of the department. The preparation and defense of a thesis embodying the results of an original investigation in a specialized area of Electrical and Computer Engineering are essential features of the program.

## 4+1 and 4+2 Bachelor's/Master's Degree Programs

The department offers the opportunity for University of Maine ECE undergraduates to begin taking graduate courses during their senior year, double-counting up to 9 credits toward the BS and the MSEE or MSCE. **The 4+1 is for MS with non-thesis, and the 4+2 is for MS with thesis.** Details can be found at the department website: <https://ece.umaine.edu/41-bsms-degree-programs/>

## Application

Applications are accepted at any time for admission in the Fall (September), or the Spring (January) semester. The following webpage lists a few frequently asked questions:

<https://ece.umaine.edu/faq-for-prospective-graduate-applicants/>

Application materials can be obtained from the Graduate School, 5775 Stodder Hall, Rm 42, Orono, ME 04469-5775, e-mail at [graduate@maine.edu](mailto:graduate@maine.edu), or downloaded from the web site

<http://www.umaine.edu/graduate/admissions/admissions>

## Additional Information

Individual faculty may be contacted via the ECE department web site at <http://ece.umaine.edu/graduate/phd-electrical-computer-engineering/>

Alternatively, the Graduate Coordinator can be reached by regular mail at Department of Electrical and Computer Engineering, University of Maine, Orono, ME 04469, by telephone at (207) 581-2223, or by FAX at (207) 581-4531.

## Graduate Faculty

**Ali Abedi**, Ph.D. (University of Waterloo, 2004), Professor, Wireless communications, coding and information theory, sensor networks.

**Herbert M. Aumann**, Ph.D. (University of Wisconsin, Madison, 1973) Adjunct Professor. Antennas, phased arrays, antenna measurements, radar systems, data acquisition and signal processing.

**Vijay Devabhaktuni**, Ph.D. (Carleton University, 2003), Professor and Chair, Artificial intelligence, cyber and homeland security, human machine teaming, optimization, and RF and microwave circuit design.

**Vikas Dhiman**, Ph.D. (University of Michigan, Ann Arbor, 2019) Robotic navigation, localization and mapping, safe control, computer vision, reinforcement learning, machine learning, and artificial intelligence.

**Richard O. Eason**, Ph.D. (University of Tennessee, 1988), Associate Professor. Robotics and computer vision.

**Nuri Emanetoglu**, Ph.D. (Rutgers State Univ. of New Jersey, 2003), Associate Professor, Novel semiconductor materials and devices optoelectronics and photonics, piezoelectric materials, thin films, surface acoustic wave devices, senso

**Donald M. Hummels**, Ph.D. (Purdue University, 1987), Professor. Communications, signal processing and pattern recognition.rs.

**David E. Kotecki**, Ph.D. (University of California at Davis, 1988), Associate Professor. Microelectronics, circuits, electronic materials, computer modeling and simulation.

**Mohamad T. Musavi**, Ph.D. (University of Michigan, 1983), Professor. Artificial Neural Networks, computer vision, power systems and smart grid.

**Mauricio Pereira da Cunha**, Ph.D. (McGill University, 1994), Professor. Microwave acoustics, signal processing, sensors and applications.

**Bruce E. Segee**, Ph.D. (University of New Hampshire, 1992), Professor. Instrumentation, neural networks and computer interfacing.

**Rosemary Smith**, Ph.D. (University of Utah, 1982), Professor. Microsensors, micro and nano fabrication technology, biomedical microdevices.

**John F. Vetelino**, Ph.D. (University of Rhode Island, 1969), Professor. Surface acoustic wave devices and applications, microsensors, sonar signal processing, solid state

**Vincent Weaver**, Ph.D. (Cornell University, 2010), Associate Professor. High performance computing, computer architecture, operating systems, embedded programming

**Yifeng Zhu**, Ph.D. (University of Nebraska-Lincoln, 2005), Professor. Deep Learning, computer architecture and systems including parallel/distributed computing, and computer storage systems.

## **Electrical Engineering Technology Graduate (Certificate)**

The purpose of the graduate certificate in Electrical Engineering Technology (EET) is to increase and enhance the technical and management knowledge and skills of an individual working in industry with a bachelor's degree in a technical field. General skills developed include advanced circuit applications, advanced software applications, and advanced power applications. These technical content areas include real-world, practical applications. Elective courses allow students to develop specialized skills in additional content areas related to the power industry and engineering project management. This certificate is also a path-way towards a Professional Science Master's degree with a concentration in EET if students wish to continue their studies.

An earned baccalaureate engineering, engineering technology, math, physics, or equivalent degree from an accredited program is required for admission.

## **Elementary Education**

Curriculum, Assessment and Instruction (M.S., M.Ed., Ed.S.)

**Master of Science (M.S.):** The M.S. is a research-oriented degree which culminates in conducting a master's thesis, guided by a committee of three faculty from the program or related fields. This is a 30-credit-hour program, including six credits of thesis research. Four courses (12 credits) are the same as for the M.Ed., as follows:

EHD 521 - Classroom Practice to Improve Learning

EHD 533 - Dynamics of the Curriculum

EHD 519 - Formative Assessments: Research, Practice and Policy

EHD 541 - Prevention and Intervention in School Settings

M.S. only requirement:

EHD 510 - Introduction to Educational Research

In addition, students must complete six credits of thesis and three credits of research methods (Educational Research (EHD 575); Statistical Methods in Education (EHD 573); or Qualitative Research: Theory, Design, and Practice (EHD 571), as well as a three-course area of specialization chosen in consultation with the adviser and approved by the thesis committee. Depending on the student's prior coursework, experience, and the thesis topic, the thesis committee may require a second research methods course in place of one of the specialization courses.

**Master's of Education (M.Ed.):** The Master of Education program in Curriculum, Assessment and Instruction is designed for teachers who, while continuing a career in classroom teaching, seek to assume responsibility and leadership roles in enhancing standards in the areas of curriculum, assessment and instruction. The degree requires a minimum of 33 credit hours and is offered either completely online or through a combination of online and on-campus courses. The following six online courses (18 credits) are required of all students:

EHD 521 - Classroom Practice to Improve Learning

EHD 533 - Dynamics of the Curriculum

EHD 519 - Formative Assessments: Research, Practice and Policy

EHD 541 - Prevention and Intervention in School Settings

EHD 586 - Seminar: Action Research in PreK-12 Schools - offered Fall only.

EHD 587 - Practicum: Action Research in PreK-12 Schools - offered Spring only.

The **Education Specialist (Ed.S.)** provides a cohesive program of professional development beyond the master's level for educational specialists. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be completed within six years.

## Engineering Applications fo Artificial Intelligence

The certificate in Engineering Applications of Artificial Intelligence offer students the skills to apply artificial intelligence tools and approaches to the solution of practical problems across various engineering disciplines. The emphasis on engineering applications is not currently offered in Maine, thus the addition of the certificates will address industry needs in this area. As noted in the market analysis within the proposal, more than 50% of the job postings for AI and Machine Learning in Maine are in the manufacturing sector where engineering applications of AI is a direct benefit.

## Engineering Management (Certificate)

The graduate certificate provides training for engineers interested in developing skills in project management, data-based decision making, and the management of engineering organizations. Students who wish to continue to a full masters program have a variety of options in either business or engineering. The market demand for advanced engineering management skills is greater than ever. The courses are delivered through both online and traditional modalities and there are options for the graduate certificate to be completed fully online. The certificate requires 15 credits of coursework.

An earned baccalaureate engineering, engineering technology, or equivalent degree from an accredited college or university is required for admission. A minimum grade point average of 2.5 applies to all candidates and minimum TOEFL score of 80 (IbT), 6.5 (IELTS) or 60 (PTE Academic) are required for international students.

#### Educational Objectives

- Manage projects in the context of an engineering organization including planning, controlling, scheduling and risk analysis
- Use data to make decisions as well as optimize processes and resources to minimize waste, maximize benefits, and maximize performance
- Manage engineering organizations

## Engineering Physics

## Degree Programs

Programs of study leading to the degrees of **Master of Science**, **Master of Engineering** (Engineering Physics), and **Doctor of Philosophy** are offered through the **Department of Physics and Astronomy**.

## Doctor of Philosophy

Doctor of Philosophy: Typically a total of 5-6 years are needed to complete the Ph.D. degree for a student who enters the program with a bachelor's degree. This time is approximately equally divided between course work and dissertation research. A dissertation presenting the results of an original investigation in a specialized area of physics is an essential feature of the program and must be completed and defended successfully. Requirements also include passing the comprehensive examination, which must be passed by the end of the third year of study for students who enter the Ph.D. program with a bachelor's in physics or by the end of the second year for students entering with a master's in physics.

The program of study for each student in the Ph.D. program includes a minimum of 30 course hours. The following courses, or their equivalents, are required of all students: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 574 Methods of Theoretical Physics, PHY 503 Quantum Mechanics I, PHY 603 Quantum Mechanics II, PHY 512 Statistical Mechanics, PHY 510 Graduate Laboratory, and PHY 624 Solid State I. In addition, students must take at least one advanced course, chosen from among PHY 598 Continuum Mechanics, PHY 602 Electrodynamics II, PHY 575 Methods of Theoretical Physics II, PHY 598 Statistical Mechanics II, and PHY 625 Solid State II.

Students must also take at least one research specialty elective course, which must be approved by the student's dissertation advisory committee. These electives do not have to be PHY courses, and they can not be from among the 400-level PHY undergraduate core courses in Electricity and Magnetism, Quantum and Atomic Physics, Thermodynamics, Statistical Mechanics, Mathematical Methods, or Optics.

In general, additional courses beyond the above minimal requirements are expected to be included in a student's program of study, at the discretion of the student's dissertation committee (or the Department Graduate Coordinator prior to formation of the dissertation committee). Each of the 400-level undergraduate core courses may be taken for graduate credit under this additional course expectation.

## Master of Science

The program of graduate study for the master's degree, which normally requires two academic years on a half-time basis, is developed around an original investigation, the results of which are presented as a thesis.

Of the minimum of 30 semester hours required for the Master of Science degree, 24 are devoted to courses in physics and such allied fields as other sciences, mathematics, and engineering. However, the following courses or their equivalents, which are offered every year, must be included: PHY 501 Mechanics; PHY 502 Electrodynamics I, and PHY 503 Quantum Mechanics I.

## **Master of Engineering (Engineering Physics)**

<http://www.physics.umaine.edu/programs/degrees/grad.html#masterengphy>

A minimum of 30 semester hours is required for the Master of Engineering (Engineering Physics) degree. Of the total of 24 required course hours, nine hours must be selected from a meaningful engineering course sequence. In addition, nine hours must be selected from three of the following courses: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, and PHY 510 Graduate Laboratory. A thesis is optional but is strongly encouraged and requires a minimum of 6 credits of thesis (PHY 699). The thesis may be completed in either the Physics Department or the engineering department in which the engineering course sequence is taken. Satisfactory completion of the non-thesis option requires 36 approved course credits.

## **Research**

Experimental research is being conducted in the following areas: the physics and chemistry of surfaces, including microsenors, catalysis, adhesion, thin film growth, surface crystallography, phase transitions, tribology, and development of new instrumentation; liquid crystals and colloidal crystalization; environmental nuclear radiation; health physics; biophysics, including Fluorescence Microscopy and Spectroscopy, Function and Lateral Organization of Biomembranes, Single Molecule Fluorescence Photophysics, and the biophysics of membranes and macromolecules; low temperature physics, including superconductivity; optical, x-ray, and radio observations of galaxies and clusters of galaxies; general relativity; physics education, investigating student learning. Theoretical work includes studies of galactic formation and stability, atomic and solid state theory, semi-conductors, non-linear systems, pattern formation, chemically-driven microscopic motors and pumps, radionuclide transport theories, statistical mechanics, equilibrium and nonequilibrium phase transitions, and surface physics.

## **Cooperative Research**

Cooperative research projects involving students in Physics degree programs have been conducted with the Department of Electrical and Computer Engineering in studies of semiconductor devices and sensor technology; the Department of Chemistry in optical and resonance studies on anticancer compounds and polymers on metallic surfaces; the Institute for Quaternary Studies in studies of glaciology; the Department of Biochemistry, Microbiology and Molecular Biology in studies of nucleic acids; the Departments of Geological Sciences and Civil and Environmental Engineering in natural radioactivity in the environment; and the Departments of Biological Sciences and Geological Sciences in acid rain studies.

A major interdisciplinary research organization at the University is the Frontier Institute in Sensor Technologies (FIRST) in which research opportunities exist in high technology areas related to surfaces, interfaces, and thin film materials. Specific information is available at <http://www.umaine.edu/first/>.

## **Research Facilities**

The **Frontier Institute in Sensor Technologies (FIRST)** unites researchers from the Departments of Chemistry, Physics, Electrical and Computer Engineering, and Chemical and Biological Engineering in many projects spanning aspects of surface and interface science, thin films, sensors, microsystems, and nanotechnology. Current facilities include thin film synthesis, electron and optical spectroscopies, scanning probe microscopies, X-ray and electron diffraction, focused ion beam-scanning electron microscopy, fluorescence microscopy, device fabrication (Class1000 clean room with photolithography, metallization, wet and dry etch, PECVD, sputtering, mask generation, and packaging), and sensor testing (gas delivery systems, electrical and microwave test equipment, and data acquisition/integrated electronic test suites).

**Biophysics and Optics:** Three laboratories include a superresolution localization microscopy facility and four F-PALM microscopes, image processing computer cluster, tunable femtosecond pulsed Ti:Sapphire laser and optical parametric oscillator (OPO), cell culture facilities, polymerase chain reaction (PCR) thermal cycler, and other equipment for molecular biology, confocal and two-photon laser-scanning microscopes, fluorescence correlation and cross-correlation microscope, fluorimeter, spectrophotometer, Krypton-Argon and Argon ion lasers, numerous diode lasers spanning visible wavelengths from 400-700 nm, and optical tweezer.

The **Physics Education Research Laboratory** has facilities and equipment for conducting research on the learning and teaching of physics, including a classroom intended for curricular activities based on physics education research (PER) and dedicated clinical interview space to ensure the anonymity and privacy of students participating in our research work (as required by our institutional review board for testing with human subjects).

**Astronomy/Astrophysics:** The Emera Astronomy Center consists of two observatories, a planetarium, and a multi-purpose classroom space. The Jordan Observatory houses a PlaneWave CDK20 (20 inch) telescope on a German Equatorial Mount with an Apogee Aspen CG16M CCD camera with 7 slot filter wheel for imaging and photometry. The telescope and dome both can be remotely controlled. Additionally, the facility has an historic Alvin Clark refractor (8 inch) housed in a roll-off roof observatory for visual observations. The Jordan Planetarium is a 10 meter 4K digital planetarium with 50 seats which can show a variety of astronomy and science visualizations, real time astronomical data, and full-dome films. The planetarium conducts regular public programs, school programs, and numerous special events. The facility has a multipurpose classroom housing a number of interactive displays and is used for astronomy labs and other university courses.

## Admission

In addition to satisfying the general admission requirements of the Graduate School, candidates for advanced degrees in physics should have completed at least 16 semester hours in physics beyond the introductory course and have studied mathematics at least through differential equations. Candidates who have majored in other physical sciences or mathematics are encouraged to apply. A candidate's preparation for graduate study in physics or astronomy can be strengthened by taking selected undergraduate courses for graduate credit.

## Financial Assistance

Teaching assistantships are available for the academic year and include remission of tuition for up to nine credit hours per semester and three credit hours in the summer session. These appointments provide for approximately half-time teaching and half-time study. Teaching assignments usually involve six contact hours per week. Summer support is usually available for students in the program.



The University of Maine supports a number of University fellowships and tuition scholarships. Research assistantships are also available in some of the areas of investigation listed above.

## Application

Applications are accepted at any time for admission in the Fall (September), or the Spring (January) semester. Application materials can be obtained from the Graduate School, 5755 Stodder Hall, Room 42, Orono, ME 04469-5755, e-mail at [graduate@maine.edu](mailto:graduate@maine.edu), or downloaded from the web site <http://www.umaine.edu/graduate/admissions/admissions>.

## Additional Information

Individual faculty may be contacted via their email addresses above. The department's home page is <http://www.physics.umaine.edu/>.

Alternatively, the Graduate Coordinator can be reached by regular mail at Department of Physics and Astronomy, University of Maine, Orono, ME 04469, by telephone at (207) 581-1039, or by FAX at (207) 581-3410.

## Graduate Faculty

**Susan R. McKay**, Ph.D. (M.I.T., 1987), Professor and Chair. Condensed matter theory, phase transitions and critical phenomena, systems with quenched disorder, spin glasses, random-field ferromagnets, systems far from equilibrium, pattern formation, non-linear systems, and chaos. (e-mail: [susan\\_mckay@umit.maine.edu](mailto:susan_mckay@umit.maine.edu))

**R. Dean Astumian**, Ph.D. (Texas-Arlington, 1983), Professor. Design of microscopic mechanical and electrical pumps and motors powered by non-equilibrium isothermal chemical reactions. (e-mail: [astumian@maine.edu](mailto:astumian@maine.edu))

**David J. Batuski**, Ph.D. (New Mexico, 1986), Associate Professor. Observational cosmology, large-scale structure in the universe, dynamics of galaxy clusters, interacting galaxies and radio sources. (e-mail: [batuski@maine.edu](mailto:batuski@maine.edu))

**Neil F. Comins**, Ph.D. (University College, Cardiff, 1978), Professor. Galactic formation, structure, stability, evolution stellar stability, observational astronomy (optical, radio), computational astrophysics general relativity, and astronomy education. (e-mail: [neil.comins@umit.maine.edu](mailto:neil.comins@umit.maine.edu))

**Charles T. Hess**, Ph.D. (Ohio, 1967), Professor. Alpha and gamma spectroscopy, x-ray fluorescence, environmental radioactivity, radon in water and air, and health physics. (e-mail: [hess@maine.edu](mailto:hess@maine.edu))

**Samuel T. Hess**, Ph.D. (Cornell University, 2002), Assistant Professor. Biophysics, lateral membrane organization, protein structure and dynamics, single molecule fluorescence spectroscopy, nonlinear fluorescence microscopy, development of new markers for intracellular imaging, numerical modeling, quantum dots. (e-mail: [sam.hess@umit.maine.edu](mailto:sam.hess@umit.maine.edu))

**Peter H. Kleban**, Ph.D. (Brandeis, 1970), Professor. Member of the Laboratory for Surface Science and Technology (LASST). Theory of phase transitions, surface science, and electron spectrometers. (e-mail: [kleban@maine.edu](mailto:kleban@maine.edu))

**Robert J. Lad**, Ph.D. (Cornell, 1986), Professor. Director of the Laboratory for Surface Science and Technology (LASST). Surface physics and chemistry, ceramic materials, interfaces, thin films and gas-surface interactions. (e-mail: [rjlad@maine.edu](mailto:rjlad@maine.edu))

**James McClymer**, Ph.D. (Delaware, 1986), Associate Professor. Digital imaging and light scattering from equilibrium and nonequilibrium phase transitions in liquid crystals. (e-mail: [mcclymer@maine.edu](mailto:mcclymer@maine.edu))

**Richard A. Morrow**, Ph.D. (Princeton, 1963), Professor. Semiconductor theory and defects in GaAs. (e-mail: [morrow@maine.edu](mailto:morrow@maine.edu))

**Donald B. Mountcastle**, Ph.D. (Virginia, 1971), Associate Professor. Molecular biophysics, structure and function of biological and model membranes, cooperative interactions, microcalorimetry, and thermodynamics. (e-mail: [donald.mountcastle@umit.maine.edu](mailto:donald.mountcastle@umit.maine.edu))

**Charles W. Smith**, Ph.D. (Ohio, 1968), Professor. Low temperature experimental physics, superconductivity, point contact spectroscopy, and condensed matter physics. (e-mail: [charless@maine.edu](mailto:charless@maine.edu))

**John Thompson**, Ph.D. (Brown, 1998), Assistant Professor. Member of Center for Science and Mathematics Education Research. Co-director, Physics Education Research Laboratory. Physics Education: student conceptual understanding of physics topics including thermal physics, sound and longitudinal waves, and two-dimensional kinematics; research on understanding of science teaching and learning; curriculum development and assessment. (e-mail: [John\\_Thompson@umit.maine.edu](mailto:John_Thompson@umit.maine.edu))

**William N. Unertl**, Ph.D. (Wisconsin, 1973), Professor. Member of the Laboratory for Surface Science and Technology (LASST). Surface physics and chemistry, atomic force microscopy electron spectroscopy, surface structure, friction and adhesion. (e-mail: [unertl@maine.edu](mailto:unertl@maine.edu))

**Michael C. Wittman**, Ph.D. (Maryland, 1998), Assistant Professor. Director of the Laboratory for Research in Physics Education (LRPE). Investigating student learning (wave physics, quantum mechanics, electricity and magnetism), research-based curriculum development and dissemination, modeling student reasoning in physics. (e-mail: [wittmann@maine.edu](mailto:wittmann@maine.edu))

## Research and Associate Graduate Faculty

**David Frankel**, Ph.D. (Stanford, 1978), Senior Research Scientist, Laboratory for Surface Science and Technology. Surface science and vacuum technology.

## Cooperating Graduate Faculty

**Jayendra C. Rasaiah**, Ph.D. (Pittsburgh, 1965), Professor. Statistical mechanics of electrolytes and polar fluids, computer simulation studies of solutions, fluctuation-dominated kinetics in heterogeneous media, theory of electron transfer reactions, and molecular biophysical chemistry.

## English

Students admitted to graduate study in the Department of English pursue a 31-credit program (ten courses and one-hour orientation to graduate studies in English) leading to the Master of Arts degree. The program offers degree candidates a challenging and supportive learning environment in which to enhance their knowledge, explore new ideas, and gain experience in research, writing, and teaching. Students explore the aesthetic and pragmatic dimensions of the written word in seminars and workshops that balance tradition with innovation in local and global contexts.

The program allows students to explore new facets of English study -- everything from the intricacies of skills such as creating an assignment-sequence for a class, preparing technical documentation, grant-writing, or editing a short story,

to the challenges of poetics, literary and rhetorical theory, and empirical field-research on writing -- while also deepening and widening their knowledge of literature. The degree culminates with a professional portfolio that graduates use to advance their goals toward PhD or MFA programs, teaching careers, employment in the private or public-sector, or personal growth.

Graduate students are central actors in the program's intellectual community: they serve on committees, organize events, participate in research expos, and have their own symposium. Teaching Assistantships in the award-winning first-year composition program include full-tuition waivers, close mentoring, a one-one teaching load, generous stipend support, and a strong benefits package. Students can apply for a third year of funding through the competitive Ulrich Wicks Distinguished Teaching Assistantship. Poets in the program are eligible for support through the Millay Prize for Poetry.

The department offers optional concentrations in Creative Writing, Gender and Literature, Poetry and Poetics, and Writing Studies.

The degree provides valuable training for teachers of English in high school and community colleges. Those interested in competing for top doctoral programs in literature or writing studies or pursuing a competitive MFA will receive solid preparation for future studies. Alumni of our program have also gone on to careers in journalism, law, publishing, library science, theater, politics, consulting, editing, web and social-media content, photography, and all sectors of public and private education.

In the scheduling of its courses and in the design of the required MA Degree Portfolio that candidates use to demonstrate their accomplishments, the Department presents a substantial and coordinated curriculum of graduate study. The English Department is home to "College Composition," its award-winning first-year writing program, of which our 21 teaching assistants are vital members. It is also home to the Center for Poetry and Poetics (formerly the National Poetry Foundation), which regularly hosts international conferences on modernist and postmodernist poetry, and publishes the scholarly journal *Paideuma: Modernist and Contemporary Poetry and Poetics* as well as many books of and on poetry. To these enterprises graduate students have sometimes contributed editorial assistance as well as articles, and the NPF offers a graduate work-study assistantship providing experience in the practical side of scholarly publishing.

### **Admission Requirements**

Applicants normally are expected to have at least a 3.0 grade-point average in English from an accredited institution, and to provide us with three letters of recommendation, official transcripts, a personal statement that responds to the prompt on the department admissions webpage, and a 10-20 page sample of critical analysis (applicants to the creative writing concentration must also submit a 10-20 page sample of creative work.)

Applicants who wish to complete one of the concentrations should indicate this on their application forms. Those wishing to be considered for teaching assistantships will respond to a teaching exercise provided by the department on completion of their application to the graduate program.

The department offers 21 teaching assistantships, of which about half are awarded to incoming students in a typical year. Applicants wishing to be considered for an assistantship beginning in September should have their complete application materials (transcripts, writing samples, personal statement, three letters of recommendation, and teaching exercise) on file with the department by the previous January 15th. The English program accepts applications for graduate studies on a rolling basis; however, applicants for teaching assistantships and other financial aid must submit their materials by January 15<sup>th</sup>.

### **Degree Requirements**

Of the usual 30 hours of coursework, at least 24 hours must be in English courses numbered 500 or above, including up to six hours of thesis credit (ENG 699). Students with teaching assistantships normally take two years to complete the program; other full-time students sometimes finish more quickly. Typically, four or five graduate courses are offered each semester and two each summer.

All candidates demonstrate their readiness to graduate via a comprehensive and selective Degree Portfolio that illustrates a range of coursework while also highlighting the candidate's special research interests. Degree Portfolios accepted for review are comprised of roughly 50 pages of the candidate's best work, introduced by a 10-12 page (double-spaced) critical-reflective letter. Thesis candidates, including creative writers, also do one-hour defenses of their theses. Thesis candidates take 3-6 credits of thesis work. All students in the creative writing concentration produce a thesis consisting of a substantial body of original work (e.g. a novel, a collection of stories, a collection of poems). The thesis is optional for students in other concentrations.

### **Coursework:**

Four of the ten graduate courses normally required for the degree must involve critical engagement with texts distributed across three different time-periods. Graduate teaching assistants are required to take ENG 693 Teaching College Composition during their first semester of teaching.

### **Specific requirements for the optional concentrations are as follows:**

Concentration in Writing Studies: 9-12 credits in courses exploring current theories about writing, the teaching of writing, and the contexts of writing--including linguistics, critical theory, and discourse analysis. ENG 579 Theories of Composing, ENG 693 Teaching College Composition, and an additional six credits which may include courses in literacy or rhetoric outside of the department, as approved by the student's advisor.

Concentration in Creative Writing: 9-12 credit hours in creative writing, typically including six credits of ENG507: Graduate Fiction Workshop and three to six thesis credits.

Concentration in Gender and Literature: 9-12 credits in courses exploring the interrelationships of gender, language and literature, normally to include two offerings of ENG 549 Studies in Gender and Literature. One course may be taken outside the department, as approved by the student's advisor.

Concentration in Poetry and Poetics: 9-12 credits emphasizing theoretical and creative approaches to poetry and poetics. This concentration allows students to combine interests in literary analysis and poetry writing. Includes three to six credit hours of ENG 580: Topics in Poetry and Poetics, three credit hours of ENG 508: Writing Workshop in Poetry & Poetics, and three credit hours of literature courses focused on poetry and/or theory

To learn more about graduate study in English, visit  
<https://english.umaine.edu/graduate-program/>

### **Graduate Faculty**

**Hollie Adams, Ph.D.** (University of Calgary, 2014), Assistant Professor. Creative Writing, Postmodern Fiction, Canadian Literature.

**Caroline Bicks, Ph.D.** (Stanford, 1997), Professor and Stephen E. King Chair in Literature. Shakespeare, early modern drama and culture, history of science, women's and gender studies, feminist theory, girlhood studies.

**Carla Billitteri**, Ph.D. (SUNY at Buffalo, 2001), Associate Professor. Literary theory; feminist theory and gender studies; poetry and poetics; nineteenth- and twentieth-century European and American Literature; drama.

**Laura Cowan**, Ph.D. (Princeton, 1988), Associate Professor. Modernist literature, poetry, nature literature.

**Ryan Dippre, Ph.D.** (University of California-Santa Barbara, 2014). Associate Professor and Director of College Composition. Writing development: K-16 and lifespan; writing technology and beliefs; research methods.

**Dylan B. Dryer**, Ph.D. (University of Wisconsin-Milwaukee, 2007), Associate Professor and Coordinator of Graduate Studies. Research methods, rhetorical genre studies, writing development and assessment, corpus linguistics, language ideologies.

**Steven R. Evans**, Ph.D. (Brown, 1999), Associate Professor and Department Chair. Poetry and poetics; critical theory; sonic archives.

**Heather Falconer**, Ph.D. (Northeastern University 2018), Assistant Professor. Equity and inclusion; qualitative research methods; disciplinary writing; pedagogy; critical theory.

**Benjamin Friedlander**, Ph.D. (SUNY-Buffalo, 1999), Professor. Poetry and poetics; nineteenth- and twentieth-century American literature.

**Sarah Harlan-Haughey**, Ph.D. (Cornell University, 2011). Associate Professor. Medieval literature, folklore, oral traditional studies, and literature and the environment.

**Gregory Howard**, Ph.D. (University of Denver). Associate Professor. Fiction writing, American fiction, postmodern literature.

**Margaret A. Lukens**, Ph.D. (Colorado, 1991), Professor. Nineteenth-century American literature, Native American literature, multi-cultural studies, theatre.

**Jennifer Moxley**, M.F.A. (Brown, 1994), Professor. Creative writing, poetry & poetics, translation.

**Elizabeth Neiman**, Ph.D. (University of Wisconsin-Milwaukee, 2011). Associate Professor. Romanticism, 19th Century British fiction, and gender studies

**Rosalie Purvis**, MFA (Brooklyn College, 2005) Ph.D. (Cornell University, 2020). Theatre Practice, Dramatic Literature, Border Studies, Translation Theory, Queer Theory, Performance Studies, Creative Practice as Research (PAR)

**Deborah D. Rogers**, Ph.D. (Columbia, 1982), Professor. Restoration and eighteenth-century English literature.

**Kathryn Swacha**, Ph.D. (Purdue University, 2018), Assistant Professor. Rhetoric and communication, rhetoric of health and medicine, rhetorical theory, institutional rhetorics, professional and technical writing

## Entomology

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

### Doctor of Philosophy

- Biological Sciences

- Ecology and Environmental Sciences
- Plant Science
- Zoology

#### **Master of Science**

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

#### **Research Specializations**

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoospore fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

### **Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

### **Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

### **Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: [umbiosci@maine.edu](mailto:umbiosci@maine.edu), <http://biology.umaine.edu> .

## **Graduate Faculty**

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

**Eleanor Groden**, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

**David Hart**, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

**Clarissa Henry**, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of segmentation and muscle development in Zebrafish.

**Rebecca Holberton**, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

**Michael T. Kinnison**, Ph.D. (University of Washington, 1999) Professor of Evolutionary Applications. Microevolution, eco-evolutionary dynamics, aquatic ecology, population and conservation genetics, fish ecology.

**Danielle Levesque**, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

**Joyce E. Longcore**, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

**Brian McGill**, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

**Brian Olsen**, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.

**Jasmine Saros**, Ph.D. (Lehigh University, 1999). Professor. Paleolimnology, phyto-plankton ecology, lake ecosystem response to global change.

**Michelle Smith**, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.



**Ek Han Tan**, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

**Kristy Townsend**, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

**Mary S. Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in *Drosophila*; educational multimedia materials.

**Seth Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

**Yong Jiang Zhang**, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

## Cooperating Faculty

**Susan H. Brawley**, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

**William O. Bray**, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

**Jim Dill**, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

**David Hiebeler**, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

**Sara Lindsay**, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

**William H. Livingston**, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

**James D. McCleave**, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

**Paul Rawson**, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

**Alan M. Rosenwasser**, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

**Walter C. Shortle**, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid

precipitation.

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

**Rebecca J. Van Beneden**, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

**Robert G. Wagner**, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

## Financial Economics

The **Master of Science in Financial Economics** degree prepares graduates for employment in the financial services sector in positions requiring advanced quantitative and analytical skills and in-depth familiarity with the structure and functioning of financial markets and institutions. The program provides a solid foundation in microeconomic and macroeconomic theory and financial management to ensure that graduates have the conceptual tools needed to develop sound research designs and understand the role of financial markets and institutions within the economy. The program includes courses from the School of Economics and the Maine Business School and offers thesis and non-thesis options.

### Admission Requirements

Admission to the School of Economics is competitive. An undergraduate degree in economics or a related field is desirable but not essential for admission. The School of Economics is much more concerned with the applicant's capacity for graduate study, quantitative reasoning and the quality of previous work. Below is a list of **required** and **recommended courses**. Applicants seeking *admission* generally achieve a B or better in these courses. Applicants seeking *funding* (see below for more information) generally achieve an A- or better in most of the required courses listed below AND have a **3.5 GPA** or higher. Applicants with lower grades/GPA may be admitted/funded, especially if they have unique professional or personal experiences that demonstrate strong knowledge, skills, determination, and ability to be successful in a rigorous graduate program and make a unique contribution to the School of Economics.

Required Courses (UMaine equivalent\*):

- Intermediate Microeconomic Theory (ECO 350)
- Intermediate Macroeconomic Theory (ECO 321)
- Statistics (STS 215 or 232)
- Calculus I (MAT 126)
- Business Finance (FIN 350)

Strongly Recommended but Not Required (UMaine equivalent\*):

- Calculus II (MAT 127)
- Calculus III (MAT 228)
- Linear Algebra (MAT 262)
- Mathematical Economics (ECO 480)
- Econometrics (ECO 485)
- Accounting (ACC 400)
- Computer Programming experience (e.g., R, Matlab, Python)

*\*Descriptions for UMaine equivalent courses can be found in the UMaine Undergraduate Catalog:  
<http://catalog.umaine.edu/>*

In addition to the required and recommended courses listed above, we expect: 1) a strong, well-written personal **essay** that clearly communicates why the applicant is a good fit for our program and why our program is a good fit for the applicant in the context of a set of clear academic and professional goals; the essay should also demonstrate the potential for the applicant to succeed when faced with challenges; 2) strong **letters of recommendation** from faculty that taught required courses and/or other mentors of related work (e.g., thesis/research advisor, job supervisor, etc.), which demonstrate the applicant's ability to be successful in a rigorous graduate program; 3) a well-written and clear **resume/CV** that demonstrates a strong work ethic and interest in gaining applicable skills/knowledge outside of the classroom. GRE scores may help faculty evaluate applications where there is uncertainty about potential success in the program. They are recommended but not required. GRE scores of admitted students in the past have been around 160 for each of the Verbal and Quantitative sections and 4 for the Analytical section.

Applicants from countries where English is NOT the official language must furnish proof of their **proficiency in English**. There are two major tests for this purpose: the Test of English as a Foreign Language (TOEFL) and tests from the International English Language Testing System (IELTS). For **admission**, the School requires TOEFL scores to be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher. To obtain **funding**, scores should be higher: TOEFL above 98, 247 or 597 respectively, and the IELTS equal to 7.6 or higher. TOEFL/IELTS scores may be waived if the applicant has attended a U.S. college or university for a period of at least four years or has earned a degree from a U.S. university or college.

Other general admission criteria are described in the general section of this catalog.

## Degree Requirements

Successful completion of 30 credit hours of course work is required for the M.S. in Financial Economics degree. Students on the thesis track also must pass an oral examination and written thesis approved by their Advisory Committee before the completion of their program. The thesis option is more demanding and intensive but offers students an opportunity to complete an independent research project under the guidance of an economics faculty member. The non-thesis option is designed for students who wish to obtain greater breadth in their coursework and job experience through internships, independent studies, and/or additional electives.

Graduate students in this program are required to complete the following sequence of courses (credits in parentheses):

- ECO 511 Macroeconomic Theory (3)
- ECO 514 Microeconomic Theory (3)
- ECO 530 Econometrics (3)
- ECO 532 - Applied Time Series Econometrics (3)
- ECO 553 - Financial Economics (3)
- 2 MBA Finance Courses (6) from the following list:
  - MBA 609 Financial Statement Analysis
  - MBA 651 Financial Management
  - MBA 652 Management of Financial Institutions
  - MBA 653 Investment Management
  - MBA 654 Futures and Options Markets
- Graduate-level Electives\* (9)

\*The THESIS track requires 6 credits of ECO 699, which may be counted toward the 9 credits of graduate-level electives.

\*Descriptions for all UMaine Graduate level courses can be found in the UMaine Graduate Catalog:

<http://gradcatalog.umaine.edu/>

### **Funding Support**

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for assistance with either research, teaching, or administration. Efforts are made to match the student's interests and background with the needs of the School. Scholarship funding is also available. The faculty nominates top-ranking applicants for these awards. Funding support includes a stipend, tuition costs, and subsidized health insurance coverage. Additional funds are provided to students on a competitive basis to cover research expenses. Graduate assistantships require 20 hours of work per week. For details on funding opportunities, visit the School of Economics Graduate Program website: <https://umaine.edu/soe/graduate/>

### **Graduate Faculty**

The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy and human ecology expertise.

**Mario Teisl**, Ph.D. (University of Maryland), Professor and Director. Information economics, food safety, environmental and social marketing, and environmental economics.

**Christine Beitzl**, Ph.D. (University of Georgia) Cooperating Assistant Professor of Anthropology, Ecological and Environmental Anthropology. Intersections of socio-political, ecological, and economic systems.

**Kathleen Bell**, Ph.D. (University of Maryland), Professor. Environmental economics, public economics, and spatial economics.

**James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

**Andrew Crawley**, Ph.D. (University of Glamorgan) Associate Professor in Regional Economic Development. Economic impact, economic modeling.

**Adam Daigneault**, Ph.D. (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. Freshwater management, climate change mitigation and adaptation, invasive species control, valuing ecosystem services

**Angela Daley**, Ph.D. (Dalhousie University) Associate Professor of Health Economics and Policy. Health and labor economics, poverty and inequality, social policy, children and families, rural and remote communities including aboriginal people

**Keith S. Evans**, Ph.D. (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery management; nonmarket valuation; applied econometrics

**Todd Gabe**, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance.

**Sharon Klein**, Ph.D. (Carnegie Mellon University), Associate Professor. Technical, economic, environmental, and social/policy impacts of renewable energy and energy efficiency, community-based sustainable energy adoption.

**Jessica Leahy**, Ph.D. (University of Minnesota) Cooperating Professor of Human Dimensions of Natural Resources. Environmental attitudes and behaviors towards forests, forestry, and other natural resource management topics.

**Jonathan Malacarne**, Ph.D. (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

**Caroline Noblet**, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

**Jonathan Rubin**, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation fuels and vehicles, economics of greenhouse gas reductions.

**Philip Trostel**, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

**Tim Waring**, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

**Tommy Wiesen**, Ph.D. (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics.

## Food and Nutrition Sciences

The program leading to the Ph.D. in Food and Nutrition Sciences is a cooperative offering of faculty in the School of Food and Agriculture. Ph.D. candidates choose a focus (animal science, food science, or human nutrition) as a major area of study and research and a Graduate Committee is formed to include members from one or more of these academic areas. A typical doctoral committee consists of a chair who must hold a doctoral degree, at least two other University of Maine faculty members in the same discipline and another 2-3 faculty members with complementary areas of expertise.

There is no minimum credit requirement. An individualized program of study is developed by the student and Graduate Committee according to guidelines prepared by the Food and Nutrition Sciences Program Committee. Course requirements are flexible but include 4 credits of seminar (FSN 571, FSN 671, SFA 672) with formal courses in food and nutrition sciences and related areas chosen to prepare the student for comprehensive examinations and research expertise. Desirable courses for the candidates for the Ph.D. in Food and Nutrition Sciences are given by each of the cooperating programs and are listed in the Course Descriptions section of this catalog. Additional courses offered by other departments may be taken upon approval of the student's graduate committee.

Students working on a federally-funded research project must also complete a Responsible Conduct of Research (RCR) course before or during the first semester of graduate research. The training is required for all doctoral students. The following courses may be taken to satisfy the RCR requirement:

- FSN 524 - Responsible Design, Conduct and Analysis of Research (3 credits) (may also be used to fulfill the statistics requirement)
- INT 601 - Responsible Conduct of Research (1 credit)
- BIO 505 - Professionalism in Biology (2 credits)
- CMJ 600 - Introduction to Graduate Study in Communication (2 credits)
- PSY 603 - Ethics and Professional Problems (3 credits)
- SFR 521 - Research Methods (3 credits)
- SMS 691 - Marine Science Seminar (1 credit)

Comprehensive examinations are required at the end of formal course work but may be taken no earlier than one year in the program. Both written and oral examinations must be passed. The written must be passed before the oral and a maximum of three attempts is allowed for the written/oral examinations combined.

Doctoral students must document a professional competency ("special skill") unrelated to their dissertation research; this competency may be demonstrated via course work or other practical activities. Competencies may include languages, research techniques such as electron microscopy, innovation engineering, marketing, or distance education.

An original research investigation is carried out under the direction of a major advisor. A dissertation is prepared to describe the results of the research, and results are presented in a formal seminar. Although Ph.D. students are encouraged to publish manuscripts with their advisors, there is no minimum number of publications required for graduation.

The Food and Nutrition Sciences faculty are located in Hitchner and Rogers Halls. Research facilities are equipped for food safety and microbiology, food processing, food composition, and food quality evaluation. The Sensory Evaluation Center offers computerized sensory evaluation services. A pilot plant for processing fruits and vegetables, seafood and dairy products is available on site. There is a fully-equipped kitchen for food product preparation and several research laboratories for applied human studies or animal research. Special facilities and equipment are available in the College and University, including DNA sequencing, electron and confocal microscopes, and a small animal care facility.

## Graduate Faculty

**Alfred A. Bushway**, Ph.D. (Purdue, 1978), Professor Emeritus. Fruit and vegetable post-harvest quality and safety, and product development. Dr. Bushway is no longer accepting graduate advisees.

**Jason Bolton**, Ph.D. (University of Maine, 2012), Associate Extension Professor and Food Safety Specialist. Food safety; food processing; product development

**Beth L. Calder**, Ph.D. (University of Maine, 2003), Associate Professor and Extension Food Science Specialist. Assisting the food industry with research, food testing and educational programs in the areas of food safety and technology. Director of the Process and Product Review Testing Services.

**Mary Ellen Camire**, Ph.D. (Texas Woman's University, 1989), Professor. Development, evaluation, and consumer acceptance of healthful foods; sensory science and consumer research, healthy aging, nutrition education and behavior; dietary fiber; whole grains

**Dorothy Klimis-Zacas**, Ph.D. (Pennsylvania State University, 1982), Professor. Cholesterol, lipoprotein, trace mineral nutrition and metabolism as related to chronic diseases. Berry bioactives and their role on inflammation and vascular function, metabolism and gene expression related to chronic diseases (cardiovascular disease, diabetes, metabolic syndrome). Trans-cultural studies on the role of Mediterranean diet(s) on chronic diseases.

**Robson Machado**, Ph.D. (Pennsylvania State University, 2016), Assistant Extension Professor and Food Safety Specialist. Helping Maine farmers and food entrepreneurs develop safe foods, while assisting processors to address changing regulations when commercializing local food and beverage products.

**Jade McNamara**, Ph.D. (University of Rhode Island, 2018), Assistant Professor of Human Nutrition. Exploring the relationship between nutrition and food literacy and dietary behaviors, developing curricula and interventions, theory-driven behavior change methods to influence healthy behavior change in youth and young adults, evidence-based instructional practices for critical thinking in health studies and higher education. Instrument/survey development to assess behavior and perceptions of health.

**L. Brian Perkins**, Ph.D. (University of Maine, 2002), Research Assistant Professor, Instructor and Program Coordinator. Chromatographic (HPLC, GC) method development for bioactive compounds phytonutrients, and toxic substances (naturally-occurring & synthetic) in food and environmental matrices.

**Jennifer Perry**, Ph.D. (The Ohio State University, 2010), Assistant Professor. Microbial food spoilage; non-thermal technologies, biocontrol and biopreservation; food safety; food processing.

**Denise I. Skonberg**, Ph.D. (University of Washington, 1997), Associate Professor. Crustacean by-product utilization, quality evaluation of wild and farm-raised aquatic products, seafood product development.

**Mona Therrien**, D.C.N., R.D., L.D. (Rutgers 2013), Lecturer and Dietetic Internship Director. Nutrition in chronic kidney disease and diabetes.

**Kathryn L. Yerxa**, M.S., R.D. (University of Maine, 2003), Associate Extension Professor. Nutrition education; obesity prevention; food security.

## Associate Graduate Faculty

**Neil Greenberg**, MSc. (University of Maryland, 1992), Assistant Director of Aquatic Operations. Aquaculture.

**Kathleen Halpin**, M.S., R.D., L.D. (University of Southern Maine, 1978), Manager, Clinical Nutrition & Patient Services, Maine Medical Center. Portland, ME. Clinical nutrition.

**Lawrence Leblanc**, Ph.D. (SUNY Stony Brook, 2001), Research Scientist. Environmental organic chemistry.

**Lisa Phelps**, Ph.D., Program Administrator, University of Maine Cooperative Extension. 4H.

**Kathleen Savoie**, M.S., R.D. (University of Massachusetts-Amherst, 1991), Associate Extension Professor. Community nutrition; food security; food safety; food preservation.

**Susan S. Sullivan**, D.Sc., R.D. (Boston University, 1995), Associate Director, School of Food and Agriculture. Clinical nutrition topics and vitamin D.

**Sharon Tate**, M.S., R.D., L.D. (Montana State University, 2002), Clinical Dietitian, Maine Medical Center. Portland, ME. Clinical nutrition.

## Food Science and Human Nutrition

The School of Food and Agriculture provides students with the opportunity to obtain an M.S. degree in Food Science and Human Nutrition, and a Ph.D. in Food and Nutrition Sciences. The M.S. program has two options- on campus and online. Online students may only take classes offered online. All M.S. students must have a graduate advisory committee consisting of the graduate advisor and two other FSN faculty. On campus students may request that one member of the committee be a faculty member in another UM program.

Faculty research programs include nutrition behavior change, obesity prevention, bioactive food components and their role in disease prevention and amelioration, food processing and preservation, food safety and quality, seafood quality, sensory evaluation, and product development.

A thesis option is only available on campus. Students who do not pursue a thesis project are not eligible for School of Food & Agriculture assistantships or fellowships and cannot apply to the doctoral program upon completion of the online M.S.

On-campus applicants who want a Food Science focus must have successfully completed undergraduate training with either a major or minor in one of the biological or physical sciences including courses in organic chemistry and biochemistry or an undergraduate degree in food science, food technology, food engineering or processing. On-campus applicants with a Human Nutrition focus should have an undergraduate degree in nutrition (or approved by the Academy of Nutrition and Dietetics), human ecology, chemistry, biochemistry, or in an appropriate combination of biological sciences with courses in nutrition, organic chemistry, biochemistry, and human physiology. The Dietetic Internship concentration is only available to students who have obtained a verification statement from an Accreditation Council for Education in Nutrition and Dietetics (ACEND) accredited undergraduate program and who have matched into the University of Maine Dietetic Internship Program. The Dietetic Internship cannot be completed online. Applicants selecting the combined Human Nutrition and Food Technology UMaine Online program should have had 2 semesters of college-level chemistry, two semesters of college-level biology (with one semester being Anatomy & Physiology), and an entry-level nutrition course.

Graduate Record Examinations (GRE) scores are not required for M.S. applicants, but residents of other nations may be required to document their English skills with TOEFL or comparable documentation.

The Master of Science in Food Science and Human Nutrition requires a minimum of 30 credit hour minimum ; however, the Dietetic Internship concentration requires at least 34 credits. A minimum GPA of 3.0 is required for graduation.

On-campus students are required to take FSN 571 Technical Presentations and FSN 671 Advanced Graduate Seminar (preferably in the first year of study) and 3-4 credits of statistics at the 400 or higher level. Thesis students must take at least 12 credits of graduate lecture or laboratory courses in FSN and non-thesis students must take 15 credits of graduate lecture or lab classes in FSN. Up to 4 credits of FSN coursework at the 400 level may be used to satisfy the FSN class requirement if the course was not taken as an undergraduate. Seminars and special topics classes may not be counted towards the minimum number of FSN classes. The lecture classes that may be used to fulfill the minimum credit requirement for on-campus students include:

FSN 501 Advanced Human Nutrition  
FSN 502 Food Preservation  
FSN 506 Nutritional Assessment  
FSN 508 Nutrition & Aging  
FSN 510 Trace Mineral Nutrition, Metabolism, and Clinical Applications  
FSN 512 Current Food Safety Systems  
FSN 517 Food Safety and Quality Control  
FSN 520 Food Product Development  
FSN 524 Responsible Design, Conduct and Analysis of Research  
FSN 528 Food Microbiology  
FSN 529 Food Microbiology Laboratory  
FSN 530 Integrative and Functional Nutrition  
FSN 538 Fermented Foods and Probiotics  
FSN 540 Advanced Clinical Topics  
FSN 542 Sustainability, Nutrition and Health  
FSN 543 Communication in Nutrition and Food Technology  
FSN 545 Utilization of Aquatic Food Resources  
FSN 555 Organic and Natural Foods  
FSN 565 Type 2 Diabetes, Obesity and Food  
FSN 580 Food Chemistry  
FSN 584 Lipids, Diet and Cardiovascular Disease  
FSN 585 Principles of Sensory Evaluation  
FSN 586 Sensory and Consumer Science Applications  
FSN 587 Food Analysis  
FSN 603 Nutrients in the Food System; or SFA 551 Infectious Diseases and Food Safety- From Plants to Humans.



Please note that FSN 524 Responsible Design, Conduct and Analysis of Research may be used to satisfy either the statistics or the minimum number of formal lecture class requirements, but not both.

Thesis students must also complete one approved Responsible Conduct of Research course (see list below)

FSN 524 - Responsible Design, Conduct and Analysis of Research (3 credits) (may also be used to fulfill the statistics requirement)

INT 601 - Responsible Conduct of Research (1 credit)

BIO 505 - Professionalism in Biology (2 credits)

CMJ 600 - Introduction to Graduate Study in Communication (2 credits)

PSY 603 - Ethics and Professional Problems (3 credits)

SFR 521 - Research Methods (3 credits)

SMS 691 - Marine Science Seminar (1 credit)

- no more than 6 credits as FSN 581, Problems in Food Science & Human Nutrition
- 5-11 credits of FSN 699 Graduate Thesis/Research

The Dietetic Internship and Master of Science degree, thesis or non-thesis, requirements are the same as those listed above except for:

- 34 credit hour minimum, typically taking two years to complete
- FSN 650 Dietetic Internship Orientation and Application I (2 credits), FSN 651 Dietetic Internship Orientation and Application II (2 credits), FSN 652 Dietetic Internship Evaluation (1 credit), and FSN 681 Dietetic Supervised Practice (6 credits)
- FSN 506 Nutritional Assessment and FSN 540 Advanced Clinical Topics
- An additional 6 (thesis students) or 9 (non-thesis) minimum credit hours of FSN formal coursework as described above
- 21- month continuous enrollment to complete FSN 650, 651, 652, and 681. FSN 681 is completed as 1 credit in the summer and 5 credits in the fall or spring, depending upon an individual student's program

The Master of Science in Food Science and Human Nutrition: Combined Human Nutrition and Food Technology online track requires:

- 30 credit hour minimum, typically taking two years to complete.
- FSN 501 Advanced Human Nutrition, FSN 502 Food Preservation, FSN 524 Responsible Design, Conduct and Analysis of Research, and FSN 543 Communication in Nutrition and Food Technology.
- An additional 15-18 credit hours of approved UMaine Online FSN graduate courses carrying an 0190 or 0990 section code (FSN 506 Nutritional Assessment; FSN 508 Nutrition and Aging; FSN 530 Integrative and Functional Nutrition; FSN 538 Fermented Foods and Probiotics; FSN 545 Utilization of Aquatic Food Resources; FSN 555 Organic and Natural Foods; FSN 585 Principles of Sensory Evaluation; FSN 586 Sensory and Consumer Science Applications; and FSN 603 Nutrients in the Food System). Other courses offered are not eligible for the online tuition discount and may not be applied towards the degree or a graduate certificate.
- A maximum of 3 credits of online graduate classes from another University of Maine program or up to 6 credits of pre-approved graduate credit from another institution may be accepted if approved by the student's graduate committee.
- A minimum of 3.0 GPA to graduate

## Graduate Faculty

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**Jason Bolton**, Ph.D. (University of Maine, 2012), Associate Extension Professor, and Food Safety Specialist. Food safety; food processing; product development.

**Mary Ellen Camire**, Ph.D. (Texas Woman's University, 1989), Professor. Development, evaluation, and consumer acceptance of healthful foods; sensory science and consumer research, healthy aging, nutrition education, and behavior; dietary fiber; whole grains.

Suzanne Ishaq, Ph.D. (University of Vermont, 2015). Assistant Professor of Animal and Veterinary Sciences. Better characterization of microbiomes using cutting-edge technology, using this characterization to determine the relation of community structure to system functionality and homeostasis in simplified models, and development of prevention and intervention therapies which can return a perturbed microbiome back into balance *in vivo*.

**Dorothy Klimis-Zacas**, Ph.D. (Pennsylvania State University, 1982), Professor. Cholesterol, lipoprotein, trace mineral nutrition, and metabolism as related to chronic diseases. Berry bioactives and their role in inflammation and vascular function, metabolism, and gene expression related to chronic diseases (cardiovascular disease, diabetes, metabolic syndrome). Trans-cultural studies on the role of the Mediterranean diet(s) on chronic diseases.

Yanyan Li, Ph.D. (The Ohio State University, 2011). Assistant Professor. Studying the health benefits of bioactive dietary components, in particular anti-cancer and anti-inflammatory properties and their molecular mechanisms.

**Robson Machado**, Ph.D. (Pennsylvania State University, 2016), Assistant Extension Professor, and Food Safety Specialist. Helping Maine farmers and food entrepreneurs develop safe foods while assisting processors in addressing changing regulations when commercializing local food and beverage products.

**Jade McNamara**, Ph.D. (University of Rhode Island, 2018), Assistant Professor of Human Nutrition. Exploring the relationship between nutrition and food literacy and dietary behaviors, developing curricula and interventions, theory-driven behavior change methods to influence healthy behavior change in youth and young adults, evidence-based instructional practices for critical thinking in health studies and higher education. Instrument/survey development to assess behavior and perceptions of health.

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**Susan S. Sullivan**, D.Sc., R.D. (Boston University, 1995), Associate Dean of Instruction, College of Natural Science, Forestry, and Agriculture. Clinical nutrition topics and vitamin D.

**Sharon Tate**, M.S., R.D., L.D. (Montana State University, 2002), Clinical Dietitian, Maine Medical Center. Portland, ME. Clinical nutrition.

Tao Zhang, Ph.D. (University of Michigan, 2010), Assistant Professor, School of Pharmacy and Pharmaceutical Sciences, Binghamton University, State University of New York.

## Food Technology (Certificate)

### Food Technology (Certificate)

The Food Technology graduate certificate program is ideal for professionals whose undergraduate education is in chemistry, microbiology, nutrition or engineering and would like to find employment in the food industry. The certificate also offers benefits for persons who have been working in the food industry but want to update their skill set with new knowledge on food technology. Graduates of the certificate program will learn how to safely develop and market new foods.

The 12-credit graduate certificate in Food Technology is offered 100% online and will meet the needs of working professionals. Lectures are asynchronous and live class discussions are scheduled at convenient times for students. The courses available to meet the 12-credit requirement are:

FSN 502: Food Preservation

FSN 517: Food Safety and Quality Control

FSN 524: Responsible Design, Conduct and Analysis of Research

FSN 538: Fermented Foods and Probiotics

FSN 543: Communication in Nutrition and Food Technology

FSN 545: Utilization of Aquatic Food Resources

FSN 555: Organic and Natural Foods

FSN 585: Principles of Sensory Evaluation

FSN 586: Sensory and Consumer Science Applications

FSN 603: Nutrient Changes in the Food System

The Food Technology graduate certificate program admission requirements include a baccalaureate degree from an accredited college or university with a minimum GPA of 3.0 on a 4.0 scale, two semesters of college level chemistry, two semesters of college level biology including one course on anatomy and physiology, and one college level introductory nutrition course.

## Forest Resources

The School of Forest Resources (SFR), in the College of Natural Sciences, Forestry, and Agriculture, offers graduate study leading to a non-thesis Master of Forestry, a Master of Science in Forest Resources and a Ph.D. in Forest Resources. Several faculty in the School participate in interdepartmental degrees offered through the Ecology and Environmental Sciences Program. As of May 2018, the Master of Science and Ph.D. programs offered by the School may be in one of the following concentrations: Forest Ecosystem Science, Forest Policy and Economics, Human Dimensions of Natural Resources, Bioproducts Engineering and Parks, Recreation and Tourism.

Students may choose from a wide range of specialties, including forest biological sciences (forest ecology, silviculture, forest genetics, soils, entomology, physiology, and pathology), forest biometrics (inventory, modeling, remote sensing, GIS and spatial analysis), forest economics and policy, forest business administration, forest management and planning, forest operations science, wood science and technology (bioenergy, wood composites, wood engineering, renewable nanomaterials), and forest-based parks, recreation, and tourism.

The forestry program at The University of Maine is one of the oldest in the United States with undergraduate degrees accredited since the early years of professional forestry in the United States. All graduate forestry degrees are offered under full University accreditation and, in addition, the Master of Forestry degree is accredited by the Society of American Foresters, meeting the educational requirements for professional licensure.

The School of Forest Resources is housed in Nutting Hall, with well-equipped laboratories for both basic and applied graduate research, greenhouse facilities on campus, and several field research stations throughout the state.

Maine, the most heavily forested state in the United States, sets the context for SFR research, though projects reach beyond state and national boundaries. Much of the research in the SFR is field oriented, and there are a variety of ecosystems and socioeconomic conditions available for investigation. The College is responsible for the management of the Dwight B. Demeritt Forest, a 1,700-acre tract adjoining the campus, the 4,000-acre Penobscot Experimental Forest, and nearly 4,000 acres of other forest properties in Maine. In addition, Maine contains millions of acres of forest land that are under diverse management by large ownerships, forest industries, small ownership parcels, state and federal forests, and Acadia National Park. Through the cooperation of these diverse landowners, opportunities exist for silvicultural, on-site wood processing, and ecological studies. Maine's systems of land use regulation and forest taxation and the state's long-standing reputation as a "vacationland" for forest recreation provide other categories of potential research interest.

The Barbara Wheatland Geospatial Analysis Laboratory provides a center of excellence for geospatial analysis in graduate student and faculty research, along with undergraduate education and professional development. The lab houses computer workstations equipped with image processing and GIS software, and research leverages a data acquisition and image analysis program using manned and unmanned aircraft. The program supports numerous basic and applied research projects with the primary focus on exploring innovative ways to leverage remote sensing and geospatial technology for forest and natural resource management, environmental monitoring and conservation, forest ecosystem science and climate change.

Forestry graduate study opportunities are strengthened by association with strong research programs within the SFR College of Natural Sciences Forestry and Agriculture, elsewhere on the Orono campus, and in the region. The Center for Research on Sustainable Forests was established in 2006. The Center brings together University of Maine researchers working in the interdisciplinary areas of forest resources. The Center is a resource for the public regarding Maine forest research and the sustainability of Maine's forests. The Cooperative Forestry Research Unit is funded by Maine landowners to conduct research on the intensive management of northeastern forest types. Graduate students studying in wood science & technology have access to world class equipment and researchers through strong ties to two research units on campus. The Advanced Structures and Composites Center (<https://composites.umaine.edu/>) houses a 100,000 square foot state-of-the-art facility for materials and wood engineering research. The Forest Bioproducts Research Institute ([www.forestbioproducts.umaine.edu](http://www.forestbioproducts.umaine.edu)) mission is to advance understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts. An Acadian Forest Ecosystem Research Program carries on long-term research on the nearby Penobscot Experimental Forest. The USDA Forest Service research program in Orono (through the Northern Research Station) employs scientists who hold appointments among the College's graduate faculty. A scientist from the USDA Forest Products Laboratory (FPL) is also stationed at the University of Maine facilitating scientific and research interactions with FPL scientists. Cooperative relationships also are common between the School of Forest Resources and several other University of Maine departments.

### **Admissions**

Students are admitted to the graduate programs in the School of Forest Resources on the basis of academic records, Graduate Record Exam (GRE) scores, experience, and recommendations. All applicants requesting financial aid will be considered for the several teaching and research assistantships available each year; no additional application forms are required. Several private or government funded research assistantships secured by individual faculty are also available on a competitive basis. Applications for admission in the fall semester should be submitted by January 15, especially if the applicant is seeking financial aid. Undergraduate students in the School of Forest Resources may opt for continuing their studies to earn the non-thesis Master of Forestry (MF) degree, providing certain academic requirements are met (see the SFR website). This SFR '4+1' MF option permits undergraduate students to take up to nine credits of graduate-level course work during their senior year, which would apply to both BS and MF degrees. Qualified undergraduates would apply to the SFR 4+1 program during their junior year.

### **Degree Requirements**

In addition to meeting all of the requirements of the Graduate School, graduate students in the School of Forest Resources must select an advisory committee, develop a program of study, and prepare a thesis or project proposal as early in their programs as possible. Other course requirements are established by the student and their advisory committee. Master of Science students must pass a thesis defense upon completing their thesis without a dissenting vote of the advisory committee. Ph.D. students must take a mandatory comprehensive examination, consisting of both written and oral sections, usually administered after most of the student's course work has been completed. Both this comprehensive examination, the passage of which is a prerequisite to further study, and the final examination at the end of a Ph.D. program may be passed with no more than one dissenting vote of the examining committee.

### **Further Information**

For details about specific aspects of the School of Forest Resources graduate programs, visit our web sites (<https://forest.umaine.edu>) or contact the Graduate Coordinator, currently Dr. Shawn Fraver; e-mail [shawn.fraver@umaine.edu](mailto:shawn.fraver@umaine.edu).

For the full list of Graduate Faculty please visit <https://forest.umaine.edu/people/department/graduate-faculty/>

## **French**

The Department of Modern Languages and Classics offers a Master of Arts in Teaching (M.A.T.) French, a Master of Arts in Teaching (M.A.T.) Spanish; a Master of Arts (M.A.) in French with optional concentrations in French Literature or North American French Studies. For details see the Modern Languages and Classics graduate web page or contact the graduate coordinator in the department.

## **Master of Arts in Teaching French**

The M.A.T. in French (30 credits) has been redesigned with the collaboration of the campuses of the University of Maine System specifically to meet the needs of Maine's schools. The programs offer full-time instruction during the academic year to meet the requirements of pre-service teachers and an intensive institute during the summer for in-service teachers. Candidates take seven to eight courses (21-24 credits) in language, literature, culture and linguistics in the target language, one course in language pedagogy (MLC 466/566) and one course on teaching the exceptional student in English (SED 500). An oral exam and a professional teaching portfolio which illustrate the candidate's familiarity with Maine's teaching standards and his/her readiness to teach a second language in the K-12 classroom are the final requirements for both degrees.

Practicing teachers who are already certified to teach French or Spanish may opt to take additional courses in their target language, or they may resume the study of a second foreign language at the advanced (400 or 500) level in lieu of taking courses leading to certification.

## **Master of Arts in French**

This program (30 credits) is intended for individuals with an interest in language, linguistics, literature, and culture and who are considering pursuing a doctoral degree in the field. The candidate will be expected to demonstrate both oral and written proficiency in French in the course of his or her studies. Candidates must complete 24 credits of course work, with a minimum of 12 credits at the 500-level. The program of study may include courses in other departments when these relate to the student's field of interest. Six hours of thesis credits are also required. Upon completion of the thesis, the Master of Arts candidate will defend the thesis before a committee of the graduate faculty at an oral examination which will also include questions on the student's course work.

## **Master of Arts with a concentration in French Literature**

This concentration is intended for individuals with an interest in literature. Candidates specializing in French literature are expected to complete the requirements for the M.A. described above by including four courses in literature, three of which must be at the 500-level, in their program of study.

## **Master of Arts with a concentration in North American French Studies**

North American French studies at the University of Maine developed from a natural link between the department and the geographic location of the university. The large number of francophone citizens who make up the population of the state of Maine, the significant communities with French heritage (Québécois and Acadian) that surround it, and the presence of Franco-American and Canadian-American Centers on campus have combined to create a strong interest and an expertise in North American French language and culture. The requirements for this degree are similar to those of the M.A. described above. The primary difference is that literature, language, and culture courses will be oriented to francophone North America.

## Financial Aid

The Department of Modern Languages and Classics annually awards two Teaching Assistantships in French. Graduate teaching assistants generally teach one first or second-year French course per semester. Graduate degree candidates may also be nominated for Trustee Tuition Scholarships and Chase Distinguished Research Assistantships offered by the Graduate School. Others may qualify for Canadian-American Center Assistantships, New England, Atlantic Provinces, and Québec Fellowships, and Foreign Language and Area Study awards available through the Canadian-American Center.

The Graduate School  
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Dept. of Modern Languages & Classics  
University of Maine  
214 Little Hall  
Orono, ME 04469-5742  
207-581-2095  
[carlos.villacorta@maine.edu](mailto:carlos.villacorta@maine.edu)

## Graduate Faculty

**Carlos Villacorta Gonzales**, Ph.D. (Boston University, 2009), Assistant Professor of Spanish and Department Chair. Twentieth and 21st Century Latin American Literature and Culture; Contemporary Peruvian Poetry; Post-modernism in Latin American, Urban Studies.

**Zachary Ludington**, Ph.D. (University of Virginia, 2014), Assistant Professor of Spanish and Graduate Coordinator. Modern and Contemporary Spain, the international Avant-Garde, La Edad de Plata, Translation.

**Susan Pinette**, Ph.D. (University of California, Irvine, 1999), Professor and Director, Franco-American Programs. Francophone literature. Eighteenth century French literature.

**Frédéric Rondeau**, Ph.D. (McGill University, 2010), Associate Professor of French and Director of the Canadian-American Center. 20th Century Quebec Literature and Culture; Counter-Culture (transnational perspective); Post-68

Literature, Culture, and Politics (France-Quebec); Francophone Literature of North America; Quebec Poetry and Literary Journals; Literary Avant-gardes; Contemporary French philosophy

**Jane S. Smith**, Ph.D. (Washington, 1994), Associate Professor Emerita of French. French linguistics. North American French dialects. Morphology. Language policy. Foreign language pedagogy.

## Associate Faculty

**Andrea Mercado**, M.S./M.A. (Florida International University, Miami, FL 2009) Instructor. Specializations in teaching English language learners, Underrepresented populations, Student with Limited/Interrupted Formal Education, Family and Community Partnerships

**Maria Sandweiss**, M.L.S. (Maine, 2010), Lecturer in Spanish. Hispanics in the U.S. and foreign language pedagogy.

**Kathryn E. Slott**, Ph.D. (Pennsylvania, 1980), Associate Professor. Nineteenth and 20th century poetry. Nineteenth century novel. Twentieth century theatre. Poetics. Québec literature.

## External Faculty

**Nancy Erickson**, Ph.D. (Michigan, 1992), Associate Professor, University of Southern Maine. French Renaissance literature. French women writers.

**Jean-Claude Redonnet**, Doctorat d'Etat és Lettres (1979). Director of Research & Professor Emeritus, Université de Paris-Sorbonne. International collaboration in higher education and cultural exchange.

## Emeriti Faculty

**Eugene F. Del Vecchio**, Ph.D. (University of Washington, 1979), Professor. Nineteenth and early 20th century Spanish literature. Comparative literature. Literary and genre criticism.

**Kathleen N. March**, Ph.D. (SUNY at Buffalo, 1979), Emerita Professor. Contemporary Hispanic literature. Literature and society. Peninsular and Latin-American narrative and poetry.

**Kristina Passman**, Ph.D. (Iowa, 1982), Emerita Associate Professor. Mythology. Latin literature. Women in the Ancient World. Greek.

**Raymond J. Pelletier**, Ph.D. (Massachusetts-Amherst, 1977), Emeritus Associate Professor and former Director, Canadian-American Center. Graduate Coordinator. Eighteenth century French literature. Foreign language pedagogy. Franco-American literature and culture. Bilingualism and bilingual education.

**James Troiano**, Ph.D. (SUNY at Buffalo, 1973), Professor Emeritus. Contemporary Latin-American theatre and short story.



# **Geographic Information Systems (Certificate)**

Geographic Information Systems have become a common information management and analysis tool used across many academic disciplines, government agencies and businesses. Students from diverse backgrounds may advance their career potential by building knowledge in this area. Practitioners in business, industry and government may be interested in acquiring base skills in this area to keep up with changing information technology in their work environment. The graduate certificate program is designed to provide a foundation in key aspects of geographic information systems.

The Graduate Certificate in Geographic Information Systems requires completion of a minimum of 15 credits of required coursework. These fifteen credits of coursework must include the following three core courses:

SIE 509 - Introduction to Geographic Information Systems

SIE 557 - Database System Applications

SIE 510 - GIS Applications

The remaining 6 credits may be selected from among the following set of courses:

SIE 507 - Information Systems Programming

SIE 512 - Spatial Analysis

SIE 515 - Human Computer Interaction

SIE 516 - Interactive Technologies for Solving Real-World Problems

SIE 525 - Information Systems Law

SIE 550 - Design of Information Systems

SIE 505 - Formal Foundations for Information Science

SIE 555 - Spatial Database Systems

SIE 558 - Real-Time Sensor Data Streams

SIE 559 - Geosensor Networks

SIE 580 - Ontology Engineering Theory and Practice

Only courses in which the student obtained a grade of B or higher count towards the completion of the Geographic Information Systems Graduate Certificate.

## **GIS Graduate Certificate Admission**

Students to be admitted into the Geographic Information Systems Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, an essay, and a current resume that includes contact information for three references. Students can apply to transfer up to 3 credits of graduate course work into the GIS Graduate Certificate assuming the credits have not counted toward an undergraduate or another graduate degree. If not waived, the three core courses must be taken at the University of Maine. The GIS Certificate Coordinator must approve any transfer credits after assessing whether they are appropriate or not.

### **Continuation of GIS Certificate to M.S. in Spatial Information Science and Engineering or M.S. in Spatial Informatics**

When nearing or upon completion of the GIS Graduate Certificate, students may apply for the MS Spatial Information Science and Engineering (all courses are both on campus and online) or the MS Spatial Informatics (online only). They must meet all the master's requirements for admission. Students can transfer from the GIS Graduate Certificate those SIE courses in which they received a grade of B or higher.

### **Additional Information**

Advising Notes and Applying: <https://spatial.umaine.edu/graduate-certificates/>

Course Descriptions: <http://gradcatalog.umaine.edu/> > Graduate Courses or see SIE course descriptions

### **Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor and GIS Graduate Certificate Coordinator. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## Gerontology (Certificate)

The Interprofessional Graduate Certificate Program in Gerontology is designed to increase the knowledge, skills and abilities of health and human service professionals who provide care to older adults in a variety of settings.

This 9-credit program, offered via distance-education technology, will meet the needs of working professionals who, because of the rapidly aging population, find themselves caring for a growing number of older adults and their caregivers.

Graduates of the certificate program will be prepared to function as members of interprofessional teams to effectively address the health and human service needs of an increasingly diverse aging population.

Graduate Certificate Program admission requirements include a baccalaureate degree in any field with a GPA 2.75 or higher. Individual courses in the certificate program may be taken as electives by graduate students from any program. In addition, students who are enrolled in an undergraduate program may request permission of the instructor to take individual courses.

More detailed information on the certificate program can be found at [umaine.edu/gerontology](http://umaine.edu/gerontology).

## Global Policy

### Global Policy

Return to: Graduate Programs, Certificates, Specializations, Emphases

The School of Policy and International Affairs (SPIA) administers the Master of Arts in Global Policy. Core seminars define the body of knowledge and skills considered fundamental to assume a role in global policy development and analysis. These core courses include:

- SPI 501 - Methods of Inquiry and Research (3 credits)
- SPI 502 - Issues in World Economy (3 credits)
- SPI 503 - International Relations (3 credits)
- SPI 510 - Public Service Seminar (1 credit)
- SPI 595 - SPIA Internship (2-6 credits)

All students must complete an international internship; students with suitable employment experience may waive some course requirements with graduate coordinator approval. The M.A. in Global Policy has four concentrations - International Environmental Policy; Climate Policy; International Trade and Commerce; and International Security & Foreign Policy. Although each concentration consists of distinct required and elective coursework, all focus on policy and policy choices. Other electives can be taken with preapproval from the graduate coordinator. Requirements of the M.A in Global Policy degree include a minimum of 30 graduate-level credit hours. SPIA only accepts grades of B or better in core seminars. Requirements: An undergraduate degree in international affairs or a global policy field is not essential for admission. However, all students must complete certain prerequisites before finishing the program, including:

- Introductory Microeconomics (equivalent to UMaine's ECO 120) and Macroeconomics (equivalent to UMaine's ECO 121) ; and
- Demonstrate an intermediate-level proficiency in a foreign language.

**Financial Aid:** SPIA awards a limited number of scholarships and fellowships to well-qualified students on a competitive basis. Travel grants and internship scholarships are also available to students working on professional, research, and teaching projects. The Graduate School offers a few tuition waivers and modest fellowships. All applicants are considered for funding opportunities at the time of admissions review; no additional application is required.

**Students:** SPIA has approximately 30 graduate students from around the world with diverse undergraduate academic backgrounds, including majors in Political Science, International Affairs, Economics, Education, Business Administration, Engineering, History, and English.

**Applying:** SPIA reviews complete applications on a rolling basis. A complete package includes three letters of recommendation, and transcripts of all previous college work. Applications are available at The Graduate School website at <http://www.umaine.edu/graduate/>. Website: For more information about SPIA, please visit: [www.spia.umaine.edu/](http://www.spia.umaine.edu/)

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207-581-3153  
[spia@maine.edu](mailto:spia@maine.edu)  
<http://spia.umaine.edu/>

### **Cooperating Graduate Faculty**

**Pankaj Agrawal**, Professor of Finance and Nicolas M. Salgo Professor

**George Criner**, Associate Dean of Instruction; Professor, School of Economics

**Habib Dagher**, Founding Executive Director of the Advanced Structures & Composites Center

**Elizabeth DePoy**, Professor of Interdisciplinary Disability Studies and Social Work

**William B. Farrell**, Principal Consultant, Swordfish Consulting International and Adjunct Professor of International Development

**Per Erik Garder**, Professor of Civil and Environmental Engineering

**Stephen Gilson**, Coordinator and Professor of Interdisciplinary Disability Studies; and Professor of Social Work

**Kenneth M. Hillas**, Adjunct Professor of International Affairs

**Stephen Hornsby**, Professor of Geography and Canadian Studies

**Michael Howard**, Professor Emeritus of Philosophy

**Cindy Isenhour**, Associate Professor of Anthropology and Climate Change

**Shaleen Jain**, Professor and Department Chair of Civil and Environmental Engineering, Cooperating Assistant Professor, Climate Change Institute

**Teresa R. Johnson**, Associate Professor of Marine Policy, School of Marine Sciences

**Debra Jean Kantor**, Associate Extension Professor, UMaine Cooperative Extension

**Roger King**, Associate Professor Emeritus of Philosophy

**Ivan Manev**, Professor of Management

**Paul A. Mayewski**, Director and Professor of the Climate Change Institute and Distinguished Professor in the School of Earth and Climate Sciences

**Nicholas Mickinski**, Libra Assistant Professor of Political Science and International Affairs

**Jonathan Rubin**, Director, Margaret Chase Smith Policy Center; Professor, School of Economics

**Daniel H. Sandweiss**, Professor of Anthropology and Quaternary and Climate Studies

**James Settele**, Director, School of Policy & International Affairs

**Seth Singleton**, Adjunct Professor of International Relations

**Mario Teisl**, Director and Professor, School of Economics

**Stefano Tijerina**, Lecturer in Management

**Philip Trostel**, Professor, School of Economics

**Kristin Vekasi**, Associate Professor of Political Science and International Affairs

**Timothy M. Waring**, Associate Professor of Social-Ecological Systems Modeling, School of Economics

## High Leverage Practices to Promote Inclusion

## High Leverage Practices to Promote Inclusion

Data from the National Center for Education Statistics indicate that 62% of all students identified with a disability are educated in the general education setting for 80% or more of the school day. The High Leverage Practices to Promote Inclusion Graduate Certificate responds to this critical and growing need for teachers to have appropriate support for serving all students in their classrooms, including students with disabilities, at risk students, and typical learners.

In the **Graduate Certificate in High Leverage Practices to Promote Inclusion** program, you will learn the practical tools to implement instructional changes that promote diversity and foster inclusivity in your classroom and within the school culture. You will join students from a variety of backgrounds and fields and participate in active learning experiences using evidence-based inclusive practices for students. You will learn about high leverage practices (HLPs)

that are critical to helping students learn and for supporting students' social and emotional development. Field-based experiences are threaded throughout the program and candidates receive first-hand opportunities to translate research and theory into practice.

Certificate program objectives:

- Students will understand current issues and challenges relating to effective learning interventions,
- Students will apply the latest research in educational intervention,
- Students will promote positive learning and inclusive education,
- Students will interpret assessment data, and
- Students will develop knowledge and skills to better meet the diverse needs of students in all educational settings.

There are two tracks for the Graduate Certificate in High Leverage Practices to Promote Inclusion:

1. Special educators enroll in the following courses:
  - SED 532 Behavior management
  - SED 546 Intervention for Writing Difficulties
  - SED 566 Executive functioning
  - SED 545 Intervention for reading difficulties
  - SED 544 Math methods in special education
2. General educators or others supporting individuals with autism enroll in the following courses:
  - SED 546 Writing intervention for students
  - SED 566 Executive functioning
  - SED 545 Intervention for reading difficulties
  - SED 544 Math methods in special education

For more information, please visit the College of Education and Human Development.

## Higher Education

The programs in Higher Education advance the knowledge and skills essential for effective leadership in a range of professional areas in today's colleges and universities. All programs emphasize the integration of oral and written communication skills, critical thinking skills, a cognitive understanding of colleges and universities as complex organizations, the social context within which they function, the individual identity development of the students they serve, and the effective use of technology in curriculum and communication.

### **Student Development in Higher Education (M.Ed., Ed.S)**

**M.Ed.:** The Master of Education (MEd) in Student Development in Higher Education prepares entry-level professionals for a variety of positions in student affairs in postsecondary education in increasingly diverse and technologically advanced colleges and universities. Master's level academic coursework provides solid theoretical and practical grounding for understanding the student services profession in the context of colleges and universities as complex organizations including: student development, sociocultural identity differences/diversity, ethical professional practice, research, and technological competence. The practical implications of coursework are explored through class discussions of application, internship experiences, and graduate assistantships in campus departments.

The Master's Program in Student Development in Higher Education encompasses a body of knowledge and theory that provides a basis for professional practice. It is designed around the guidelines established by the Council for the Advancement of Standards for Student Services/Development Programs and the ACPA/NASPA Competencies. Theory-to-practice internships provide hands-on experience in a student affairs setting. The 36-credit-hour graduate program in Student Development in Higher Education includes three major components:

1. Student development in higher education core (19 credit hours): A set of courses required of all students in the program providing a base of knowledge about colleges and universities and student development as a field. The core includes at least 3 credit hours of internship experience and 3 credits of electives. The program culminates in an integrating capstone seminar and final paper.
2. Research Core (6 credit hours): Two courses providing a basic understanding of assessment, research design and statistical methods for conducting and/or interpreting research.
3. Focus Block/Concentration (11 credit hours): An area of emphasis specific to the student's interests: Options include: leadership, gender studies, and an individualized option.

**Ed.S.:** The College of Education and Human Development provides an option for an Education Specialist providing a cohesive program of professional development beyond the master's level for educational specialists. The program of study is individually planned by the student and their advisor. A minimum of 30 semester hours of work beyond the master's level is required to earn the Ed.S. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. A master's degree in the Ed.S. subject matter is required for admission to the program.

Students at the master's and Ed.S. levels typically hold graduate assistantships (GAs) with offices and programs at UMaine. These are typically secured by applying directly to the sponsoring offices.

Additional information regarding the program and the supplemental admissions process is available from Higher Education admissions, 136 Shibles Hall, University of Maine, Orono, Maine 04469 or by visiting the program's website <https://umaine.edu/edhd/graduate/higher-education-masters-cas/>

Application deadline for the M.Ed. is April 1<sup>st</sup> for Fall enrollment, but those seeking graduate assistantship positions should apply by December 1<sup>st</sup> for preferred consideration.

### **Ph.D./Ed.D. in Higher Education**

The doctoral program in Higher Education prepares ethical, visionary, informed, and competent programmatic and institutional leaders.

Through its structure and content, the doctoral degree in Higher Education provides mid-career professionals with the theoretical and practical frameworks to understand colleges and universities as complex organizations within the American social context including foundations in leadership, law and policy, sociocultural identity differences/diversity, ethical professional practice, historical context, and research. Students develop advanced research skills to explore critical questions related to these areas through coursework, evaluating existing scholarship, and by conducting original research.

Graduates of the Higher Education doctoral program will provide leadership characterized by:

- High-level analytic thinking
- Advanced research design and analysis skills
- Problem-solving skills

- Ethical leadership and decision making
- Understanding of the dynamics of sociocultural identity differences
- Historical perspectives
- Understanding of colleges and universities as complex organizations
- Understanding of professional responsibilities, networks/communities, and ethics in the field
- Effective, persuasive, and inclusive written and oral communication skills
- Understanding the social context and complexities of higher education
- Comprehension of the impact of social, economic, political, and legal trends
- Technology literacy
- Flexibility and confidence to provide leadership in times of change

The structure of the program entails 90 credit hours past the bachelor's degree. Admission requires a master's degree for which variable credits may be applied to the doctoral degree, upon approval of program faculty and in accordance with Graduate School guidelines. The master's need not be in Education. The disciplinary backgrounds and the applied experience mid-career students bring with them are central to the learning environment. Students are expected to learn from one another as well as from faculty and others with specific expertise in areas of higher education. The student's program consists of group and individualized experiences culminating in the dissertation including:

- The Professional Core: a broad, common strand of doctoral level course work required of all students in the Higher Education program (18 credit hours)
- Research Foundation: a set of courses to provide expertise in evaluating and conducting research in educational settings including basic statistics and introductory qualitative research, research design and either advanced statistics or advanced qualitative research (a minimum of 12 credit hours)
- Professional specialization: a set of interdisciplinary courses tailored to the individual professional goals, needs, and interests (a minimum of 18 credit hours which may include master's work and work transferred from other institutions)
- Dissertation research structured to solve problems or produce knowledge with direct applicability to higher education practice (a minimum of 6 credit hours)

Additional information regarding the program and the supplemental admissions process is available from 136 Shibles Hall, University of Maine, Orono, Maine 04469 or by visiting the program website <https://umaine.edu/edhd/graduate/higher-education-phd-edd/>

Application deadlines: December 1<sup>st</sup> for admission consideration for following Fall. Students should check the program website to be sure program is accepting doctoral applicants this year.

## History

The Department of History offers both the M.A. and the Ph.D. degrees. There are two programs of study for the master's candidate. The thesis option requires the satisfactory completion of an extended essay based upon research in one's area of concentration as well as 24 additional hours of course work. The non-thesis option requires the satisfactory completion of 30 hours. While students who follow the thesis option must defend their written work, non-thesis students must pass a comprehensive oral examination.

A master's degree candidate may concentrate in American, Canadian, European, and East Asian history. The Ph.D. candidate may concentrate in either American, Canadian or International history and must become knowledgeable in two areas of history and in a related discipline. Other than these geographic areas of concentration, several faculty share expertise in borderlands, labor, Native American, environmental, and oral history. Faculty areas of specialization have also yielded much graduate work in women's history, science and technology, military history, historical geography, intellectual history, trans-national history, cultural history, and ethnic history among others.



M.A. students, in conjunction with a major advisor, select a) an area of concentration such as American, Canadian, European, or East Asian history, or b) a topic of concentration such as Technology, Environmental, or International history.

The Ph.D. candidate may concentrate in either American, Canadian-American, or International history and must become knowledgeable in two areas of history and in a related discipline. Comprehensive written and oral examinations in these areas usually are scheduled at the end of two years of preparation. The candidate also must submit a scholarly and substantial piece of original research (dissertation) and defend it before his or her committee. Candidates at both the master's and doctoral levels are expected to demonstrate competence in a foreign language. The student's advisory committee is responsible for determining specific requirements.

The Raymond Fogler Library is the historian's research center. Among its most significant collections are journals, books, and documents in Maine, New England, Canadian, and maritime history. The Maine History journal is edited out of the Department and provides opportunities for graduate students to learn about the editing, layout, graphics, and printing of a journal. Small travel grants are available for dissertation work at research centers in other cities.

Admission to the graduate program in history is based upon the requirements of the Graduate School, including GRE scores. The History Department currently awards on a competitive basis several teaching assistantships annually which pay a stipend and include a waiver of tuition. Students also may compete for other University scholarships.

In recent years, topics of theses and dissertations have included Black reformers and the early civil rights movement in Pittsburgh 1915-1945, managing the river commons in New England 1760-1860, cookbooks and the negotiation of domesticity in Anglo-America 1830-1880, Acadian sorcerers and Mi'kmaw shamans in Acadian folklore, Jonathan Fisher and early American education 1780-1830, the Gospel of the northeastern frontier 1744-1764, Mothers' Aid in Maine and New Brunswick in the early 20th century, the 1994-1995 public debate over proposed national history standards, and divergent visions of technology within American-Egyptian relations in the 1950s.

### **Graduate Faculty**

**Joel Anderson**, Ph.D. (Cornell, 2015), Lecturer, Medieval Europe, Viking and medieval Scandinavia, cultural and religious history.

**Mary Freeman**, Ph.D. (Columbia, 2018), Assistant Professor, New England and Maine History

**Nathan Godfried**, Ph.D. (University of Wisconsin-Madison, 1980), Professor. 20th Century U.S., Labor and Economic, Mass Media and Popular Culture.

**Mazie L. Hough**, Ph.D. (University of Maine, 1997), Associate Professor. U.S., Women, Political, Legal.

**Anne Kelly Knowles**, Ph.D. (University of Wisconsin-Madison, 1993), Professor. Historical Geography, Holocaust, Antebellum US, Labor and Immigration, History of Cartography, Geovisualization, and Historical GIS.

**Michael Lang**, Ph.D. (University of California, Irvine, 1997), Associate Professor. Modern Europe, historiography, intellectual history, international relations.

**Ngo Vinh Long**, A.B., A.M., Ph.D. (Harvard University), Professor of History. China, Japan, Southeast Asia.

**Elizabeth McKillen**, Ph.D. (Northwestern, 1987), Professor. U.S., Foreign relations, Labor, 20th Century.

**Mark J. McLaughlin**, Ph.D. (University of New Brunswick, 2013), Assistant Professor of History and Canadian Studies. Environmental History, Canadian History, History of Science and Technology, Comics Studies.

**Stephen M. Miller**, B.A. (Tufts University); M.A. (New York University); Ph.D. (University of Connecticut), Adelaide & Alan Bird Professor and History Department Chair. Great Britain, South Africa, Military, Imperialism.

**Micah Pawling** Ph.D. (University of Maine, 2010), Assistant Professor, ethnohistory of Native North America, Native American, Wabanaki, environmental, United States, and Canadian history.

**Liam Riordan**, Ph.D. (University of Pennsylvania, 1996), Professor. Colonial British America, American Revolution, and Early U.S. Republic, cultural and social history.

### **Collaborative and Affiliated Graduate Faculty**

**Libby Bischof**, Professor of History, University of Southern Maine

**Stephen Hornsby**, Professor of Geography, University of Maine

**Michael J. Socolow**, Professor of Communication and Journalism, University of Maine

**Stefano Tijerina**, Lecturer, Business School, University of Maine

### **Emeritus Graduate Faculty**

**William J. Baker**, Professor Emeritus

**John F. Battick**, Associate Professor Emeritus

**Richard Blanke**, Professor Emeritus

**Jay A. Bregman**, Professor Emeritus

**Alex Grab**, Professor Emeritus

**Richard W. Judd**, Professor Emeritus

**Jerome J. Nadelhaft**, Professor Emeritus

**Warren C. Riess**, Associate Research Professor Emeritus

**Scott W. See**, Librarian Professor Emeritus

**William H. TeBrake**, Professor Emeritus

## **Horticulture**

The graduate Horticulture program at the University of Maine is available through the School of Food and Agriculture. It is a multi-dimensional program that offers graduate students the opportunity to explore the many aspects of horticulture through course work, teaching, extension, and scholarly research. Opportunities exist in a broad range of horticultural commodities such as: ornamental plant selection and evaluation, low-temperature tolerance, landscape plant production, blueberry physiology and hardiness, greenhouse production and management, pomology, tissue culture, and weed management. Students are encouraged to participate in all aspects of the Horticulture program and develop a well-rounded curriculum of study.

Students entering the graduate Horticulture program will be required to develop an original research project in one of the many facets of horticulture. In doing so, students will have access to extensive facilities such as the horticulture greenhouses, The Lyle E. Littlefield Ornamentals Trial Garden and Research Center, tissue culture and other lab equipment, as well as several other research facilities. Also, an extensive relationship exists with local, state, national, and international horticulture professionals, and graduate students are encouraged to not only take advantage of these resources, but to also provide a conduit between the program and industry members. Prospective students are encouraged to contact a faculty member directly for more information on individual research interests and potential

courses of study. Additional information concerning graduate studies in Horticulture may be obtained from Dr. Bryan J. Peterson (Graduate Coordinator) ([bryan.j.peterson@maine.edu](mailto:bryan.j.peterson@maine.edu)), or from the website, (<http://umaine.edu/foodandagriculture/>).

### **Graduate Faculty**

**Stephanie Burnett**, Ph.D. (University of Georgia, 2004), Associate Professor of Horticulture.

**Lily Calderwood**, Ph.D. (University of Vermont, 2015), Extension Wild Blueberry Specialist and Assistant Professor of Horticulture.

**Renae E. Moran**, Ph.D. (University of Arkansas, May 1996) Professor. Variety evaluation and postharvest fruit quality.

**Bryan J. Peterson**, Ph.D. (Iowa State University, 2013). Associate Professor of Horticulture. Propagation, selection, and responsible use of woody ornamental plants. Ecology, ecophysiology, and conservation of native taxa.

**Matthew Wallhead**, Ph.D., (University of New Hampshire, 2016), Extension Ornamental Horticulture Specialist and Assistant Professor of Horticulture.

## **Human Development**

The graduate program in Human Development is designed to provide advanced training, with special emphasis on child development and family relations. This program is designed for those interested in working in the human development field in such leadership positions as center director, director of services, program coordinator, case manager or project manager.

### **The curriculum is designed to:**

- train students in the fundamentals of professional practice in agencies serving children, adolescents, adults and families
- provide students with advanced content in one or more research areas (e.g., early childhood, human sexuality, family relationships)
- provide students with internship opportunities in human service programs or in applied research mentored by a faculty member

### **Degree Requirements**

The Master of Science degree in Human Development requires a minimum of 30 credit hours.

## **Core Courses**

All candidates for the M.S. degree in Human Development must complete the following 6 core graduate courses:

- HUD 551 - Fundamentals of Human Development Credits: 3
- HUD 552 - Professional Practices in Human Development Credits: 3
- HUD 553 - Program Planning and Evaluation in Human Development Credits: 3

- HUD 554 - Legislation and Policy in Human Development Credits: 3
- HUD 555 - Grant Development in Human Development Credits: 3
- HUD 556 - Introduction to Research Methods in Child Development and Family Relations Credits: 3

## Seminars

In addition to the coursework outlined above, students must complete six credit hours of HUD elective courses.

## Internship

In their second year, students must also complete 6 credits of:

- HUD 601 - Supervised Fieldwork in Child Development and Family Relations Credits: 1-6  
Or
- HUD 699 - Graduate Thesis/Research Credits: Ar

## Internship Options

The internship experience entails high-quality, professional placement with an agency or work on a research project with a faculty member in human development.

Option A: Leadership in an Agency. This option is appropriate for students with an interest in a career in a variety of settings, including federal, state or local governments, and public or private agencies that directly service the needs of children, adolescents, adults or families. In addition to the formal course requirements, students complete a 300-hour internship in a public or private agency in their last semester. If currently employed in a human development field, the employer would need to add new leadership responsibilities to the position.

Option B: Applied Research. This option is appropriate for students with an interest in pursuing graduate education in a doctoral program (typically in human development and family studies) or those otherwise interested in a career in research. In addition to the formal course requirements, students complete a research project based on original research supervised by a member of the faculty. Students complete a research article suitable for submission to an academic journal. Students in this option are encouraged to take one class in statistics or qualitative research design.

Application deadline is April 1st for Fall admission. A limited number of graduate assistantships are available on a competitive basis each year. Students interested in an assistantship should apply by January 15 and send a letter to the Associate Dean, College of Education and Human Development, requesting to be considered.

Applicants are evaluated on criteria including undergraduate GPA, letters of recommendation and matching program interests.

## **Human Nutrition (Certificate)**

## **Human Nutrition (Certificate)**

The Human Nutrition graduate certificate program is designed to enhance the knowledge and skills of health care professionals, exercise physiologists, and health educators in the area of human metabolism, nutrition assessment, and food systems. Dietitians can explore new areas of study such as integrative and functional nutrition, gerontology, and sustainability. Responsible conduct of research training is provided to enhance students' ability to work on research projects with nonprofit organizations or other institutions. Graduates of the Human Nutrition graduate certificate program will develop a foundation in nutrition science, be able to identify and evaluate current research on nutrition and health and use evidence-based nutrition strategies. Please note that in most states, only registered and/or licensed dietitians may provide nutrition advice to persons who have an underlying medical condition such as diabetes or heart disease. This certificate does not lead to credentialing as a dietitian.

The 12-credit graduate certificate in Human Nutrition is offered 100% online and will meet the needs of working professionals. Lectures are asynchronous and live class discussions are scheduled at convenient times for students. The courses available to meet the 12-credit requirement are:

FSN 501: Advanced Human Nutrition

FSN 506: Nutritional Assessment

FSN 508: Nutrition and Aging

FSN 524: Responsible Design, Conduct and Analysis of Research

FSN 530: Integrative and Functional Nutrition

FSN 538: Fermented Foods and Probiotics

FSN 542: Sustainability, Nutrition, and Health

FSN 543: Communication in Nutrition and Food Technology

FSN 555: Organic and Natural Foods

FSN 603: Nutrient Changes in the Food System

The Human Nutrition graduate certificate program admission requirements include a baccalaureate degree from an accredited college or university with a minimum GPA of 3.0 on a 4.0 scale, two semesters of college level chemistry, two semesters of college level biology including one course of anatomy and physiology, and one college level introductory nutrition course.

## **Individually Designed Education**

## **INDIVIDUALLY DESIGNED (M.Ed., Ed.S.)**

**M.Ed.:** The college-wide individually designed Master of Education provides a cohesive program of professional development for educators. The program of study is individually planned by the student and their advisor. A minimum of 33 semester hours of work is required to earn the M.Ed. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. In lieu of a thesis, students must complete a comprehensive paper, project, portfolio, or oral examination, generally during the final semester or year of study. The purpose of this requirement is to enable demonstration of learning that has taken place across the program as a whole. The M.Ed. program is individually designed; however pre-planned concentrations are available in Art Education.

**Ed.S.:** The college-wide Education Specialist program provides a cohesive program of professional development beyond the master's level for practicing educators. The program of study is individually planned by the student and his or her advisor. A minimum of 30 semester hours of work beyond the master's level is required to earn the Ed.S. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600 level at the University of Maine. A master's degree in the Ed.S. subject matter or related field is required for admission to the program.

## **Information Systems**

## **Information Systems**

The Master of Science in Information Systems program focuses on technical, managerial and policy issues associated with constructing and managing computer-based information systems for modern organizations. All areas of private and public enterprise rely on information systems for communication, planning, providing services, control and supporting decisions. The objectives of this program are to meet the growing demand in society for graduates with high-level information system skills and provide a path for women and men from diverse fields to rapidly transition to information system career paths by providing them with foundation graduate level courses in information systems. The program is explicitly designed to accommodate students from wide ranging undergraduate degree backgrounds.

Students develop knowledge and technical skills in foundation areas of formal methods, programming, information system design, human computer interaction and information law and ethics. Students gain working familiarity with one or more programming languages if not already acquired. Based on this foundation, students have leeway to craft a remaining selection of courses in consultation with and approval by their academic adviser and the MSIS steering committee. Flexibility is provided to accommodate the particular backgrounds, interests and information system professional career aspirations of each student as well as to be responsive to the ever-changing technological and business environments. Thus students might choose to focus additional coursework within a specific information systems domain or pursue course interests among several applications and theory domains including business, engineering, computer science, psychology, education and additional germane science areas. The goal is to prepare graduates to succeed as information system professionals in a variety of roles and settings.

### **Degree Requirements**

The Master of Science in Information Systems (MSIS) consists of 30 credits, all earned in course work. The program consists of five three-credit required core courses and a minimum of fifteen additional credits from a list of elective courses approved for the program drawn from a range of disciplines. If some required courses are duplicative of courses that may have been taken in the student's undergraduate degree program, those courses need not be repeated, and the student will select in consultation with the Graduate Coordinator and the Steering Committee additional

approved courses to arrive at the total of 30 credit hours. The MSIS is offered wholly on-campus as well as entirely online.

### **Required Courses**

The following five courses must be taken and all count toward the graduate degree unless they were counted in a student's undergraduate program or are waived.

- SIE 507 - Information Systems Programming Credits: 3
- SIE 515 - Human Computer Interaction Credits: 3
- SIE 525 - Information Systems Law Credits: 3
- SIE 550 - Design of Information Systems Credits: 3
- SIE 505 - Formal Foundations for Information Science Credits: 3

### **Elective Courses**

Students must take at least fifteen additional credits that are approved in advance by the MSIS Steering Committee from the following approved elective course listings in order to arrive at the total required of 30 credits. Students should NOT assume that any combination of the following courses will be approved by the Steering Committee. Students should obtain approval of their full program of study prior to taking elective courses to ensure that they count toward their degree requirements. Students may propose additional graduate courses than those listed below be included on their program of study on a case-by-case basis or added to the list. The MSIS Steering Committee assesses the reasonableness of such requests and makes the final decision on whether specific additional courses serving the objectives of the MSIS program and the needs of the student may be included.

Some of the elective graduate courses listed may require prerequisites in addition to the minimum required for general admission to the MSIS graduate program. Some schools and departments grant enrollment preference to graduate students in their own programs so check with the relevant department or college as appropriate.

#### **Business**

- BUA 601 - Strategic Data Analysis Credits: 3
- BUA 680 - Foundations of Business Intelligence and Analytics Credits: 3
- BUA 681 - Data Management and Analytics Credits: 3
- BUA 682 - Data Pre-Processing for Business Analytics Credits: 3
- BUA 683 - Information Visualization Credits: 3
- BUA 684 - Business Data Mining and Knowledge Discovery Credits: 3
- BUA 685 - Problem Solving and Decision Analysis Credits: 3
- BUA 686 - Predictive and Business Forecasting Credits: 3

#### **Computer Science**

Any formally approved 400 level COS courses and above including those addressing machine learning, cloud computing, computer vision, and including:

COS 435/535 - Engineering Privacy in Software Systems

COS 565 - Data Visualization

COS 570 - Topics in Artificial Intelligence

**Data Science and Engineering**

Any formally approved DSE graduate courses

**Digital Curation**

DIG 500 - Introduction to Digital Curation Credits: 3

DIG 510 - Metadata Credits: 3

DIG 540 - Digital Collections and Exhibitions Credits: 3

DIG 550 - Digital Preservation Credits: 3

**Education**

SIE 504 - The Beauty and Joy of Computing Credits: 3

EDT 520 - Methods of Teaching with Computer Technology Credits: 3

EDT 545 - Information Security in the Educational Environment Credits: 3

**Electrical and Computer Engineering**

Any 400 level ECE courses and above

**Interdisciplinary**

INT 601 - Responsible Conduct of Research Credits: 1

**Spatial Information Science and Engineering**

SIE 508 - Object Oriented Programming Credits: 3

SIE 509 - Principles of Geographic Information Systems Credits: 3

SIE 510 - Geographic Information Systems Applications Credits: 3

SIE 512 - Spatial Analysis Credits: 3

SIE 516 - Interactive Technologies for Solving Real-World Problems Credits: 3

SIE 517 - Spatial Interaction Design Credits: 3

SIE 554 - Spatial Reasoning Credits: 3

SIE 555 - Spatial Database Systems Credits: 3

SIE 557 - Database System Applications Credits: 3

SIE 558 - Real-Time Sensor Data Streams Credits: 3

SIE 559 - Geosensor Networks Credits: 3

SIE 580 - Ontology Engineering Principles Credits: 3



### **Detailed Requirements**

- Programs of Study are approved for each student by the Steering Committee for the MSIS graduate program. This committee consists of the MSIS Graduate Program Coordinator and two additional graduate faculty members in the department or affiliated with the program.
- Each student's Program of Study must include the five required core courses with the remainder of courses to be selected from an approved course list maintained by the department or proposed by the student and assessed for possible approval. The list is regularly updated and includes appropriate courses drawn from across campus and other UMS campuses. Each student's Program of Study must be approved in advance by the MSIS Steering Committee.
- At least 15 credits of the 30 required on a student's program of study must be at the 500 level or above.
- Up to two courses may be taken at other universities by distance methods or otherwise if contained on the student's graduate program of study and approved in advance by the MSIS Steering Committee.
- Up to two graduate courses may be transferred into the student's graduate program of study if taken prior to admission to the Graduate School, the courses did not count towards the student's undergraduate or other graduate degree requirements, and the courses are approved by the MSIS Steering Committee.
- The MSIS Graduate Coordinator serves as the advisor for each student admitted to the program and the MSIS Steering Committee serves as the graduate committee for each student in the program.
- All students must complete the entire M.S. graduate program of study within a six-year period (as established by the Graduate School).

### **Admission Requirements**

Admission to the University of Maine Master of Science in Information Systems is competitive but on a rolling basis. In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully and achieve positions of leadership in the private or public sectors. While the submission of GRE scores and letters of recommendation are encouraged, they are not required. We generally seek an undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a four-year international equivalent. Within their curriculum, all applicants should have completed a university course in Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are recommended but not required. The review committee considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School. The entire application packet including transcripts, test scores, (if required), essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. To be considered for Fall admission, completed applications should be received if at all possible 8 weeks prior to the beginning of the term.

**Concurrent Graduate Certificates** - Applicants applying for the MS Information Systems that desire to acquire as well a Graduate Certificate in GIS, Information Systems, or Data Science and Engineering along the way to acquiring the MS, should apply additionally for the Graduate Certificate prior to completing the MS course requirements. For model curriculum examples that combine the MSIS with other graduate certificates, see Graduate Certificates.

**Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students** - High-performing undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the *MS Information Systems* graduate degree program. Applicants to the Accelerated

Four Plus One should submit the Application for Admission to the SIE or MSIS Four Plus One Program. Such applications are not accepted after the senior year has commenced. For further details, see the MSIS Four Plus One Program.

**Cooperating MSIS and Business Graduate Programs** - A range of opportunities exist for gaining business graduate credentials while pursuing the MSIS. Please consult the *MSIS and MBA Dual Degree* and *Cooperating MSIS and MBA Programs*

### **Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## **Information Systems (Certificate)**

## **Information Systems (Certificate)**

Technology is transforming today's organizations and information has become the lifeblood of modern enterprises. Information systems are vastly increasing the efficiency and effectiveness of organizations and allowing industry and commerce to provide innovative new services and products. As the need for information and its supply expands, the demand for knowledgeable analysts, integrators, designers, developers and administrators of such systems will continue to grow.

The Graduate Certificate in Information Systems requires completion of the following five courses:

SIE 507 Information Systems Programming (3 credits)

SIE 515 Human Computer Interaction (3 credits)

SIE 525 Information Systems Law (3 credits)

SIE 550 Design of Information Systems (3 credits)

SIE 505 Formal Foundations for Information Science (3 credits)

All of these required courses are available in either the fall or spring semester simultaneously on-campus and online. Typically, distance students view class sessions over the internet that have been recorded with the on-campus students although some sessions may be pre-recorded. Students in both class sections accomplish the same assignments and exams. Online students may, at their option, participate in most classes live over the internet. Work sessions and/or office hours are typically offered at times convenient for online students.

If one or more courses are waived due to previous course work or acquired skills, the graduate coordinator in consultation with the student selects appropriate replacement courses.

### **Course Descriptions**

Descriptions for courses in the program as well as alternative more advanced courses if core courses are waived may be found through the school's MS Information Systems Curriculum website. For more detailed descriptions and sample syllabi see the Spatial Computing Courses.

### **Student Eligibility and Admission Criteria**

Students desiring to acquire the Graduate Certificate in Information Systems should apply by completing the Graduate Certificate Application. The entire application packet including transcripts, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. Admissions are rolling. The time limit for completion of the Graduate Certificate is the same as that set by the Graduate School for completion of a master's degree.

**Note 1: Combining the Graduate Certificate in IS with a Master's Degree** - Upon or near the completion of the Graduate Certificate, students may choose to extend their coursework to earn a full Master's degree. For model curriculum examples that combine the Graduate Certificate in Information Systems with various sample online Master's degrees, see Graduate Certificates (Section III).

**Note 2: Combining the Graduate Certificate in IS with the MBA** - This combination is for the student most interested in a graduate business degree but who wants further information systems skills and knowledge. Thus, in addition to the MS degrees noted above, pursuing the Graduate Certificate in Information Systems in combination with the MBA is another popular option.

### **Spatial and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## **Innovation Engineering (Certificate)**

The Graduate Certificate in Innovation Engineering gives students a complete array of tools and a systematic approach to creating, communicating and commercializing ideas in response to problems and opportunities in any field; they also learn how to lead the process of innovating within organizations-businesses, nonprofits, governments, educational institutions, arts organizations, etc. Graduate students in any field will benefit from having a Graduate Certificate in Innovation Engineering noted on their transcripts, in particular when they want to communicate their credentials to future employers.

Graduate students matriculated in any field may take the graduate coursework in Innovation Engineering; these students should notify the Director of Academic Programs in Innovation Engineering of their intention to complete the Certificate, and apply through the Graduate School.

Graduate non-degree students (students who have earned a Bachelor's degree or its equivalent) may apply for admission to the Graduate Certificate in Innovation Engineering with demonstrated depth of experience or expertise towards implementing projects in a specific area; to apply, send cover letter and resume to the Director of Academic Programs in Innovation Engineering, Foster Center for Student Innovation, University of Maine, Orono, ME 04469-5798, and submit the Graduate Certificate Application through the Graduate School.

### **Educational Objectives**

Students will be able to use Innovation Engineering tools and methods to create and realize innovative, meaningfully unique solutions to problems in their chosen fields.

Students will be able to communicate the benefits of their innovations to target audiences.

Students will be able to apply fundamental theories and methods to work with teams or client groups to solve problems

in any field.

### **Required Courses**

- INV 510 Innovation Engineering Accelerated
- INV 511 Experience: Innovation Engineering Case Study
- INV 590 Using Innovation: Proposal & Project

Graduate students earn the Graduate Certificate in Innovation Engineering by completing, in this order, INV 510, INV 511, and INV 590 with a grade of B- or better in each course. Students must complete the coursework for the certificate within a period of five years.

## **Instructional Design (Certificate)**

Instructional Design (Certificate)

Graduate Certificate in Instructional Design

*A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine*

The University of Maine Graduate Certificate in Instructional Design helps students become leaders in effective and innovative uses of current and emerging technology. The required coursework, research, and clinical experiences are designed for educators working in a variety of contexts. Students will engage in inquiry-based curriculum and build capacity to continually assess their local context; implement technology to enhance teaching, learning and assessment; build professional learning networks to support ongoing professional development; and, develop expertise in current and emerging instructional technologies. Essential to this program is a commitment to local community, advocacy for accessibility, and social justice, especially in the context of the potential for new technology to influence educational settings .

### **Required for the Certificate in Instructional Design**

1. EDT 540 Instructional Design and Project Management
2. EDT 541 Advanced Instructional Design
3. EDT 542 Supporting Technology Integration through Professional Development and Coaching
4. EDT 543 Practicum in Instructional Design

For more information: <https://online.umaine.edu/contact-us/> or [umaineonline@maine.edu](mailto:umaineonline@maine.edu)

Students in this program will learn how to:

- Demonstrate mastery of instructional design concepts, theories, and principles
- Utilize relevant concepts, theories, and practices of instructional design to assess instructional design in varied contexts

- Design and build original instructional content and services informed by instructional design concepts, theories, and principles
- Develop project management, coaching, and mentoring skills to support independent and collaborative work
- Demonstrate mastery of evidence-based and audience-specific approaches to instruction

## Instructional Technology

Instructional Technology

*A collaborative degree between the University of Maine, the University of Maine Farmington, and the University of Southern Maine.*

### Master of Education in Instructional Technology

The University of Maine Master's program in Instructional Technology is a 33-credit fully online degree. It is designed to help students become leaders in effective and innovative uses of current and emerging technology. The required coursework, research, and clinical experiences are designed for educators working in a variety of contexts. Students will engage in inquiry-based curriculum and build capacity to continually assess their local context; implement technology to enhance teaching, learning and assessment; build professional learning networks to support ongoing professional development; and develop expertise in current and emerging instructional technologies. Essential to this program is a commitment to local community, advocacy for accessibility, and social justice, especially in the context of the potential for new technology to influence local educational settings.

The Masters in Instructional Technology is designed to investigate the following central questions:

**Learning Environments:** How do educators leverage technology to create environments that support the development of diverse skills, and emphasize challenging learning experiences?

**Teaching and Learning:** How can technology enhance teaching and learning partnerships that support and promote innovative models of deeper learning?

**Digital Citizenship:** How can educators promote an understanding of the social, ethical and legal issues and responsibilities related to a globally connected society?

**Professional Practice:** How can educators develop and model pedagogical and andragogical principles of learning to promote professional growth and practice in a globally connected society?

**Leadership:** How can educators align vision, implementation, and practice to foster learning enhanced by technology?

Core Courses (21 credits)

EDT 520 Digital Age Teaching and Learning Methods

EDT 531 Studio in Computing for Learning

EDT 540 Instructional Design and Project Management

EHD 510 Introduction to Educational Research

Technology for All Learners (speak with advisor for options)

EDT 559 Leadership for Educational Technology

Capstone

EDT 543 Practicum in Instructional Design

EDT 657 Educational Practicum

EDT 693 Educational Internship

Electives (12 credits of approved electives)

In accordance with the Graduate School, with approval students may transfer up to six graduate-level credits taken within the last five years prior to matriculation. For more details on transfer credits, please refer to the Graduate School General Policy on transfer credits.

Requirements for Admission:

Online application

Official academic transcripts

Résumé detailing your professional experience

An essay describing your motivation for obtaining an M.Ed. in Instructional Technology

Educational Specialist in Instructional Technology

The University of Maine, in collaboration with the University of Southern Maine and the University of Maine at Farmington is pleased to announce a new, 100% online Education Specialist degree in the field of Instructional Technology. This is an advanced degree for students to build upon work during a masters and to enhance their leadership skills and knowledge. Students must have completed a master's degree, in education or a related field, to be accepted to this program.

The Education Specialist (Ed.S.) in Instructional Technology will require a minimum of 30 credit hours to complete. The exact course of study will be planned in careful consultation with an academic advisor. We look forward to working with you as you define your new direction and grow as a professional and leader in the field of instructional technology.

A minimum of 30 semester hours past a master's degree is required to earn the Ed.S. Coursework is taken at the 500/600 level. A minimum of 18 credits must be from the Instructional Technology program; a maximum of 12 credits may be from outside the program with permission of the academic advisor. Students also are required to complete a capstone experience, such as an action research project or internship. All work for the Ed.S. must be completed within a six-year period.

Requirements for Admission:

Online application

Official transcript for earned bachelor's degree

Official transcript for earned master's degree

Graduate GPA of 3.25 or above

A 500-700 word statement describing the educational challenges you have encountered in your work, and how you think the Ed.S. program might help you overcome those challenges and lead to a desired goal. You are encouraged to

review the available course listings and mention a few specific courses from the instructional technology program, or other graduate areas, that would be relevant to your goals.

One letter of recommendation from a current administrator

For more information: <https://online.umaine.edu/contact-us/> or [umaineonline@maine.edu](mailto:umaineonline@maine.edu)

## **Interdisciplinary Disability Studies Certificate**

The University of Maine Center for Community Inclusion and Disability Studies (CCIDS) is now offering a 3- course asynchronous online Graduate Certificate in Interdisciplinary Disability Studies <http://ccids.umaine.edu/interedu/graduate-certificate/>. The three online Graduate Certificate in Interdisciplinary Disability Studies provides individuals from a variety of disciplines and professional backgrounds specialized knowledge in disability theory, policy, and research. This program can lead to valuable knowledge and credentials for those currently working or desiring to work with disability as an element of human diversity such as the design of accessible environments and products, disability and human rights policy, or fashion for those who navigate using wheeled mobility.

The program is open to students who have obtained a baccalaureate degree, including those who seek only the certificate; students who want to study in one or more of the courses without seeking the certificate; and students currently matriculated in masters and doctoral programs.

## **Interdisciplinary Program**

The Interdisciplinary Ph.D. (IPhD) program allows well-qualified graduate students the opportunity to pursue study in multidisciplinary areas of inquiry where expert faculty are available to guide doctoral research.

For such a program to be feasible, there must be at least one member of the Graduate Faculty who is a specialist in the area of the student's interest, and three additional Graduate Faculty members (in at least two departments) who are prepared to supervise the proposed research. The fifth member of the committee is usually an outside scholar. The chairperson and the majority of advisory committee members must have experience in supervision and direction of doctoral students and have a strong record of research and scholarly activity. Students will not be able to gain admission to the IPhD program unless they can demonstrate evidence of an interdisciplinary research focus and a suitable dissertation advisory committee to the IPhD policy and admissions committee.

## **General Eligibility and Admission Criteria**

- A master's degree (or equivalent) in a discipline related to the proposed area of study.
- Submission of a detailed program of study and a prospectus discussing the proposed research focus. The student's program of study must identify and be endorsed by the UM Graduate Faculty who have agreed to supervise the coursework and the dissertation.
- All other materials required by the Graduate School for students applying to doctoral programs.



While this program may be individually planned, it is not a program that is conducted independently of the UM campus, nor by distance education. The majority of coursework is taken through the University of Maine, and except for the admission procedures, the policies and regulations governing the Interdisciplinary Ph.D. are the same as those for other Ph.D. programs.

Graduate assistantships for this program are usually limited to advisors' current grants or to competitive selection for a Graduate School assistantship or fellowship, see Financial Information section of this catalog. In some instances, departments have funded teaching assistantships for Interdisciplinary Ph.D. students.

Before submitting the application, arrangements must be made to meet with a representative of the Graduate School office to explore academic and professional goals and to assess the University's capabilities to offer graduate coursework in the student's proposed area. The IPhD admission guidelines, <https://umaine.edu/graduate/resource/interdisciplinary-phd-guidelines/> will also be reviewed at this meeting.

Application materials include a description of the applicant's goals and objectives, program of study, research prospectus, vitae of the proposed advisory committee, and supporting academic credentials (e.g. transcripts, letters of recommendation). Application deadlines are November 1 for spring admission and April 1 for summer or fall admission.

Some interdisciplinary faculty groups at the University of Maine have established formal concentrations within the Interdisciplinary program. Those are noted elsewhere in this catalog. In these interdisciplinary concentrations, applications are reviewed by the program admissions committees after receipt by the Graduate School.

## Interdisciplinary Studies

The Master of Arts in Interdisciplinary Studies (MAIS) program offers mature students with appropriate academic qualifications (minimum 3.0 undergraduate GPA) the opportunity for interdisciplinary graduate work. Students who enter the program may pursue their study on a full-time or part-time basis.

The program is based on the assumption that technical competence and specialized training are best employed in combination with knowledge traditionally fostered by the liberal arts and sciences. Through core seminars, an individualized program of study, and the completion of a master's project, students may explore major issues and synthesize knowledge from several disciplines.

Similar programs have attracted professionals who feel they need further study to investigate complex issues connected with their work or interests. Some teachers and librarians find such a course of study an alternative to graduate work in education or in another single discipline. Others see the program as an improvement over a self-directed study of reading or participation in a series of unrelated courses beyond the baccalaureate degree. By emphasizing the integration of knowledge in different disciplines, the program offers a unique alternative to traditional graduate study.

Prior to making application to the Interdisciplinary Studies program, students must contact the Graduate School to arrange an interview to discuss interests and academic goals. Applicants to the Maine Studies and Peace Studies concentrations may contact the coordinator of that concentration in lieu of the Graduate School.

After the interview, applicants whose academic goals are consistent with the mission of the program must ensure that the Graduate School receives the following materials:

1. An e-mail to [graduate@maine.edu](mailto:graduate@maine.edu) from a faculty member at the University of Maine who has agreed to serve as the primary advisor.

2. Two letters of recommendation. Students are strongly encouraged to use the online letter of recommendation feature within the online application or have recommenders send an electronic copy to [graduate@maine.edu](mailto:graduate@maine.edu).
3. Official college/university transcripts from all institutions attended.
4. Application for graduate degree. The online application feature allows applicants to include an essay which presents student's life experiences as well as objectives and reasons for applying to the program.
5. Online application fee of \$65.00.

Admission is contingent upon the positive vote of the majority of the members of the Admissions Review Committee. General application deadlines are the first Monday in November for the Spring semester and the first Monday in April for the Fall or Summer terms. Completed applications for the concentrations in Maine Studies or Peace Studies may be considered up to six weeks before the beginning of the term of admission.

## Degree Requirements:

Students in the program must complete:

- 6 to 9 semester hours of interdisciplinary core seminar (IDS 500) credit or interdisciplinary 500-/600-level courses as deemed appropriate by the advisor
- 15 to 21 semester hours of additional graduate level credit approved by the student's advisory committee to meet the individual student's academic interests
- 3 to 6 semester hours of Master's Project (IDS 699) credit developed from the student's coursework and research

Of the minimum 30 semester hours total credit required, at least 15 hours, not including the credit for the master's project, must be in 500- and/or 600-level courses.

In addition to the self designed option, formal concentrations within the Interdisciplinary Studies program are available in Disability Studies, New Media, Maine Studies, and Peace and Reconciliation Studies. The Maine Studies and Peace Studies concentrations may be completed via distance education with careful planning and close advising from the coordinators of the concentrations.

Further information on the Interdisciplinary Studies M.A. program and the coordinator contact information for individual concentrations is available from the Graduate School. (<http://www.umaine.edu/graduate/mais>)

## Intermedia (Studio)

The MFA in Intermedia is an interdisciplinary, studio-centered program committed to hybrid creative research, experimental technological production, as well as development and production in forms of art such as time-based media, digital and video art, installation, performance art, artists' books and multiples, community-based social art practices, conceptual art, net art, and other forms that the students may generate from their own Intermedial explorations. These newer forms are however, not without grounding in, or connections to, traditional art forms in the visual arts, music, writing, performance studies, and media studies.

The MFA focuses on the intersection of new technologies and creative production. The name of the program "Intermedia" reflects our aim and intent - that is to work with and study creative processes that fall conceptually and physically between known/used media, as well as between traditional disciplines such as photography and computer science, biology and sculpture, or music and sociology. Students will develop diverse skills grounded in methodologies from many disciplines that foster the experimental, analytic, and speculative processes necessary for innovative production and creative thinking in Intermedia.

## Program Requirements

The three-year IMFA degree in Intermedia at the University of Maine provides graduate students with the opportunity to engage in innovative, creative and theoretical work in a flexible program that encourages individual research and development within an interdisciplinary context. The 60-credit curriculum is designed for 18 credits per year with 6 credits in summer of the third year for Thesis Exhibition preparation and presentation, but it may also be completed on a part time basis over a longer period of time.

## Financial Aid

In addition to University fellowships and scholarships listed elsewhere in this catalog, the Intermedia Program offers graduate assistantships to qualified students. Graduate assistantships can take the form of either a RA or TA position. RA positions include working independently or with faculty, in a variety of research and program support roles dependent on the student's background and skills. TA positions are offered in conjunction with undergraduate New Media classes and thus require specific media and/or programming knowledge. Teaching assistants are carefully supervised and develop instructional skills that prove useful in later professional careers. Assistantships are nine-month appointments that include tuition waiver and/or monthly stipends. Applicants interested in an assistantship should indicate this in their initial application for admission and contact the Intermedia Program for information on specific available assistantships.

## Course of Study

Given the nature of Intermedia as a non-disciplinary specific, research-based activity it is central that the program be simultaneously structured but flexible to allow for varieties of student choices and areas of study. The standard conceptual and structural elements of the program consist of the following areas or categories:

- Basic creative approaches, history and theory
- Ongoing individualized research and creative production
- Praxis production and research studio work
- Individualized technical and theoretical areas
- Field experience/study abroad experience

## Contact Information:

Dr. Susan L Smith, Director, [susan.lynn.smith@maine.edu](mailto:susan.lynn.smith@maine.edu)

207.581.4470

### Area One

This area consists of two foundational classes:

- IMD 500 - Creative Concept Development Credits: 3
- IMD 501 - Histories and Theories of Intermedia Credits: 3

These two classes will be required of all first year MFA students and will give them strong foundations in diverse approaches to creative and research work as well as historical and theoretical foundations in Intermedia.

## Area Two

Ongoing individualized research and creative production will be facilitated through Intermedia Studio Critique classes:

- IMD 570 - Intermedia Studio Critique I Credits: 3
  - IMD 571 - Intermedia Studio Critique II Credits: 3
- In these classes students will gain practical experience in conceptualization of work, design implementation, physical production, and presentation of research/creative work.

## Area Three

Praxis production and research studio work consists of three primary areas taken in three different classes (one taken each year).

- IMD 560 - Research Studio I: Critical Research Methods for Creative Production Credits: 3
- IMD 561 - Research Studio II: Projects in Collaborative Production Credits: 3
- IMD 562 - Research Studio III: Professional Development and Large-scale Practices Credits: 3

## Area Four

Individualized technical and theoretical areas are explored through elective offerings each semester. Every full-time student will take one elective course related to his or her interests and foci each semester. These can be drawn from IMD 520, IMD 530 and IMD 540 topical courses or graduate level courses from across the campus as they relate to individual IMFA student's areas of research and work.

## Area Five

Field or Study Abroad Experiences are expected of all IMFA students. As part of the Intermedia Program students are expected to take at least one field study course (but may take up to three such courses) that adds to their interdisciplinary study in the IMFA Program. This can include study in another subject area, a residency, or an apprenticeship. Students can also choose to take one semester (usually the first semester of the third year) to study or work abroad to meet this requirement.

## Applications

Applications are accepted once a year. The priority deadline is February 15th (for consideration for RA/TA Awards) of the year in which you wish to start your graduate studies, but rolling acceptance continues through June until all open positions are filled. Applicants must complete an application to the Graduate School as well as send a CV, portfolio and letters of reference to the Intermedia Program.

## Correspondence

### The Graduate School

5775 Stodder Hall Room 42  
University of Maine  
Orono, ME 04469-5775  
207-581-3291  
graduate@maine.edu

### Intermedia Program

101	IMRC	Center,	Stewart	Commons
University		of		Maine
Orono,		ME		04469-5785
207-581-4390				
Vfiggins@maine.edu				
207-581-4389				
ofsmith@maine.edu				

## Kinesiology and Physical Education

A general, science-based curriculum provides the foundation for this 30 credit hour Graduate program. However, the curriculum is designed with 6-9 credit hours of electives, allowing the student to focus on his/her specific academic interest within the field. Classroom and laboratory experiences are designed to provide the student with an applied understanding of the scientific basis of exercise/training in different populations.

The program offers two paths towards a Master's degree. Each includes a minimum of 30 credit hours.

**M.Ed.:** (non-thesis) Admission to this track requires scores from either the Miller Analogies Test (MAT) or the Graduate Record Examination (GRE).

**M.S.:** The M.S. requires carrying out an original piece of research resulting in a written thesis. Admission to this track requires scores from the GRE.

## Library and Media Specialist (Certificate)

*A collaborative certificate between the University of Maine, the University of Maine Farmington, and the University of Southern Maine*

The **Graduate Certificate in Library and Media Specialist** is a 100% online program preparing teachers, educational leaders, and resource specialists to facilitate and advocate for equitable access to information for all students. Aligning to the current standards for school librarianship by the American Library Association and the American Association for School Librarians, this program develops the knowledge and skills to manage school library and information services. Students in this program also learn how to:

- Become an effective educator of learning in the digital age including instruction, assessment, and curriculum development
- Demonstrate efficient and ethical information-seeking behavior and teach this behavior to students
- Apply theories of Library Information Science to school libraries including teaching, management, and leadership
- Strategically plan, facilitate and advocate for flexible, open access to library resources and services
- Be an ethical, forward-thinking leader in the field of education and in school libraries

**Required for the Certificate in Classroom Technology Integration**

- EDT 515: Dynamic PK-12 Library Management
- EDT 516: Reference and Research for Digital Age Teaching, Learning and Libraries
- EDT 520: Digital Age Teaching and Learning Methods
- EDT 531: Studio for Computing in Learning
- EDT 561: Technology-Supported Inquiry-Based Teaching and Learning

For more information: <https://online.umaine.edu/online-graduate-certificate-in-library-and-media-specialist/>

<https://online.umaine.edu/contact-us/> or [umaineonline@maine.edu](mailto:umaineonline@maine.edu)

## Literacy Education

Literacy Education

LITERACY EDUCATION PROGRAMS (M.S., M.Ed., Ed.S., Ph.D.)

The Master of Education, Educational Specialist, and Doctor of Philosophy programs in the Literacy, Language and Culture Program provide practicing teachers and advanced professionals in literacy and related areas with the opportunity to explore current issues of literacy research and instruction with nationally and internationally recognized faculty in an atmosphere that encourages discussions and inquiry. While Maine is a national leader in many measures of literacy achievement in schools, changing global needs require continual examination and implementation of best literacy practices. Coursework, with faculty who have extensive experience with schools and public school students, balances theoretical and practical issues to inform and change literacy practices. Because all literacy courses require on-going practical classroom experiences, applicants seeking admission to graduate courses and programs in literacy should normally have a minimum of two years of successful teaching experience.

Application for admission is conducted online through the Graduate School and requires three letters of recommendation, a statement of intent, Miller's Analogy Test scores for Master's students (waived for students whose

undergraduate GPA was 3.0 or higher), and GRE scores for Ph.D. students, transcripts from all previous institutions and the application fee.

Interested applicants are encouraged to contact a faculty member in the Literacy, Language and Culture Program prior to application to address any questions and for assistance in selecting the most appropriate program for the applicant's goals. Master's programs in literacy are sometimes offered to cohorts in various sites around the state.

#### Master's Programs in Literacy

##### **M.Ed. in Literacy Education (33 credits)**

The M.Ed. in Literacy Education program is designed to further elementary and secondary teachers' knowledge of literacy theories, practices, and research. Applicants should normally hold certification in either elementary or secondary education and have a minimum of two years of successful teaching experience. *The M.Ed. in Literacy Education does not lead to Maine certification.* The M.Ed. in Literacy Education program has a required core of 15 hours of coursework. To fulfill elective requirements, students consult with their advisor to identify appropriate courses.

Courses in the M.Ed. in Literacy Education program are divided into three phases: Phase 1 courses, Phase 2 courses, and Elective courses. Students must complete all Phase 1 courses before taking Phase 2 courses.

##### **Required Core Courses**

###### *Phase 1 Courses (18 credits):*

EHD 510 Introduction to Educational Research (3 credits)  
ERL 517 Literature for Children or ERL 518 Literature for Young Adults (3 credits)  
ERL 534 Literacy and Language Development (3 credits)  
ERL 540 Writing in Schools and Colleges (3 credits)  
EEL 561 Literacy Processing I (3 credits)  
EEL 562 Literacy Processing II (3 credits)

###### *Phase 2 Courses (9 credits)*

ERL 552 Seminar in Teacher Research (3 credits)  
ERL 553 Literacy Assessment (3 credits)  
ERL 601 Seminar in Reading (3 credits)

###### *Elective*

###### *Courses (6 credits)*

The elective courses may come from any college or university program with the approval of the student's advisor.

Contact: Dr. Susan Bennett-Armistead ([susan.bennett-armistead@maine.edu](mailto:susan.bennett-armistead@maine.edu))

The M.Ed. program in Literacy Education also offers the following concentrations: Literacy Specialist, and Individualized.

### **M.Ed. in Literacy Education (Literacy Specialist Concentration) (39 credits)**

The M.Ed. in Literacy Education (Literacy Specialist Concentration) leads to Maine certification as a Literacy Specialist, K-12. Applicants must hold certification in either elementary or secondary education and have two years of successful teaching experience. The program is designed to reflect the International Reading Association's 2010 Standards for Reading Specialist/Literacy Coach competencies in the areas of literacy acquisition, assessment, individual learner and program evaluation and development, and literacy leadership. The program is rigorous and tightly scheduled, with few choices. As such, applicants are encouraged to speak with an advisor early in the process to prepare a course plan.

Courses in the M.Ed. in Literacy Education (Literacy Specialist Concentration) program are divided into three phases: Phase 1 courses, Phase 2 courses, and an elective course. Students must complete all Phase 1 courses before taking Phase 2 courses. Literacy Specialist Program Requirements include:

#### **Phase 1 Courses (18 credits)**

EHD 510 Introduction to Educational Research (3 credits)  
ERL 517 Literature for Children or ERL 518 Literature for Young Adults (3 credits)  
ERL 534 Language and Literacy (3 credits)  
ERL 540 Writing in Schools and Colleges (3 credits)  
EEL 561 Literacy Processing I (3 credits)  
EEL 562 Literacy Processing II (3 credits)

#### **Phase 2 Courses (18 credits)**

ERL 537 Literacy Across the Curriculum (3 credits)  
ERL 553 Literacy Assessment (3 credits)  
ERL 569 Clinical Practices (6 credits)  
EEL 652 Intervention Designs for Struggling Learners I (3 credits)  
EEL 653 Intervention Designs for Struggling Learners II (3 credits)

#### *Elective Course (3 credits)*

The elective course may come from any college or university program with the approval of the student's advisor.

Contact: Dr. Susan Bennett-Armistead ([susan.bennett-armistead@maine.edu](mailto:susan.bennett-armistead@maine.edu))

### **Individualized Concentration in Literacy, Language and Culture (33 credits) *Temporarily suspended***

The individualized concentration in the M.Ed. in Literacy Education offers students the opportunity to focus on Writing and the Teaching of Writing as a low-residence option. The course of study is planned in consultation with a faculty advisor and includes online academic year courses and on-campus summer options. The program also includes an online practicum guided by a writing mentor.

**Program requirements for the Individualized Concentration in Literacy, Language and Culture M.Ed. include:**



ERL 540 Writing Schools & Colleges (3 credits)  
ERL 544 Digital Writing in Classrooms (3 credits)  
ERL 545 Introduction to the National Writing Project (3 credits)  
ERL 570 Designing Online Learning Experiences (3 credits)  
ERL 590 Special Topics in English Language Arts: Seminar in Fiction (2) (3 credits each; 6 credits)  
ERL 590 Special Topics in English Language Arts: Seminar in Crafting Story (3 credits)  
or  
ERL 590 Special Topics in English Language Arts: Seminar in Memoir (3 credits)  
EHD 657 Writing Practicum (2) (3 credits each; 6 credits)  
ERL 547 National Writing Project Seminar in Mentoring (3 credits)

*Elective Course (3 credits)*

The elective course may come from any college or university program with the approval of the student's advisor.

Contact: Dr. Susan Bennett-Armistead ([susan.bennett-armistead@maine.edu](mailto:susan.bennett-armistead@maine.edu))

See [MaineWritingProject.org](http://MaineWritingProject.org)

Ed.S. in Literacy

**The Education Specialist Program in Literacy Education (30 credits)**

The College of Education and Human Development's Education Specialist programs provide students with a cohesive program of professional development beyond the master's level. The program of study is individually planned by the student and their advisor. A minimum of 30 semester hours of work beyond the masters level is required to earn the Ed.S. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. A master's degree in Literacy Education or a closely related field is required for admission to the program.

**Ph.D. Program in Literacy Education**

The Ph.D. program in Literacy Education is designed for individuals exhibiting leadership in literacy, such as curriculum development, teacher research, publishing, professional presentations, and theoretical research. It prepares candidates for academic positions in universities, positions in administration and supervision of literacy programs at the local, state and federal levels, textbook and other kinds of publishing endeavors, and employment in various departments of government. Each candidate's program is individually developed based on the student's background, goals and objectives, and the requirements of the degree. A primary function of the Ph.D. program is to develop competency in diverse educational research strategies as a significant means of advancing knowledge. Applicants must interview with the faculty in the Literacy, Language, and Culture Program, and must provide evidence of successful teaching experience, a record of professional leadership and responsibilities, and samples of professional writing. Application information is available from the Graduate School. For additional information about the program, please contact Dr. Susan Bennett-Armistead ([susan.bennett-armistead@maine.edu](mailto:susan.bennett-armistead@maine.edu)).

**Program of Study for the Ph.D. in Literacy Education**

The Ph.D. program consists of five components: required coursework, coursework in research methodologies, foundational coursework, elective coursework, practica experiences, and the dissertation. Specifically:

1. Literacy Coursework (minimum 15 credit hours). At least four seminars must be completed at C.A.S./doctoral level. It is normally assumed the student is a recent graduate of a literacy master's degree program. For students with different backgrounds, a core of at least 15 credits of prerequisite literacy master's degree coursework may be required.
2. Research Methods (minimum 15 credit hours). Students are required to complete a minimum of 15 hours selected from courses in consultation with their doctoral program committee. Courses might include EHD 571 (Qualitative Research: Theory, Design, and Practice), EHD 572 (Advanced Qualitative Research), EHD 573 (Statistical Methods in Education I), and EHD 574 (Statistical Methods in Education II).
3. Foundations coursework (minimum 12 credit hours) Students are required to take four courses in foundations of education, from EHD 621 (Educational Psychology), EHD 660 (History of American Education), EHD 661 (Sociology of Education), EHD 663 (Comparative and International Education), EHD 664 (Philosophy of Education).
4. Elective Coursework (minimum 12 credit hours typically outside of the Literacy, Language, and Culture Program area).
5. Practica Coursework. Students must complete either EHD 657 (Educational Practicum) or EHD 690 (Methods of College Teaching).
6. Dissertation Research (minimum 6 credits of EHD 699 (Graduate Thesis).

Special Programs in Literacy

### **Reading Recovery® and Comprehensive Literacy Interventions**

(For further information, call the University Training Center for Reading Recovery and Comprehensive Literacy (207) 581-2493.)

The College of Education and Human Development is a nationally-affiliated Reading Recovery Training Center, providing initial training and ongoing professional development for teacher leaders and teachers, as well as ongoing support for implementation at affiliated Reading Recovery sites. Interested applicants must have the involvement of the superintendent and school board in order to apply for Teacher Leader or Teacher Training. Reading Recovery coursework may be applied to graduate programs if approved by one's faculty advisor.

Courses for Reading Recovery teacher training consist of 2 courses spanning a school year:

EEL 598 Reading Recovery Teacher Training I (3 credits)  
EEL 599 Reading Recovery Teacher Training II (3 credits)

Courses for Literacy Lessons™ teacher training (Special Education and ELL) consist of 2 courses spanning a school year:

EEL 596 Literacy Lessons™ Teacher Training I (3 credits)  
EEL 597 Literacy Lessons™ Teacher Training II (3 credits)

Teacher Leader training requires a year-long training of 24 graduate credits, including:

EEL 655 Seminar: Issues Related to Reading Recovery Theory and Practice (3 credits)  
EEL 656 Seminar: Issues Related to Reading Recovery Theory and Practice (3 credits)

EEL 657 Reading Recovery Internship I (3 credits)  
EEL 658 Reading Recovery Internship II (3 credits)  
EEL 659 Reading Recovery Practicum I (3 credits)  
EEL 660 Reading Recovery Practicum II (3 credits)  
and additional coursework in literacy interventions.

The Reading Recovery Training Center also provides initial training and support for a portfolio of literacy interventions for teachers of grades PreK-12 in instructional Tiers I to IV of a comprehensive literacy model.

Courses offered on campus or in affiliated Reading Recovery sites include:

EEL 561 Literacy Processing: Exploring How Students Learn to Read and Write I (3 credits)  
EEL 562 Literacy Processing: Exploring How Students Learn to Read and Write II (3 credits)  
EEL 563 Literacy Processing in Middle and High School Settings I (3 credits)  
EEL 564 Literacy Processing in Middle and High School Settings II (3 credits)  
EEL 565 Small Group Interventions for Middle and High School Students I (3 credits)  
EEL 566 Small Group Interventions for Middle and High School Students II (3 credits)  
EEL 596 Literacy Lessons™ Teacher Training (3 credits)  
EEL 646 Dyslexia Studies Within a Literacy Processing Framework I (3 credits)  
EEL 647 Dyslexia Studies Within a Literacy Processing Framework II (3 credits)  
EEL 652 Intervention Designs for Struggling Learners I (3 credits)  
EEL 653 Intervention Designs for Struggling Learners II (3 credits)

For further information, go to <https://umaine.edu/maineliteracy>.

### **Maine Literacy Partnerships in Comprehensive Literacy (MPCL)**

Maine Partnerships in Comprehensive Literacy (MPCL) at the University of Maine (UMaine) is a PreK to grade 12 Tier I continuous school improvement model. The model is dedicated to increasing the academic achievement of all students through on-going professional development for educators. Literacy achievement is the tool used for measuring school improvement in four related areas: student learning, teacher perceptions, school climate, and school processes. MPCL affiliated schools establish a partnership with the University Training Center (UTC) at UMaine to creating a system for successful literacy education. This commitment includes the:

Training and support of a literacy coach within the school.  
Collection of data to monitor the progress of every student.  
Provision of safety nets for at-risk students.  
Development of a school leadership team.  
Establishment of a long-term professional development plan that includes every teacher.

Interested MPCL coach applicants must have a Master's degree and secure the approval of the building principal and district superintendent. MPCL coach coursework requires a yearlong, 9 credit course of study provided by the MPCL Trainer, including EEL 580/581 Theoretical Perspectives within MPCL Coaching I and II, and EEL 582/583 Clinical Practices in MPCL Coaching I & II. A subsequent coaching class, EEL 585 Reflective Practice in MPCL Coaching is offered on a regular basis.

The MPCL coach provides on-going professional development for teachers at the school site, while the school team oversees and monitors the learning of all students. University of Maine graduate courses are taught at the school level by the MPCL coach. These courses include EEL 543/544 Literacy Teaching and Learning I and II; EEL 552 An Exploration of Writers Workshop in PreK-12 Classrooms; EEL 554 An Exploration of Readers Workshop in PreK-12 Classrooms; EEL 556 An Exploration of Language Workshop in PreK-12 Classrooms.

The school and coach maintain a partnership with the MPCL Trainer for on-going professional development and implementation support. For further information, go to <https://umaine.edu/maineliteracy>.

#### National Writing Project

The Maine Writing Project is one of 200 sites of the National Writing Project, a network of K-college educators dedicated to the improvement of the teaching of writing and learning in America's schools. The annual institute of the Maine Writing Project is a six- credit course sequence focusing on current theory, research, and effective practices (ERL 545/ERL 456). Participants engage in developing and sharing effective teaching practices by crafting their own creative and expository writing, and by creating a workshop presentation in an area of their expertise. Participants earn six credits that fit most College of Education and Human Development programs of graduate study. At the completion of the institute, participants become Teacher-Consultants in the National Writing Project. They are eligible to further their study with 547 (Seminar in Mentoring ERL 548 (Advanced Institute in Teacher Leadership

Contact: Dr. Susan Bennett-Armistead ([susan.bennett-armistead@maine.edu](mailto:susan.bennett-armistead@maine.edu))

See [MaineWritingProject.org](http://MaineWritingProject.org)

## **Maine Arts and Humanities in Medicine (Certificate)**

The Arts and Humanities in Medicine Certificate program is designed around a fellowship year where the physician or provider works at Northern Light/EMMC under the auspices of the Graduate Medical Education Committee while enrolled in the Program at the University of Maine. Art and Design can build creative bridges and new lines of communication between the external clinical experience and the internal turmoil within the patient. It can help shape their entire medical health experience by engaging multiple perspectives and senses, assisting the participant as they process complex layers of information and emotion.

Medical schools and medical education programs have begun to develop new approaches to cultivate interdisciplinary collaboration, both with the medical humanities and the arts, supporting creative approaches to health-related problems as well as providing the arts with a medical perspective that allows for bi-directional growth of both fields. Programs, journals, websites, and databases are dedicated to this form of interdisciplinary collaboration; however, many focus on literature that examines the intersection of various arts and medicine. Few focus on developing art and science-based projects that create new perspectives on medicine for and with the medical practitioner, where they collaboratively evolve a deeper understanding of both canons.

For more information, please contact the Program Coordinator, Owen Smith. [ofsmith@maine.edu](mailto:ofsmith@maine.edu)

## **Marine Biology**

## **School of Marine Sciences**

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resources and coastal zone management. More than 30 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; physiology and biochemistry; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

SMS faculty provide leadership in research programs that encompass all the world's oceans, with emphasis on the Gulf of Maine. Faculty are headquartered at both the Orono campus of UM and its coastal marine laboratory, the Ira C. Darling Marine Center (see Research Resources), and the Gulf of Maine Research Institute. Further information about SMS is on the web at: [www.umaine.edu/marine](http://www.umaine.edu/marine). Further information about the Darling Marine Center is on the web at: <https://dmc.umaine.edu/>

The School of Marine Sciences offers the following graduate degrees:

- M.S. and Ph.D. degrees in Oceanography;
- M.S. and Ph.D. degrees in Marine Biology;
- M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources (*administered jointly with The School of Food and Agriculture*);
- M.S. degree in Marine Policy; and
- Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.
- P.S.M. (Professional Science Masters) degree in Marine Science.

The School of Marine Sciences offers core and advanced courses in all degree areas. Most specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

## Master of Science and Doctor of Philosophy in Marine Biology

The Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Marine Biology are designed to provide students with a broad knowledge base in marine biology. Areas of study include, but are not restricted to behavior, cell and molecular biology, comparative morphology, development and ecology, evolution, genetics, physiology, taxonomy/systematics. Marine Biology is a dynamic field, and our programs are flexibly designed to accommodate new discoveries and technologies.

M.S. and Ph.D. Programs in Marine Biology are research-oriented, leading to completion of a thesis. To succeed, students will be required to learn to

- a. formulate valid scientific questions
- b. design appropriate experiments to answer those questions
- c. develop the necessary technical skills to conduct the experiments
- d. examine and interpret the results of the experiments.
- e. apply results as appropriate.

Although some of the groundwork for this will be provided through formal course work, considerably more training will occur in less formal situations in which students work closely with one or more faculty members on focused topics. Marine Biology faculty of SMS provide expertise in an extensive range of phyletic groups of marine organisms from bacteria and viruses, through planktonic organisms, to marine algae, marine invertebrate and vertebrate animals. Their specialties encompass levels of biological organization from population biology, ecology and systematics, through physiology and biochemistry, to molecular biology.

## Program Requirements

To maintain maximum flexibility, the majority of courses comprising a student's Program of Study will be determined by the student in consultation with his/her major advisor and advisory committee.

- Basic knowledge of descriptive oceanography equivalent to SMS 302 or SMS 484. Coursework taken prior to admission must be approved by Graduate Program Coordinator.
- SMS 500 - Marine Biology Credits: 4
- SMS 691 - Marine Science Seminar Credits: 1
- One semester of graduate level statistics.
- Participation in SMS Graduate Student Symposium during each year of full-time study.

## Examples of existing elective courses include

- INT 510 - (BSC, SMS) Marine Invertebrate Zoology Credits: 5
- SMS 501 - Biological Oceanography Credits: 3
- SMS 531 - Coral Reefs Credits: 3
- SMS 562 - Fisheries Population Dynamics Credits: 3
- SMS 598 - Special Topics in Marine Science Credits: 1-3

## Graduate Faculty

**James Acheson**, Ph.D. (Rochester, 1970), Emeritus Professor. Area: Cultural Anthropology. (Marine Policy)

**Emmanuel Boss**, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

**Damian Brady**, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology)

**Susan Brawley**, Ph.D. (California, 1978), Professor. Area: Algal Physiology, Development and Ecology. (Marine Biology, Oceanography)

**Ian Bricknell**, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Aquaculture)

**Kristina Cammen**, Ph.D. (Duke University, 2014), Assistant Professor. Area: Marine mammal science, ecological and evolutionary genomics, ocean health, conservation biology. (Marine Biology)

**Fei Chai**, Ph.D. (Duke University, 1995), Professor. Area: Ecosystem Modeling; Tropical Oceanography. (Oceanography)

**Yong Chen**, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

**Laurie Connell**, Ph.D. (North Carolina, 1988), Associate Research Professor. Area: Molecular Ecology. (Marine Biology)

**Kevin Eckelbarger**, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

**William Ellis**, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

**Keith Evans**, Ph.D. (Iowa State University, 2011), Assistant Professor. Area: Economics, fishery management , applied econometrics, nonmarket valuation (Marine Policy)

**Walt Golet**, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology)

**Heather Hamlin**, Ph.D. (University of Florida, 2007) Associate Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)

**Nishad Jayasundara**, Ph.D. (Stanford University, 2012) Assistant Professor. Area: physiology and biochemistry (Marine Biology)

**Teresa Johnson**, Ph.D. (Rutgers University, 2007), Associate Professor. Area: Fisheries Management. (Marine Policy)

**Peter A. Jumars**, Ph.D. (Scripps Institution of Oceanography, 1974), Emeritus Professor. Area: Benthic Biological Oceanography, Organism-Environment Interactions at the Level of Individuals, Deposit Feeding. (Oceanography, Marine Biology)

**Lee Karp-Boss**, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

**Heather Leslie**, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor, and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Biology)

**Sara Lindsay**, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

**Lawrence M. Mayer**, Ph.D. (Dartmouth, 1976), Professor. Area: Marine Biogeochemistry. (Oceanography)

**James D. McCleave**, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)

**Mary Jane Perry**, Ph.D. (Scripps Institution of Oceanography/California, San Diego, 1974), Emerita Professor. Area: Phytoplankton Physiology and Ecology, Primary Productivity, Bio-optics. (Oceanography, Marine Biology)

**Neal R. Pettigrew**, Ph.D. (Woods Hole Oceanographic Institution/M.I.T., 1981), Professor. Area: Near-shore, Estuarine and Continental Shelf Circulation. (Ocean-ography)

**Paul Rawson**, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)

**Jeremy Rich**, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)

**Warren Riess**, Ph.D. (New Hampshire, 1987), Associate Research Professor. Area: History; Underwater Archeology. (Marine Policy)

**Jeffrey A. Runge**, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

**Malcolm Shick**, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1982), Professor. Area: Benthic Marine Ecology, Lobsters, and Plant-Herbivore Interactions. (Oceanography, Marine Policy, and Marine Biology)

**Joshua Stoll**, Ph.D. (University of Maine, 2016), Assistant Professor. Area: ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

**Andrew Thomas**, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

**David W. Townsend**, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)

**Robert L. Vadas**, Ph.D. (Washington, 1968), Professor. Area: Marine Ecology, Algal Ecology. (Marine Biology, Aquaculture)

**Rebecca Van Beneden**, Ph.D. (Johns Hopkins, 1983), Professor and Director of School of Marine Sciences. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

**Rhian Waller**, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Marine invertebrate zoology, benthic oceanography, marine climate change (Oceanography)

**Les Watling**, Ph.D. (Delaware, 1974), Emeritus Professor. Area: Benthic Ecology. (Oceanography, Marine Biology, Aquaculture)

**Mark Wells**, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter.

**James Wilson**, Ph.D. (Wisconsin, 1971), Emeritus Professor. Area: Economics and Fisheries Management. (Marine Policy, Aquaculture)

**Huijie Xue**, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

**Gayle Zydlewski**, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology.

#### **Cooperating Faculty**

**Daniel F. Belknap**, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

**Nick Brown**, Ph.D. (Aquaculture Univ., Stirling, UK, 1998), Assistant Professor. Area: Aquaculture Technology

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Area: Molecular Environmental Toxicology.

**Carol Kim**, Ph.D. (Cornell, 1992), Associate Professor. Area: Zebrafish as a Model for Disease and Immune Function. (Marine Biology)

**Michael Kinnison**, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

**Paul Mayewski**, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

**Bryan Pearce**, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)



**Michael Peterson**, Ph.D. (Northwestern Univ., 1994), Professor. Area: Ultrasound, Instrumentation and Biomimetic Design. (Oceanography)

**John Singer**, Ph.D. (Georgia, 1983), Professor. Area: Marine Microbiology. Chair, Department of Biochemistry, Microbiology and Molecular Biology. (Aquaculture, Marine Biology)

**Seth Tyler**, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

### **Adjunct Faculty**

**Brian Beal**, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias

**Christopher Davis**, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.

**Lawrence Jacobson**, Ph.D. (University of Minnesota, 1986), Associate Professor. Fisheries Population Dynamics, Assessment Modeling and Management. National Marine Fisheries Service, Woods, Hole, Massachusetts

**Richard Langton**, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement. Buccoo Reef Trust

## **Marine Policy**

### **Marine Policy**

#### **School of Marine Sciences**

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resource and coastal zone management. More than 50 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

SMS faculty provide leadership in research programs that encompass all the world's oceans, with emphasis on the Gulf of Maine. Faculty are headquartered at the Orono campus of UM and its coastal marine laboratory, the Ira C. Darling Marine Center (see Research Resources), and the Gulf of Maine Research Institute. Further information on SMS is on the web at: [www.umaine.edu/marine](http://www.umaine.edu/marine). Further information on the Darling Marine Center is on the web at <https://dmc.umaine.edu/>

The School of Marine Sciences offers the following graduate degrees:

- M.S. and Ph.D. degrees in Oceanography;
- M.S. and Ph.D. degrees in Marine Biology;
- M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources (administered jointly with Food Science and Human Nutrition);
- M.S. degree in Marine Policy;
- P.S.M degree in Marine Sciences; and
- Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.

The School of Marine Sciences offers core and advanced courses in all degree areas. Specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

### **Master of Science in Marine Policy**

The Master of Science degree in Marine Policy in the School of Marine Sciences is designed to take advantage of the strong interdisciplinary nature of the School. All students in the program receive training in the human dimensions of marine resource management, marine sciences, and empirical methods. Students in the marine policy program may also be enrolled in the dual degree program. (see below).

The program offers both a thesis and a non-thesis option. Students selecting the thesis option will write a thesis that combines theoretical work and practical experience applied to pressing problems. Students selecting the non-thesis option will undertake an internship with a government agency or a non-governmental organization in the marine area directly concerned with management of marine resources and then write a final paper linking their internship experience with the theoretical and practical literature. Each student has an advisory committee of three faculty members, which must approve the thesis or internship plan and program of study.

### **Degree Requirements**

A total of 30 credit hours, consisting of at least 24 course credit hours and 6 credit hours for thesis/internship, are required to complete the M.S. in Marine Policy. Students are required to take SMS 691 - Marine Sciences Seminar (SMS 691) plus at least six credits of marine policy relevant courses and seventeen credit hours of elective coursework approved by the thesis committee. In order to complete the internship or thesis requirement, students will take at least six credits of either SMS 683 - Internship in Marine Policy Credits or SMS 699 - Graduate Thesis/Research Credits.

The program is designed to give students as much flexibility as possible so that they can take advantage of the various faculty specialties available to them within the School of Marine Sciences and elsewhere in the University. Students will usually take all of their courses at the University of Maine campus or the Darling Marine Center, but courses taken at the University of Maine School of Law or elsewhere may be credited toward the degree.

### **Examples of existing elective courses include:**

ANT 464 Ecological Anthropology (3 Credits)

ANT 521 Geographical Information Systems (3 credits)

ANT 550 Anthro. Dimensions of Enviro. Policy (3 Credits)

ECO 477 Economics and Environmental and Resource Management (3 credits)

ECO 581 Socio-ecological Systems Modeling (3 credits)

SMS 531 Coral Reefs (3 Credits)

SMS 544 Oceanography and Natural History of the Gulf of Maine (3 credits)

SMS 552 Coupled Natural and Human Systems Credits: 3

SMS 553 Institutions and the Management of Common Pool Resources Credits: 3

SMS 555 Resource management in Cross Cultural Perspective

SMS 562 Fisheries Population Dynamics Credits 3

SMS 563 Fisheries Policy and Management Credits 3

SMS 567 Knowledge and Participation in the Science Policy Process (Credits 3)

SMS 597 Independent Study (Variable Credits)

SMS 598 Special Topics (Variable Credits)

## Dual Master Degree in Marine Sciences and Policy

The School of Marine Sciences offers a unique, strongly interdisciplinary program in marine policy and science. It is intended for students interested in the application of science and policy in government agencies, non-government organizations or industry. The course of study is three years. It leads to two masters degrees: one in marine science (specializing in oceanography or marine biology) and one in marine policy.

Students are required to complete the requirements for a masters degree in one of the marine sciences (marine biology or oceanography) as well as the requirements for a marine policy degree. Six hours of each degree can be counted as electives for the other; a total of only 48 credit hours is required to complete both degrees (rather the 60 credit hours usually required for two masters). The course requirements for the science and policy degrees are listed above .

The dual degree offers three thesis/internship possibilities: a single thesis combining a joint science and policy topic; two independent thesis; or a thesis and an internship.

For more information, visit the School of Marine Sciences website at [www.marine.maine.edu](http://www.marine.maine.edu).

## Graduate Faculty

**James Acheson**, Ph.D. (Rochester, 1970), Emeritus Professor. Area: Cultural Anthropology. (Marine Policy)

**Emmanuel Boss**, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

**Damian Brady**, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology, Marine Policy)

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**Ian Bricknell**, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Marine Biology, Aquaculture)

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**Kevin Eckelbarger**, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

**William Ellis**, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

**Walt Golet**, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology, Marine Policy)

**Heather Hamlin**, Ph.D. (University of Florida, 2007) Assistant Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)

**Lewis Incze**, Ph.D. (University of Washington, 1983) Research Professor Emeritus. Area: Physiology and biochemistry (Marine Biology)

**Teresa Johnson**, Ph.D. (Rutgers University, 2007), Associate Professor. Area: Fisheries Management. (Marine Policy)

**Lee Karp-Boss**, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

**Heather Leslie**, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Policy, Marine Biology)

**Sara Lindsay**, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

**Lawrence M. Mayer**, Ph.D. (Dartmouth, 1976), Emeritus Professor. Area: Marine Biogeochemistry. (Oceanography)

**James D. McCleave**, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)

**Neal R. Pettigrew**, Ph.D. (Woods Hole Oceanographic Institution/M.I.T., 1981), Professor. Area: Near-shore, Estuarine and Continental Shelf Circulation. (Ocean-ography)

**Paul Rawson**, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)

**Jeremy Rich**, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)

**Jeffrey A. Runge**, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

**Malcolm Shick**, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1982), Professor. Area: Benthic Marine Ecology, Lobsters, and Plant-Herbivore Interactions. (Oceanography, Marine Policy, and Marine Biology)

**Joshua Stoll**, Ph.D.. (University of Maine, 2016), Assistant Professor. Area: Ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

**Andrew Thomas**, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

**David W. Townsend**, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)

**Robert L. Vadas**, Ph.D. (Washington, 1968), Professor. Area: Marine Ecology, Algal Ecology. (Marine Biology, Aquaculture)

**Rebecca Van Beneden**, Ph.D. (Johns Hopkins, 1983), Professor. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

**Rhian Waller**, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Area Marine invertebrate zoology, benthic oceanography, marine climate change (Oceanography)

**Les Watling**, Ph.D. (University of Delaware, 1974), Emeritus Professor. Area: Benthic Ecology. (Oceanography, Marine Biology, Aquaculture)

**Mark Wells**, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter. (Oceanography)

**James Wilson**, Ph.D. (Wisconsin, 1971), Emeritus Professor. Area: Economics and Fisheries Management. (Marine Policy)

**Huijie Xue**, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

**Gayle Zydlewski**, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology. (Marine Biology, Oceanography)

#### **Cooperating Faculty**

**Christine Beittl**, Ph.D. (), Associate Professor. Area: Anthropology and Human Ecology. Department of Anthropology. (Marine Policy).

**Daniel F. Belknap**, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

**Michael Kinnison**, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

**Paul Mayewski**, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

**Bryan Pearce**, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)

**Seth Tyler**, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

#### **Adjunct Faculty**

**Brian Beal**, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias

**Yong Chen**, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

**Christopher Davis**, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.

**Heather Deese**, Ph.D. (University of Maine, 2009), Area: Oceanography.

**Richard Langton**, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement.

## **Master of Arts in Teaching (MAT)**

Master of Arts in Teaching (MAT)

### **Master of Arts in Teaching (MAT)**

#### **Degree overview**

The Master of Arts in Teaching (MAT) degree is an accelerated teacher licensure program that leads to initial teacher certification in a designated content area and a master's degree. It is designed for those already holding an undergraduate degree and interested in becoming a secondary school teacher. Content areas include: Math, Life Science, Physical Science, English, Social Studies, and World Languages.

#### **Careers**

The MAT program prepares graduates for teaching positions at the secondary school level (grades 7-12). Our faculty have expertise in a variety of educational disciplines and contexts, from social studies and STEM Education to rural and urban school settings.

#### **Timeline and program delivery**

The MAT can be completed full-time in as short as 15 months, May term through the end of the following Summer term. The program can also be completed full or part time on an individual schedule and started any semester. A full-time May to Summer program of study would include:

##### **Initial summer term -**

EHD 501 - Social Context of Education (offered online)

EHD 504 - Teaching and Assessing for Student Learning (offered online)

SED 500 - Adapting Instruction for Students with Disabilities (offered online)

EHD 511 - Classroom Based Prevention and Intervention (offered online)

##### **Fall term -**

EHD 657 - Educational Practicum (in-school setting)

Content methods - one of ESS 551, ESC 552, EMA 505, MLC 566, ERL 541

##### **Spring term -**

EHD 693 - Educational Internship (in-school setting)\*

EDT 520 - Technology in Education (offered online)

**Final summer term -**

ERL 537 - Literacy Across the Curriculum (offered online)

As well as 6-credit hours of content specific coursework. Content coursework can be completed online or on-campus depending on campus offerings.

The MAT path of study will result in 24 credit hours of education requirements, 6 credit hours of content requirements, and 6 credit hours of student teaching.

\* Passing score on Praxis Content Knowledge assessment required prior to student teaching.

**To apply**

Applications are processed through the University of Maine Graduate School. A bachelor's degree, 3.0 GPA, three letters of recommendation, and passing Praxis I score are required for admission to the MAT. For applicants with a GPA lower than 3.0 applying, please attach a brief essay detailing your suitability for the program including explaining any extenuating circumstances or subsequent areas of growth. Applications are accepted on a rolling or ongoing basis. For more information, please contact Bryan Silverman: [bryan.silverman@maine.edu](mailto:bryan.silverman@maine.edu).

## Mathematics

The curriculum for the Master of Arts in Mathematics has been carefully designed/constructed in order to provide students with a solid foundation in mathematical/the basic tools and methodologies of their field of choice. Beyond the basic requirements, students-with the assistance of their advisors-can design a program of study/tailor-made program, which not only meets their specific needs and interests but is also geared toward their career goals. Throughout the program, students can be assured of continued/continuing and effective mentoring through close contact with their advisors and professors.

**Degree Requirements**

I. Base Requirements: Students must complete a program of study consisting of at least 30 credit hours, which must be approved by their advisory committee (see also the Course Restrictions below). At least 15 of these credits must be 500/600-level MAT/STS courses (exclusive of thesis and seminar credits). Additionally, there are two subject requirements and a depth requirement:

(Depth) All students must take at least one two-semester sequence (STS 531/532, MAT 523/524, MAT 527/528, MAT 563/564, or MAT 577/578).

(Linear Algebra) All students must take one or more of: MAT 562 Linear Algebra, MAT 564 Abstract Algebra II, or a course in Linear Statistical Models.

(Real Analysis) All students must take MAT 523 Functions of a Real Variable I.



## II. Choice of Option:

A. Thesis Option: Students choosing to write a thesis under the supervision of a member of the Graduate Faculty need to take a total of 5 credits of MAT 699 (Graduate Thesis), in addition to a 1-credit course on Responsible conduct of research (such as INT 601). The latter credit must be taken prior to enrolling in the fourth credit of MAT 699. Upon completion of the thesis, the student must present an oral defense.

B. Non-thesis Option: At least 24 credit hours must be at the graduate level, and at least 18 of these must be MAT/STS courses.

III. Seminar Requirement: All graduate students must successfully give at least two seminar talks. It is suggested that one seminar be given in each of the fall and spring semesters of the second year. As this is a credit-bearing requirement, it is necessary to register. The assigned course number is MAT 590. For students following the thesis option, one credit of MAT 590 is required, and the thesis defense fulfills the second seminar requirement. For students in the non-thesis option, MAT 590 must be taken twice, once for each of the two seminars given. The talks should be prepared in consultation with and under the supervision of the advisor. Students should submit a short advisor-approved abstract to the graduate coordinator at least one week in advance of the seminar day, for inclusion in the announcement. The evaluation will be handled by the advisor in consultation with the members of the student's advisory committee. A clear statement of the problem should be given with a brief historical sketch. All technical terms, specific to the area of expertise, should be clearly defined before they are used.

IV. Course Restrictions: With permission of the Graduate Coordinator in consultation with the advisory committee, degree credit may be given for MAT/STS courses at the 400-level or for classes in other departments which have a significant mathematical emphasis or particular relevance to the thesis project. However, the following classes cannot be used among the 30 credits for the MA degree in Mathematics:

\*Undergraduate courses which are required for the BA degree in Mathematics at the University of Maine. This includes MAT 425, MAT 463, and STS 434.

\*If both MAT 452 and MAT 527 are taken, only one of them can count toward the MA degree.

## Student Advisory Committee

The student advisory committee will consist of the advisor together with at least two members of the graduate faculty. In addition, the graduate coordinator will serve as an ex officio member without the voting rights. The committee should be formed by the end of the first year via this form, and will meet with the student at least once each semester of the second year to get an overview of the student's progress.

## Thesis Administration

The student should have his/her program plan, which would include the courses to be taken as well as the thesis topic, ready for discussion and approval by the student advisory committee by the start of the first semester of the second year of study. Ideally, the thesis should be formatted in LaTeX. The LaTeX class package for UMaine theses is found [here](#). A copy of the thesis will be provided to the committee and the graduate coordinator at least one week in advance of the date of the defense. The coordinator will make the thesis available to any member of the faculty for perusal prior to the defense. All public announcements relating to the thesis as well as the seminars will be made by the coordinator.

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Mathematics & Statistics

Return to `{\$returnto_text}` Return to: Graduate Programs, Certificates, Specializations, Emphases

The Department offers a Master of Arts in Mathematics. The typical student chooses to focus their advanced study in one of three broad areas: applied mathematics, pure mathematics, or statistics. At the time of admission, students will be assigned a preliminary advisor to assist them in developing a course of study consistent with their specific goals, and monitor their progress until they can formally establish their own advisory committee before the end of the first year.

### **Degree Requirements**

#### **I. Base requirements:**

Students must complete a program of study, consisting of at least 30 credit hours which must be approved by their advisory committee. At least 15 of these credits must be 500/600-level MAT/STS courses (exclusive of thesis and seminar credits). Additionally, there are two subject requirements and a depth requirement:

\* (Depth) All students must take at least one two-semester sequence (STS 531/532, MAT 523/524, MAT 527/528, MAT 563/564, or MAT 577/578).

\* (Linear Algebra) All students must take one or more of: MAT 562 Linear Algebra, MAT 564 Abstract Algebra II, or a course in Linear Statistical Models.

\* (Real Analysis) All students must take MAT 523 Functions of a Real Variable I.

#### **II. Choice of option:**

A. Thesis Option: Students choosing to write a thesis under the supervision of a member of the Graduate Faculty need to take a total of 5 credits of MAT 699 (Graduate Thesis), in addition to a 1-credit course on responsible conduct of research (such as INT 601). The latter credit must be taken prior to enrolling in the fourth credit of MAT 699. Upon completion of the thesis, the student must present an oral defense.

B. Non-thesis Option: At least 24 credit hours must be at the graduate level, and at least 18 of these must be MAT/STS courses. Two written qualifying examinations must be passed prior to graduation, chosen from analysis, algebra, and statistics. Decisions for retakes are up to the student's committee in consultation with the Graduate Coordinator.

III. Seminar Requirement: All graduate students must successfully give at least two seminars. It is suggested that one seminar be given in each of the fall and spring semesters of the second year. As this is a credit-bearing requirement, it is necessary to register. The assigned course number is MAT 590. For students following the thesis option, one credit of MAT 590 is required, and the thesis defense fulfills the second seminar requirement. For students in the non-thesis option, MAT 590 must be taken twice, once for each of the two seminars given. The talks should be prepared in consultation with and under the supervision of the advisor. Students should submit a short advisor-approved abstract to the graduate coordinator at least one week in advance of the seminar day, for inclusion in the announcement. The evaluation will be handled by the advisor in consultation with the members of the student's advisory committee. A clear statement of the problem should be given with a brief historical sketch. All technical terms, specific to the area of expertise, should be clearly defined before they are used.

#### **IV. Course Restrictions:**

With permission of the Graduate Coordinator in consultation with the advisory committee, degree credit may be given for MAT/STS courses at the 400-level or for classes in other departments which have a significant mathematical emphasis or particular relevance to the thesis project. The following classes cannot be used among the 30 credits for the MA degree in Mathematics:

\* Undergraduate courses which are required for the BA degree in Mathematics at the University of Maine. This includes MAT 425, MAT 463, and STS 434.

\* If both MAT 452 and MAT 527 are taken, only one of them can count toward the MA degree.

### **Admission to the Program**

In addition to satisfactory performance of the candidate as an undergraduate, as evidenced by transcripts, letters of recommendation, and a writing sample G.R.E. scores, the Department requires one semester of real analysis (equivalent to MAT 425) and one semester of abstract algebra (equivalent to MAT 463). Occasionally, students can be admitted with a deficiency in one of these areas if the deficiency is made up in the first year of graduate study. Prospective students are encouraged to follow the application procedure here: <http://umaine.edu/mathematics/graduate-program/application-procedure/>

### **Four Plus BA/MA Program**

The Department offers the opportunity for ambitious mathematics majors to begin taking graduate courses during their senior year, with the possibility of double-counting these credits toward the BA and the MA. Students must apply for the program by February 1 of their junior year. Details may be found here: <https://umaine.edu/mathematics/graduate-program/fourplus/>

### **Teaching Assistantships**

A limited number of graduate teaching assistantships are available. Teaching assistants are expected to spend approximately 17 hours per week either teaching a course or assisting a faculty member and working in the Math Lab, an open tutorial center. Assistantships are awarded on a competitive basis among all applicants, and the decision to renew an assistantship is based on performance in the first year of the student's program of study.

### **Graduate Faculty**

**Eisso Atzema, Ph.D.** (Utrecht University, Netherlands, 1993), Lecturer. History of mathematics, geometry, mathematics education.

**Timothy Boester, (Ph.D. University of Wisconsin, 2008)**, Lecturer. Undergraduate mathematics education.

**David M. Bradley, Ph.D.** (University of Illinois, Urbana 1995), Professor. Classical analysis, number theory, special functions, difference differential equations.

**Jack Buttcane**, Assistant Professor (Ph.D. University of California, Los Angeles, 2012). Analytic number theory.

**Tyrone Crisp, Ph.D.** (University of Pennsylvania, 2012), Group representations, operator algebras, and connections between the two.

**Aiden Forrow, Ph.D.** (MIT, 2018), Assistant Professor. Statistical genetics, computational biology.

**Brandon Hanson, Ph.D.** University of Toronto, 2015. Number Theory, combinatorics.

**David Hiebeler, Ph.D.** (Cornell University, 2001), Professor. Mathematical ecology and epidemiology, modeling and simulation.

**Andrew Knightly, Ph.D.** (University of California, Los Angeles, 2000), Professor and Graduate Coordinator. Number theory.

**Gil Moss, Ph.D.** (University of Texas, 2015), Assistant Professor. Number theory.

**Neel Patel, Ph.D.** (University of Pennsylvania, 2017), Assistant Professor. Analysis, partial differential equations, fluid dynamics.

**Franziska Peterson**, (Ph.D. University of Wyoming, 2016), Assistant Professor. Mathematics education.

**Nigel Pitt, Ph.D.** (Rutgers University, 1992), Professor. Analytic number theory.

**Natasha Speer, Ph.D.** (University of California, Berkeley, 2001), Associate Professor. Mathematics Education.

**Peter Stechlinski, Ph.D.** University of Waterloo, 2014. Associate Professor. Dynamic modeling and simulation; control and optimization; mathematical biology.

**Jane Wang, Ph.D.** (MIT, 2019), Assistant Professor. Geometry and dynamics.

#### **Associate Graduate Faculty**

**Matthew Hernandez**, Fixed Term Assistant Professor (Ph.D. Princeton University, 2017). Analysis, partial differential equations, fluid mechanics.

**Casey Pinckney**, Fixed Term Assistant Professor (Ph.D. Colorado State University, 2021). Algebraic and topological combinatorics.

**Michael Rosbotham**, Fixed Term Assistant Professor (Ph.D. Queen's University Belfast, 2022) Algebra

**Jacob Streipel**, Fixed Term Assistant Professor (Ph.D. Washington State University, 2022). Analytic number theory.

## **Mechanical Engineering**

The Department of Mechanical Engineering offers graduate programs leading to Master of Science and PhD degrees in Mechanical Engineering. Students can choose to pursue a concentration in Aerospace, Offshore Wind Energy, Robotics and Mechatronics, and Smart Manufacturing as part of their MS or PhD program of study. Current areas of research include 3D Printing/Bio-Printing, Biomechanics and Biomedical Engineering, Biomimetics, CAD/CAM, Composite Materials and Structures, Computational Mechanics, Controls and Dynamic Systems, Design Optimization, Digital Manufacturing, Fluid Mechanics, Heat Transfer, Marine Propulsion Design, Marine Renewable Energy, Nanomaterials and Devices, Offshore Engineering, Reduced-Order Modeling, Robotics, Smart Materials, Solar Thermal Energy, Solid Mechanics, Surface and interface phenomena, Thermal Sciences, Uncertainty Quantification, and Engineering Education. Admission is based on an appropriate baccalaureate degree and satisfying the requirements of the Graduate School at UMaine. Applicants holding a bachelor's degree in another science or engineering discipline may be admitted; however, some undergraduate courses may be required without graduate credit.

Each graduate student, in consultation with his or her graduate committee, prepares an individual program of study. The MS degree program can include courses from both mechanical engineering and other fields. The PhD degree program is more narrowly focused on a topic of interest to the student and the faculty advisor. For students with a strong interest in other disciplines, excellent opportunities exist for an interdisciplinary program of study in which up to 40% of the MS degree credit is earned in another department. Interdisciplinary PhD research is performed in

collaboration with faculty in other disciplines as a part of a coherent graduate degree program in Mechanical Engineering.

The Master of Science degree with thesis requires a minimum of five credit hours of thesis research in addition to 24 credit hours of acceptable coursework and one credit of Responsible Conduct of Research. The non-thesis Master's degree requires a minimum of 30 credit hours of coursework and a comprehensive examination. Application submission deadlines are July 31 for spring semester admission and February 15 for fall semester. Prospective students are encouraged to contact the mechanical engineering faculty to discuss their interest when submitting an application. The department offers a limited number of teaching assistantship positions. Research assistantships may be offered by the individual faculty. Other forms of support through external fellowships are strongly encouraged. Faculty research interests are found on the departmental and individual faculty web pages at: <http://umaine.edu/mecheng/graduate-program/>.

The Graduate School  
5775 Stodder Hall Room 42  
University of Maine  
Orono, ME 04469-5775  
207-581-3291  
[graduate@maine.edu](mailto:graduate@maine.edu)

Dr. Andrew Goupee, Graduate Coordinator  
Department of Mechanical Engineering  
5711 Boardman Hall, Room 206  
University of Maine  
Orono, ME 04469-5711  
207-581-3657  
[agoupe91@maine.edu](mailto:agoupe91@maine.edu)

### **Graduate Faculty**

**Vincent Caccese**, Ph.D. (Drexel University, 1985), Professor. Nonlinear finite element analysis, hybrid connections, seismic behavior and vibration analysis and design, fatigue analysis, impact resistant materials for personal protection.

**Sheila Edalatpour**, Ph.D. (University of Utah, 2016), Assistant Professor. Near- and far-field radiative heat transfer, computational heat transfer, electromagnetic wave scattering, high performance computing.

**Wilhelm Alexander Friess**, Ph.D. (Rensselaer Polytechnic Institute, 1997), Associate Professor. Engineering education, energy efficiency in buildings, experimental fluid mechanics, sports engineering.

**Andrew J. Goupee**, Ph.D. (University of Maine, 2010), Libra Associate Professor. Simulation and model testing of floating offshore structures, solid mechanics, structural optimization.

**Babak Hejrati**, Ph.D. (University of Utah, 2016), Assistant Professor. Control and dynamic systems, robotics, biomechanics, haptics.

**Zhihe Jin**, Ph.D. (Tsinghua University, 1988), Professor. Fracture mechanics, thermal stresses and thermal shock behavior of advanced materials, energy efficiency of thermoelectric materials, mechanics problems in geophysics.

**Bashir Khoda**, Ph.D. (University at Buffalo, 2013), Assistant Professor. Digital manufacturing, bio-manufacturing, advanced manufacturing processes, computer aided design & manufacturing (CAD&M), 3D printing.

**Richard Kimball**, Ph.D. (Massachusetts Institute of Technology, 2001), Professor. Marine renewable energy, offshore wind energy, marine propulsion design, diesel engines testing and emissions, advanced diesel fuel development.

**Justin Lapp**, Ph.D. (University of Minnesota, 2016), Assistant Professor. Solar thermal energy and thermochemistry; numerical heat transfer modeling for high temperature systems; thermal radiation; material behavior under solar thermal cycling; and thermal material properties.

**Sharmila Mukhopadhyay**, Ph.D. (Cornell University, 1989), Professor. Design, synthesis, characterization and testing of multifunctional nanomaterials; compact lightweight components for energy, environment, and biomedical applications; surface and interface phenomena; Multidisciplinary engineering research and education.

**Olivier Putzeys**, Ph.D. (University of California, Berkeley, 2007), Lecturer. Combustion and fire science; smoldering combustion and the transition to flaming; combustion in oxygen-enriched atmospheres; thermal modeling of animals using infrared thermography.

**Masoud Rais-Rohani**, Ph.D. (Virginia Tech, 1991), Department Chair and Richard C. Hill Professor. Structural and multidisciplinary design optimization, crashworthiness, lightweight and composite structures, structural reliability and uncertainty quantification, reduced-order and surrogate modeling.

**Senthil S. Vel**, Ph.D. (Virginia Tech, 1998), Arthur O. Willey Professor. Solid mechanics, composite materials, finite element and meshless methods, simulation-based design of advanced material systems, smart structures, structural optimization.

**Amrit S. Verma**, Ph.D. (Norwegian University of Science and Technology, 2020), Assistant Professor. Offshore wind turbine technology, structural testing and analysis of composite and sandwich structures, leading edge erosion of wind turbine blades, probabilistic methods, structural response to impact loads.

**Yingchao Yang**, Ph.D. (University of South Carolina, 2013), Assistant Professor. *In situ* mechanics of low-dimensional nanomaterials, structural and multifunctional nanocomposites, design and fabrication of micro/nano-devices.

## Microbiology

The Department of Molecular and Biomedical Sciences offers a variety of graduate degree programs. For the highly qualified student, a Ph.D. program in Microbiology is available. Also available is a thesis program leading to the M.S. as well as a non-thesis option, the Master of Professional Studies, designed for professionals who wish to upgrade their knowledge or skills.

Prerequisites for admission include a bachelor's degree in microbiology or other biological science with undergraduate work in organic chemistry, biochemistry, mathematics, and physics.

Curricula are planned to suit the interests and needs of the individual student and to provide a strong background in microbiology and molecular biology.

Teaching and research assistantships are available in various fields of microbiology.

The Department of Molecular and Biomedical Sciences is housed in Hitchner Hall, which is well equipped to do modern research in biochemistry, bacteriology, virology, molecular biology, genomics, bioinformatics, and immunology. Equipment available for research includes ultracentrifuges, Biotek microplate readers, LICOR CLX, Nanodrop, luminometers, qPCR instruments, liquid scintillation radioisotope counters, high speed refrigerated centrifuges, biohazard chambers, tissue culture facilities, flow cytometers, electrophoresis equipment, phase, confocal, and fluorescent microscopes, and transmission and scanning electron microscopes. Hitchner Hall has an excellent

zebrafish facility on site. Additional facilities are available on campus for holding and breeding small animals. Faculty members are actively involved in research that is supported at the federal level. Students admitted to the graduate program in Biochemistry may also carry out their research with faculty listed under Microbiology in this catalog, in a number of laboratories in other departments at the University, or through cooperative institutional arrangements such as those at the Mount Desert Island Biological Laboratory, the Maine Medical Center Research Institute in Portland, and others. (In addition to the University of Maine-based faculty listed below, several faculty at external cooperating institutions mentor research students in this degree program.)

## Graduate Faculty

**Suzanne Angeli**, Ph.D. (University of California, San Francisco, 2010) Assistant Professor. *Caenorhabditis elegans* to study the biological processes of aging and mitochondrial function.

**Julie A. Gosse**, Ph.D. (Cornell, 2005) Associate Professor and Graduate Coordinator. Biochemical, molecular, and cellular toxicology to aid in human environmental health risk assessment

**Joshua B. Kelley**, Ph.D. (University of Virginia, 2008) Associate Professor. Spatio-temporal regulation of G-proteins in receptor mediated gradient tracking using microfluidics and computational cell biology approaches.

**Benjamin L. King**, Ph.D. (University of Maine, 2016) Associate Professor. Bioinformatics and Systems Biology of Stress Responses.

**Melissa S. Maginnis**, Ph.D. (Vanderbilt, 2007) Associate Professor. Virus-host cell interactions that regulate JC Polyomavirus infection and pathogenesis.

**Sally Molloy**, Ph.D. (University of Maine, 2007) Associate Professor. Genomics and Microbiology.

**Melody N. Neely**, Ph.D. (University of Michigan School of Medicine, 1998) Chair and Associate Professor. Host-pathogen interactions, with focus on *Streptococcus*.

**Robert T. Wheeler**, PhD (Stanford, 2000) Associate Professor. Genetics, genomics, biochemistry and cell biology of fungal pathogens with mammalian hosts.

## Music

The Music Division offers graduate studies leading to the Master of Music degree with majors in music education (including an optional emphasis in advanced conducting) and performance. Individualized curriculum possibilities are designed to meet student interests and needs while offering a balanced program of academic and professional courses.

All applicants must meet the admission requirements of the Graduate School and the Division of Music. Students must have a baccalaureate degree in music. For more detailed information on admission requirements of specific degree programs, financial assistance, and graduate assistantships, visit <https://umaine.edu/spa/graduate-studies/>

Class of 1944 Hall, The University of Maine, Orono, Maine 04469, (207) 581-4703.

## Graduate Faculty

**Laura Artesani, D.M.A. (West Virginia, 1997)**, Associate Professor and Music Chair. Keyboard musicianship, music history, music education.

**Dan Barrett, D.M.A. (Arizona State, 2009)**, Lecturer. Trombone, theory, jazz.

**Isaac Bray, M.M. (Boston Conservatory, 2012)**, Instructor, Voice in Applied Voice

**Jack Burt, D.M.A. (Texas, 1995)**, Professor. Trumpet, brass ensemble, music theory, jazz band.

**Dennis Cox, D.M.A. (Missouri at Kansas City, 1978)**, Professor Emeritus. Choral music, music education.

**Liz Downing, M.M. (Colorado at Boulder, 1982)**, Instructor. Flute.

**Philip Edelman, Ph.D. (University of Missouri-Kansas City, 2016)**, Assistant Professor. Music education, instrumental music.

**Curvin Farnham, M.M. (Vandercook College of Music, 1982)**, Professor Emeritus, School of Performing Arts. Band, music education.

**Stuart Marrs, D.M. (Indiana, 1989)**, Professor and Graduate Coordinator. Percussion, music history.

**Nancy Ogle, M.M. (Indiana, 1976)**, Professor. Voice, opera workshop.

**Phillip Silver, D.M.A. (Washington, 1992)**, Professor. Piano accompanying, music history.

**Francis Vogt, M.M. (Hartt School of Music, 1992)**. Lecturer Director of Choral Activities, Voice.

**Christopher White, M.M. (Maine, 1994)**, Lecturer. Symphonic and Sports Bands.

**Anatole Wieck, D.M.A. (Juillard, 1987)**, Professor. Violin, viola, orchestra.

**Beth Wiemann, Ph.D. (Princeton, 1994)**, Professor. Clarinet, theory, composition.

## Nursing

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The University of Maine School of Nursing developed its first graduate program in 1992 and the initial group of graduate students received their Master of Science in Nursing (MSN) in May 1994. For the first years, the MSN program focused on preparing the nurse for the advanced professional role of family nurse practitioner (FNP). Later, in response to the diverse graduate education needs of Maine nurses, our graduate program expanded to prepare nurses for professional roles such as nurse educator, nurse administrator, or other professional roles. Graduate program faculty are expert practitioners and leaders in a number of different specialties and are eager to assist students to individualized programs of study. Students may select a flexible program of study, either full-time or part-time.

The School of Nursing offers a variety of program plans for graduate study:

### **Family Nurse Practitioner (MSN-FNP):**

The family nurse practitioner is prepared to provide healthcare to individuals and families across the lifespan (newborns, infants, children, adolescents, adults, pregnant and postpartum women and older adults). Primary care includes health promotion, disease and injury prevention, and the evaluation and management of common acute and chronic health problems. The focus of care includes individuals within families and the family unit; however the family chooses to define itself. Family nurse practitioners demonstrate a commitment to family-centered care in the



context of communities.

The program of study may be tailored for full-time or part-time study. Course formats are a mix of online and classroom instruction. Clinical experiences are arranged to meet program outcomes and to accommodate the needs of the student. The Graduate Program Coordinator and the student's academic advisor will help plan a program of study and timeframe that meets the academic and clinical requirements. The combined credit requirement would be approximately 49-51. The MSN-FNP curriculum meets the 2012 Criteria for Evaluation of Nurse Practitioner Programs published by the National Task Force on Quality Nurse Practitioner Education.

MSN-FNP graduates are eligible to take national certification examinations for Family Nurse Practitioners which are offered by the American Nurses Credentialing Center and by the American Academy of Nurse Practitioners (<http://www.aanpcert.org/index>). The University of Maine MSN-FNP program graduates have performed well on the national certification examinations.

**Nurse Educator (MSN):** (Update/replace this section to the following)

The MSN Nurse Educator track is 36-38 credits, and prepares nurses for teaching roles in academic settings and in professional development services of health care agencies. The program of study includes "core" graduate nursing courses which are required of all graduate nursing students, such as advanced pathophysiology, advanced health assessment and advanced pharmacology. Nursing education courses address curriculum development, teaching-learning methods, and assessment and evaluation of learning outcomes in nursing education. Required courses also include graduate level nursing research, theory development in nursing, bioethics and health policy, all of which enhance the nurse's expertise in their area of nursing practice. The student's practicum experience in nursing education and the graduate capstone (or master's thesis) provide opportunities to apply all prior learning to the new role of nurse educator and to their area of nursing practice.

A full time student can complete this program of study in approximately two calendar years, or part time study (3 to 4 years) is available with our online courses. Faculty guidance is an integral part of each portion of the student's program of study. The Faculty Advisor serves as the chairperson of the capstone project (or thesis) and provides ongoing guidance to each student as he or she progress through the program.

Graduates who complete this program meet the educational criteria for the National League for Nursing Nurse Educator certification examination.

**Individualized MSN:** (Update/replace this section to the following)

This individualized MSN is 35-37 credits, consisting of theoretical and field-experience curriculum that allows the student to develop a program of study that builds upon their professional interests and career goals. Through core courses, specialized courses, and experiential components, I-MSN students may prepare for professional careers in areas such as nurse administration, leadership, public health, gerontology, nutrition or other specialties.

The program of study may be tailored for full-time or part-time study. The Graduate Program Coordinator and the student's academic advisor will help plan a program of study and timeframe that meets the academic and experiential requirements.

**The Certificate of Advanced Study (CAS) for registered nurses with an MSN.**

A full-time student can expect to complete MSN degree requirements in 2 years. All work for the CAS or the MSN must be completed within a 6 year period.

*The master's degree program in nursing and the post graduate APRN certificate program at the University of Maine School of Nursing is accredited by the Commission on Collegiate Nursing Education, 655K Street NW, Suite 750, Washington, DC 20001, 202-887-6791*

#### **Graduate Faculty:**

**Kelley Strout**, Ph.D., RN (Northeastern University) Director, Associate Professor of Nursing and Interim Associate Dean of Health Science, NSFA

**Valerie Herbert**, DNP, RN (University of Kansas), Graduate Program Coordinator of Nursing, Associate Professor of Nursing

**Sean Sibley**, MSN, APRN, FNP-BC, NP-C (University of Maine) Family Nurse Practitioner Program Coordinator, Assistant Clinical Faculty

**Patricia Poirier**, Ph.D., RN (University of Massachusetts, Boston) Professor of Nursing

**Mary Tedesco-Schneck**, Ph.D., PNP-BC, (University of Maine) Associate Professor of Nursing

**Eva Quirion**, Ph.D., APRN, FNP-BC (University of Phoenix) Lecturer, Associate Graduate Faculty

**Debbie Saber**, Ph.D., RN, CCRN-K (University of Central Florida), Associate Professor of Nursing

**Kathryn Robinson**, Ph.D., MHA/ED, RN (Northeastern University) Assistant Professor of Nursing

**Jordan Porter**, DNP, APRN, FNP-BC (Vanderbilt University) Lecturer, Associate Graduate Faculty

**Debbie Eremita**, Ph.D., RN (University of Maine) Assistant Professor

## **Nursing Education (Certificate)**

The 10-credit Graduate Certificate in Nursing Education program prepares expert nurse clinicians for the role of educator, particularly as clinical and laboratory instructors in associate and baccalaureate degree nursing programs and as staff educators in clinical agencies.

## **Educational objectives**

The Certificate student will:

- Demonstrate specialized knowledge, skills, and abilities in the role of nurse educator.
- Facilitate adult learning through curriculum design, teaching, evaluation, and advisement responsibilities inherent in nursing faculty roles.
- Function as a nurse educator and apply evidence-based educational methods.
- Integrate technology in nursing education.

## **Required Courses**

**NUR 512 Curriculum and Course Development and Evaluation in Nursing Education** 3 credits. This course is offered every fall semester and introduces the student to curriculum and course development and evaluation in nursing education with emphasis on organizational frameworks, teaching-learning strategies and evaluation of learning. This course will be conducted through asynchronous distance education technology (Blackboard) supplemented with in-class meetings.

**NUR 515 Assessment, Measurement and Evaluation in Nursing Education**

3 credits. The course introduces the certificate student to assessment, measurement and evaluation with an emphasis on nursing education. Evidence based evaluation strategies are discussed within the context of ethical, legal, social and political aspects of nursing education. The course will be delivered in hybrid format of asynchronous distance education and a limited number of campus-based sessions. Prerequisites: NUR 512.

**NUR 516 Field Experience in Nursing Education** 4 credits. The field experience integrates theory in a reality context of the teaching role. Students participate in classroom, laboratory, and clinical settings pertinent to their area of interest and they integrate teaching/learning theories in a practice setting. Asynchronous distance education technology supplements the field experience. Prerequisites: NUR 512 and approval by advisor.

## **Student Eligibility and Admission Criteria**

- Bachelor of Science in Nursing or Master's or higher graduate degree in nursing from an accredited program.
- Undergraduate GPA minimum 3.0 on a 4.0 scale.
- College level statistics course, minimum grade of B
- College level research methods courses, minimum grade of B
- Experience as a Registered Nurse. Minimum two years is preferred.
- Licensure to practice as a Registered Nurse in Maine by date of admission.
- Pre-admission interview by School of Nursing faculty member (arranged)

## **Application to the Graduate Certificate in Nursing Education program:**

<https://umaine.edu/graduate/apply/>

Nursing Education Certificate students who wish to achieve a Master's degree in nursing must apply separately to the School of Nursing MSN program. The three certificate courses may be transferable to the MSN program of study. For more information about the School of Nursing: <http://www.umaine.edu/nursing>

*The master's degree program in nursing and the post graduate APRN certificate program at the University of Maine School of Nursing is accredited by the Commission on Collegiate Nursing Education, 655K Street NW, Suite 750, Washington, DC 20001, 202-887-6791*

## **Oceanography**

## School of Marine Sciences

The University of Maine's School of Marine Sciences (SMS) is one of the nation's largest marine research and education programs. SMS offers both graduate and undergraduate degrees; its faculty and students conduct basic and applied research on a wide variety of topics, and perform public service related to scientific policy for marine resource and coastal zone management. More than 50 faculty are affiliated with SMS, including full-time, part-time, and cooperating appointments. By its very nature, SMS is an interdisciplinary unit. Areas of expertise and research include physical, biological and chemical oceanography; aquaculture; marine biology; marine geology; marine resource development and policy; seafloor ecology; fish biology; fish pathology; fisheries science; seaweed biology; maritime studies; population genetics; molecular biology and toxicology; marine optics and acoustics and ocean engineering.

SMS faculty provide leadership in research programs that encompass all the world's oceans, with emphasis on the Gulf of Maine. Faculty are headquartered at the Orono campus of UM and its coastal marine laboratory, the Ira C. Darling Marine Center (see Research Resources), and the Gulf of Maine Research Institute. Further information on SMS is on the web at: [www.umaine.edu/marine](http://www.umaine.edu/marine). Further information on the Darling Marine Center is on the web at <https://dmc.umaine.edu/>

The School of Marine Sciences offers the following graduate degrees:

- M.S. and Ph.D. degrees in Oceanography;
- M.S. and Ph.D. degrees in Marine Biology;
- M.S. and Ph.D. degrees in Aquaculture and Aquatic Resources (*administered jointly with Food Science and Human Nutrition*);
- M.S. degree in Marine Policy; and
- Dual M.S. degree in Marine Policy and either Oceanography or Marine Biology.

The School of Marine Sciences offers core and advanced courses in all degree areas. Most specialized courses of study in the subdisciplines of marine science are also provided by various associated departments. Financial support for graduate students is primarily in the form of research assistantships. Some teaching assistantships are available.

# Master of Science and Doctor of Philosophy in Oceanography

## Master of Science and Doctor of Philosophy in Oceanography

Students in both the M.S. and the Ph.D. degree programs of Oceanography within the School of Marine Sciences (SMS) complete three core courses in, respectively, physical, chemical, and biological aspects of the marine system. Supplementary courses, both within SMS and elsewhere, are based on student needs and interests and chosen in consultation with the student, their advisor, and their thesis committee. Most course work is taken in Orono, especially during the student's first year. Thereafter, thesis or dissertation research may be carried out while based in Orono or the University of Maine's marine laboratory, the Ira C. Darling Marine Center or at the Gulf of Maine Research Institute in Portland.

Research is a vital part of graduate education and the core focus of an M.S. or Ph.D. program in oceanography at UMaine. Its scope is limited only by the imagination of students and faculty. As a result of climate change, rapidly evolving ocean conditions, and constantly improving measurement systems and data sets, oceanography students are in the midst of some of the most exciting and relevant ocean research being conducted today. This includes research on the Gulf of Maine as well as anywhere in the global oceans. To match your research interests with a faculty member we invite you to explore our research clusters and the web pages of individual faculty.

M.S. and Ph.D. Programs in Oceanography are research-oriented, leading to completion of a thesis. To succeed, students will be required to learn to

- a. formulate valid scientific questions
- b. design / acquire appropriate data collections to answer those questions
- c. develop the necessary technical skills to conduct analyses of these data
- d. examine and interpret the results of the analyses
- e. apply results as appropriate.

The program is designed to give students as much flexibility as possible so that they can take advantage of the various faculty specialties available to them within the School of Marine Sciences and elsewhere in the University.

Oceanography Program Coordinator:

Dr. Andrew Thomas

Aubert Hall 454, University of Maine, Orono, ME 04469-5741

207 581 4335

thomas@maine.edu

For a full list of faculty please visit <https://umaine.edu/marine/smspeople/>

## Required Core Courses

- SMS 501 - Biological Oceanography Credits: 3
- SMS 520 - Chemical Oceanography Credits: 3
- SMS 541 - (SMS, CIE) Physical Oceanography Credits: 3
- SMS 691 - Marine Science Seminar Credits: 1
- SMS 699 - Graduate Thesis/Research Credits: Ar
- Participation in SMS Graduate Student Symposium during each year of full-time study.

## Advanced Oceanography Courses

To be combined with core and other advanced courses to specifications of the student and thesis committee.

- SMS 531 - Coral Reefs Credits: 3
- SMS 540 - Satellite Oceanography Credits: 3
- SMS 585 - Marine System Modeling Credits: 3
- SMS 595 - Data Analysis Methods in Marine Sciences Credits: 3
- SMS 597 - Independent Study Credits: 1-3
- SMS 598 - Special Topics in Marine Science Credits: 1-3

## Faculty

**James Acheson**, Ph.D. (Rochester, 1970), Emeritus Professor. Area: Cultural Anthropology. (Marine Policy)

**Emmanuel Boss**, Ph.D. (Washington, 1996), Professor. Area: Particle Dynamics, Optical Oceanography. (Oceanography)

**Damian Brady**, Ph.D. (University of Delaware, 2008), Assistant Professor. Area: marine biogeochemistry, environmental oceanography (Marine Biology)

**Susan Brawley**, Ph.D. (California, 1978), Professor. Area: Algal Physiology, Development and Ecology. (Marine Biology, Oceanography)

**Ian Bricknell**, Ph.D. (Lancaster, 1990), Professor. Area: Marine Aquaculture, finfish culture, parasitology, fish immunology and vaccinology and fish health. (Aquaculture)

**Kristina Cammen**, Ph.D. (Duke University, 2014), Assistant Professor. Area: Marine mammal science, ecological and evolutionary genomics, ocean health, conservation biology. (Marine Biology)

**Fei Chai**, Ph.D. (Duke University, 1995), Professor. Area: Ecosystem Modeling; Tropical Oceanography. (Oceanography)

**Yong Chen**, Ph.D. (Toronto, 1995), Professor. Area: Fisheries Population Dynamics and fisheries stock assessment and management. (Marine Biology, Marine Policy)

**Laurie Connell**, Ph.D. (North Carolina, 1988), Associate Research Professor. Area: Molecular Ecology. (Marine Biology)

**Kevin Eckelbarger**, Ph.D. (Northeastern, 1974), Emeritus Professor, Darling Marine Center. Area: Invertebrate Biology. (Marine Biology)

**William Ellis**, Ph.D. (Univ. of Rhode Island, 1992), Associate Director and Associate Professor. Area: Marine and Atmospheric Chemistry. (Oceanography)

**Keith Evans**, Ph.D. (Iowa State University, 2011), Assistant Professor. Area: Economics, fishery management , applied econometrics, nonmarket valuation (Marine Policy)

**Walt Golet**, Ph.D. (University of New Hampshire, 2010), Research Assistant Professor. Area: fisheries biology, physiology, trophic ecology (Marine Biology)

**Heather Hamlin**, Ph.D. (University of Florida, 2007) Assistant Professor. Area: Endocrinology, finfish, aquaculture, contaminants (Marine Biology)

**Nishad Jayasundara**, Ph.D. (Stanford University, 2012) Associate Professor. Area: physiology and biochemistry (Marine Biology)

**Teresa Johnson**, Ph.D. (Rutgers University, 2007), Professor. Area: Fisheries Management. (Marine Policy)

**Peter A. Jumars**, Ph.D. (Scripps Institution of Oceanography, 1974), Emeritus Professor. Area: Benthic Biological Oceanography, Organism-Environment Interactions at the Level of Individuals, Deposit Feeding. (Oceanography, Marine Biology)

**Lee Karp-Boss**, Ph.D. (Washington, 1998), Associate Professor. Area: Biological Oceanography. (Oceanography)

**Heather Leslie**, Ph.D. (Oregon State University, 2004), Coordinator for PSM program, Libra Associate Professor, and Director of Darling Marine Center. Area: coupled social-ecological systems, policy, ecology. (Marine Biology)

**Sara Lindsay**, Ph.D. (South Carolina, 1994), Associate Professor. Area: Sensory Biology and Ecology of Marine Invertebrates, Benthic Ecology. (Marine Biology, Oceanography)

**Lawrence M. Mayer**, Ph.D. (Dartmouth, 1976), Professor. Area: Marine Biogeochemistry. (Oceanography)

**James D. McCleave**, Ph.D. (Montana State, 1967), Emeritus Professor. Area: Migratory and Transport Mechanisms of Fishes, Fisheries Oceanography, Eel Biology. Associate Director, School of Marine Sciences. (Oceanography, Marine Biology)

**Mary Jane Perry**, Ph.D. (Scripps Institution of Oceanography/California, San Diego, 1974), Emerita Professor. Area: Phytoplankton Physiology and Ecology, Primary Productivity, Bio-optics. (Oceanography, Marine Biology)

**Neal R. Pettigrew**, Ph.D. (Woods Hole Oceanographic Institution/M.I.T., 1981), Professor. Area: Near-shore, Estuarine and Continental Shelf Circulation. (Ocean-ography)

**Paul Rawson**, Ph.D. (South Carolina, 1996), Coordinator for Aquaculture. Area: Quantitative Genetics, Evolutionary Biology. (Marine Biology, Aquaculture)

**Jeremy Rich**, Ph.D. (Oregon State University, 2003), Assistant Professor. Area: Microbial ecologist, denitrification, anammox, DNRA. (Marine Biology)

**Warren Riess**, Ph.D. (New Hampshire, 1987), Associate Research Professor. Area: History; Underwater Archeology. (Marine Policy)

**Jeffrey A. Runge**, Ph.D. (Univ. of Washington, 1981), Research Professor. Area: Biological and Fisheries Oceanography.

**Malcolm Shick**, Ph.D. (Texas, 1974), Emeritus Professor. Area: Marine Invertebrate Physiology. (Marine Biology)

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1982), Professor. Area: Benthic Marine Ecology, Lobsters, and Plant-Herbivore Interactions. (Oceanography, Marine Policy, and Marine Biology)

**Joshua Stoll**, Ph.D. (University of Maine, 2016), Assistant Professor. Area: ocean governance, coastal community resilience, fisheries policy, social-ecological dynamics. (Marine Policy)

**Andrew Thomas**, Ph.D. (British Columbia, 1988), Professor. Area: Plankton Biology, Biological/Physical Interactions, Satellite Oceanography. (Oceanography, Marine Biology)

**David W. Townsend**, Ph.D. (Maine, 1981), Professor and Associate Director School of Marine Sciences. Area: Biological Oceanography of Shelf Seas. (Oceanography, Marine Biology)

**Robert L. Vadas**, Ph.D. (Washington, 1968), Professor. Area: Marine Ecology, Algal Ecology. (Marine Biology, Aquaculture)

**Rebecca Van Beneden**, Ph.D. (Johns Hopkins, 1983), Professor and Director of School of Marine Sciences. Area: Marine Molecular Biology and Environmental Toxicology. (Marine Biology)

**Rhian Waller**, Ph.D. (Southampton Oceanography Center, UK, 2004), Assistant Professor. Marine invertebrate zoology, benthic oceanography, marine climate change (Oceanography)

**Les Watling**, Ph.D. (Delaware, 1974), Emeritus Professor. Area: Benthic Ecology. (Oceanography, Marine Biology, Aquaculture)

**Mark Wells**, Ph.D. (University of Maine), Professor. Area: Marine Organic Matter.

**James Wilson**, Ph.D. (Wisconsin, 1971), Emeritus Professor. Area: Economics and Fisheries Management. (Marine Policy, Aquaculture)

**Huijie Xue**, Ph.D. (Princeton University, 1991), Professor. Area: Numerical Modeling of Coastal and Oceanic Circulation. (Oceanography)

**Gayle Zydlewski**, Ph.D. (University of Maine, 1996), Associate Professor and UMaine Sea Grant Director. Area: Fish Ecology.

**Cooperating Faculty**

**Daniel F. Belknap**, Ph.D. (Delaware, 1979), Professor. Area: Marine Geology, Sedimentology. Chair, Department of Earth Sciences. (Oceanography)

**Nick Brown**, Ph.D. (Aquaculture Univ., Stirling, UK, 1998), Assistant Professor. Area: Aquaculture Technology

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Area: Molecular Environmental Toxicology.

**Carol Kim**, Ph.D. (Cornell, 1992), Associate Professor. Area: Zebrafish as a Model for Disease and Immune Function. (Marine Biology)

**Michael Kinnison**, Ph.D. (University of Washington, 1999), Associate Professor. Area: Ecology and Environmental (Marine Biology)

**Paul Mayewski**, Ph.D. (Ohio University, 1973), Professor. Area: Change in Climate and Chemistry of the Atmosphere. (Oceanography)

**Bryan Pearce**, Ph.D. (Univ. of Florida, 1972), Professor. Area: Physical Oceanography, Numerical Modeling (Oceanography)

**Michael Peterson**, Ph.D. (Northwestern Univ., 1994), Professor. Area: Ultrasound, Instrumentation and Biomimetic Design. (Oceanography)

**John Singer**, Ph.D. (Georgia, 1983), Professor. Area: Marine Microbiology. Chair, Department of Biochemistry, Microbiology and Molecular Biology. (Aquaculture, Marine Biology)

**Seth Tyler**, Ph.D. (North Carolina, 1975), Professor. Area: Invertebrate Biology. (Marine Biology)

### **Adjunct Faculty**

**Brian Beal**, Ph.D. (University of Maine, 1994), Assistant Professor. Benthic Ecology, Marine Biology. University of Maine at Machias

**Christopher Davis**, Ph.D. (Univ. of Maine, 2000), Assistant Professor. Molluscan Biology and Aquaculture.

**Lawrence Jacobson**, Ph.D. (University of Minnesota, 1986), Associate Professor. Fisheries Population Dynamics, Assessment Modeling and Management. National Marine Fisheries Service, Woods Hole, Massachusetts

**Richard Langton**, Ph.D. (University of Wales, 1975), Associate Professor. Fish Relationships and Fishing Effects on Habitat, Stock Enhancement. Buccoo Reef Trust

## **One Health and the Environment (Certificate)**

The graduate certificate in One Health and the Environment totals 12 credits and is designed to be completed in two years. The certificate will include both a core curriculum as well as electives that will allow students to specialize in specific areas related to One Health and the Environment. The two core courses will be offered every other year, but not in the same year (e.g., INT 598 could be offered in the fall in even years and EES 598 could be offered in the fall in odd years. The timing of the elective courses is not in our control; however, there is a significant number of elective courses to choose from. In addition, courses not in the approved lists could be included as certificate electives but will need to be reviewed and approved by the program steering committee. The certificate is highly interdisciplinary as it requires students to take two electives, one in biophysical science and one in social science, relevant to One Health. Current electives are offered by the University of Maine by the following units: School of Food and Agriculture, School of Biology and Ecology, School of Molecular and Biomedical Sciences, Department of Mathematics, School of Nursing, School of Forest Resources, School of Marine Science. Department of Communication and Journalism,



School of Economics, Department of Anthropology, School of Social Work, Department of Wildlife, Fisheries and Conservation Biology. Other electives are taught by the School of Public Health at the University of Southern Maine.

**Dedicated faculty:**

**Andrei V. Alyokhin**, Professor, School of Biology and Ecology

**Kathleen P. Bell**, Professor, School of Economics

**Sean Birkel**, Research Assistant Professor, Climate Change Institute and School of Earth and Climate Sciences

**Sandra Butler**, Professor, School of Social Work

**Kristina Cammen**, Assistant Professor, School of Marine Sciences

**Angela Daley**, Assistant Professor, School of Economics

**Sandra DeUrioste-Stone**, Associate Professor, School of Forest Resources

**Allison Gardner**, Assistant Professor, School of Biology and Ecology

**Teresa Johnson**, Associate Professor, School of Marine Sciences

**Pauline Kamath**, Assistant Professor, School of Food and Agriculture

**Debra Kantor**, Associate Extension Professor, Cooperative Extension

**Danielle Levesque**, Assistant Professor, School of Biology and Ecology

**Anne Lichtenwalner**, Associate Professor, School of Food and Agriculture, Cooperative Extension

**Bridie McGreavy**, Assistant Professor, Communication and Journalism

**Caroline Noblet**, Associate Professor, School of Economics

**Laura Rickard**, Associate Professor, Communication and Journalism

**Linda Silka**, Senior Fellow, Senator George J. Mitchell Center for Sustainability Solutions

**Kelley Strout**, Associate Professor and Interim Director, School of Nursing

**Mario Teisl**, Professor, School of Economics

**Judith Tupper**, Practice Faculty, Public Health Program; Director, Population Health and Health Policy, Cutler Institute USM

**Erika Ziller**, Assistant Professor, Public Health USM

## **Physics**

# **Degree Programs**

Programs of study leading to the degrees of **Master of Science**, **Master of Engineering** (Engineering Physics), and **Doctor of Philosophy** are offered through the **Department of Physics and Astronomy**. Please see the Departmental web site for more detailed information than the summary below.

## Doctor of Philosophy

Doctor of Philosophy: Typically, a total of 5-6 years are needed to complete the Ph.D. degree for a student who enters the program with a bachelor's degree. A dissertation presenting the results of an original investigation in a specialized area of physics is an essential feature of the program and must be completed and defended successfully. Requirements also include passing the Oral Proposal Defense within the prescribed timelines.

The program of study for each student in the Ph.D. program includes a minimum of 30 course hours. The following courses, or their equivalents, are **required** of all students: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, PHY 510 Graduate Laboratory, PHY 512 Statistical Mechanics, PHY 574 Methods of Theoretical Physics, PHY 603 Quantum Mechanics II, and PHY 624 Solid State I.

In addition to the courses listed above, students must take at least **one advanced course**, chosen from among PHY 575 Methods of Theoretical Physics II, PHY 598 Continuum Mechanics, PHY 598 Statistical Mechanics II, and PHY 625 Solid State II.

Students must also take at least **one research specialty elective course**, which must be approved by the student's dissertation advisory committee. These electives do not have to be PHY courses, and they cannot be from among the 400-level PHY undergraduate core courses in Mechanics, Electricity and Magnetism, Quantum and Atomic Physics, Thermodynamics, Statistical Mechanics, or Optics. In addition to class work, students must also complete a minimum of 5 thesis credits (PHY 699) and 1 credit of Responsible Conduct of Research training (INT 601). INT 601 must be completed before commencing with the fourth credit of PHY 699.

In general, additional courses beyond the above minimal requirements are expected to be included in a student's program of study, at the discretion of the student's dissertation committee. Each of the 400-level undergraduate core courses may be taken for graduate credit under this additional course expectation.

## Master of Science

The program of graduate study for the master's degree, which normally requires two academic years, is developed around an original investigation, the results of which are presented as a thesis which must be successfully defended.

Of the minimum of 30 semester hours required for the Master of Science degree, 24 are devoted to courses in physics and such allied fields as other sciences, mathematics, and engineering. However, the following courses or their equivalents, which are offered every year, must be included: PHY 501 Mechanics; PHY 502 Electrodynamics I, and PHY 503 Quantum Mechanics I. In addition to the 24 credits of class work, students must complete a minimum of 5 thesis credits (PHY 699) and 1 credit of Responsible Conduct of Research training (INT 601). INT 601 must be completed before commencing with the fourth credit of PHY 699.

## Master of Engineering (Engineering Physics)

<http://physics.umaine.edu/graduate-programs/>

A minimum of 30 semester hours is required for the Master of Engineering (Engineering Physics) degree with thesis. Of the total of 24 required course hours, nine hours must be selected from a meaningful engineering course sequence. In addition, nine hours must be selected from three of the following courses: PHY 501 Mechanics, PHY 502 Electrodynamics I, PHY 503 Quantum Mechanics I, and PHY 510 Graduate Laboratory. In addition to the 24 required course credits an additional minimum of 6 credits of thesis (PHY 699) is required. The thesis may be completed in either the Physics Department or the engineering department in which the engineering course sequence is taken.

A non-thesis option exists which requires 36 approved course credits (no thesis credits). Movement from a thesis to a non-thesis degree will be under exceptional conditions and requires approval of the Department Graduate Faculty.

Students in a non-thesis program shall not normally receive financial support.

## Research

- Astrophysics: Optical, x-ray and radio observational and computational, primarily on galaxies and clusters of galaxies. <https://physics.umaine.edu/research/astronomy/>
- Biophysics: Ultra-high resolution microscopy and spectroscopy, influenza virus infection, function and lateral organization of biomembranes coupled to the cytoskeleton, single molecule fluorescence photophysics <https://physics.umaine.edu/research/biophysics-research-group/> and theoretical studies of chemically-driven microscopic motors and pumps.
- Environmental radiation & Radon Studies
- Surface Science: Physics and chemistry of surfaces, including microsensors, catalysis, adhesion, thin film growth, surface crystallography, phase transitions, tribology, and development of new instrumentation; <https://umaine.edu/first/>.
- Physics Education Research: Student reasoning in physics using dual-process theories of reasoning and decision-making; the teaching and learning of electronics in both physics and engineering; student use and understanding of mathematics in physics; K-12 teacher knowledge of content and students' ideas and their use of formative assessment, particularly with energy concepts. <http://umaine.edu/per/> .
- Statistical Physics and condensed matter: Light scattering from liquid crystals and colloids.

## Cooperative Research

A major interdisciplinary research organization at the University is the Frontier Institute in Sensor Technologies (FIRST) in which research opportunities exist in high technology areas related to surfaces, interfaces, and thin film materials. Specific information is available at <https://umaine.edu/first/>.

Departmental faculty also participate in collaborative research and K-20 STEM professional development with the Maine Center for Research in STEM Education (RiSE Center) <http://umaine.edu/risecenter/> .

## Research Facilities

The **Frontier Institute in Sensor Technologies** (FIRST) unites researchers from the Departments of Chemistry, Physics, Electrical and Computer Engineering, and Chemical and Biological Engineering in many projects spanning aspects of surface and interface science, thin films, sensors, microsystems, and nanotechnology. Current facilities include thin film synthesis, electron and optical spectroscopies, scanning probe microscopies, X-ray and electron diffraction, focused ion beam-scanning electron microscopy, fluorescence microscopy, device fabrication (Class1000 clean room with photolithography, metallization, wet and dry etch, PECVD, sputtering, mask generation, and packaging), and sensor testing (gas delivery systems, electrical and microwave test equipment, and data acquisition/integrated electronic test suites).

**Biophysics and Optics:** Three laboratories include a superresolution localization microscopy facility and four F-PALM microscopes, image processing computer cluster, tunable femtosecond pulsed Ti:Sapphire laser and optical parametric oscillator (OPO), cell culture facilities, polymerase chain reaction (PCR) thermal cycler, and other

equipment for molecular biology, confocal and two-photon laser-scanning microscopes, fluorescence correlation and cross-correlation microscope, fluorimeter, spectrophotometer, Krypton-Argon and Argon ion lasers, numerous diode lasers spanning visible wavelengths from 400-700 nm, and optical tweezer.

The **Physics Education Research Laboratory** has facilities and equipment for conducting research on the learning and teaching of physics, including a classroom intended for curricular activities based on physics education research (PER) and dedicated clinical interview space to ensure the anonymity and privacy of students participating in our research work (as required by our institutional review board for testing with human subjects).

**Astronomy/Astrophysics:** The Emera Astronomy Center consists of two observatories, a planetarium, and a multi-purpose classroom space. The Jordan Observatory houses a PlaneWave CDK20 (20 inch) telescope on a German Equatorial Mount with an Apogee Aspen CG16M CCD camera with 7 slot filter wheel for imaging and photometry. The telescope and dome both can be remotely controlled. Additionally, the facility has an historic Alvin Clark refractor (8 inch) housed in a roll-off roof observatory for visual observations. The Jordan Planetarium is a 10 meter 4K digital planetarium with 50 seats which can show a variety of astronomy and science visualizations, real time astronomical data, and full-dome films. The planetarium conducts regular public programs, school programs, and numerous special events. The facility has a multipurpose classroom housing a number of interactive displays and is used for astronomy labs and other university courses.

## **Admission**

In addition to satisfying the general admission requirements of the Graduate School, candidates for advanced degrees in physics should have earned a bachelor's degree in Physics or a closely related discipline with a 3.0/4.0 GPA in physics and mathematics courses. Typical classes beyond the introductory level include mechanics, electricity and magnetism, quantum mechanics, statistical and thermodynamics, as well as laboratory courses in these areas and electronics. Mathematics should be completed at least through differential equations.

Candidates who have majored in other physical sciences or mathematics are encouraged to apply. For these candidates we would like to see substantial advanced physics courses.

Admission to the degree programs is competitive. We primarily admit students for the Fall semester with only occasional openings for the Spring semester. We begin review of completed applications in late January (apply through the Graduate School). We consider all eligible applicants for support. If support is not required, please be sure to note that in the application.

We require the GRE exam and the GRE Physics exam. As the Physics exam is offered infrequently we will consider applications without the exam. The TOEFL or equivalent (see Graduate School website) is required for International students. The Graduate School requires a minimum iBT TOEFL score of 92 (7.0 on IELTS) to be considered for support as a TA.

## **Financial Assistance**

Teaching assistantships are available for the academic year and include remission of tuition for up to nine credit hours per semester and three credit hours in the summer session. These appointments provide for approximately half-time teaching and half-time study. Teaching assignments usually involve six contact hours per week. Some summer support is available for students in the program, but it is expected that students and advisors obtain summer research assistantships.

Research assistantships from grant funding are also available to provide graduate stipends and tuition support, information about these research assistantships is available directly from individual faculty members.

The University of Maine supports a number of University fellowships and tuition scholarships, primarily for current graduate students.

### **Application**

Students are primarily admitted starting in the Fall semester (September). Applications for admission in the Fall (September) should be complete by January 5. We occasionally have openings for Spring semester (January). Contact the Graduate Coordinator. Late applications are accepted.

### **Additional Information**

Individual faculty may be contacted via their email addresses below. The department's home page is <http://physics.umaine.edu/>.

Email the Graduate Coordinator.

Department physical address: Department of Physics and Astronomy, University of Maine, 5709 Bennett Hall, Orono, ME 04469

Telephone at (207) 581-1039.

## **Graduate Faculty**

**R. Dean Astumian**, Ph.D. (Texas-Arlington, 1983), Professor. Design of microscopic mechanical and electrical pumps and motors powered by non-equilibrium isothermal chemical reactions.

**David J. Batuski**, Ph.D. (New Mexico, 1986), Professor. Astronomy, Astrophysics, Observational cosmology; largescale structure in the universe; weak gravitational lensing studies of dark matter in superclusters of galaxies; dynamics of superclusters; radio sources in galaxy clusters.

**Neil F. Comins**, Ph.D. (University College, Cardiff, 1978), Professor. Astronomy, Astrophysics, Cosmology & String Theory, Physics and other Science Education, Relativity & Gravitation, Observational and theoretical astrophysics; galactic evolution and stability; stellar systems; general relativity; astronomy education.

**Saima Farooq**, Ph.D. (Kansas State University, 2016), Lecturer. Physics and other Science Education. Research on teaching and learning, curriculum development and assessment, primarily at the introductory level. Critical thinking in physics labs; student reasoning with experimental data, methods, analysis, and the treatment of uncertainties.

**Charles T. Hess**, Ph.D. (Ohio, 1967), Professor. Biophysics, Geophysics, Medical, Health Physics, Nuclear Physics. Environmental nuclear physics; health physics; radioactivity studies.

**Samuel T. Hess**, Ph.D. (Cornell University, 2002), Professor. Biophysics. Experimental and theoretical biophysics; super-resolution fluorescence microscopy and spectroscopy; function and lateral organization of biomembranes; influenza virus infection; single-molecule fluorescence photophysics.

**Robert J. Lad**, Ph.D. (Cornell, 1986), Professor. Condensed Matter Physics, Nano Science and Technology. Surface physics; thin films; sensor technology; materials science; ceramics; electronic materials; photovoltaics; material characterization.

**James McClymer**, Ph.D. (Delaware, 1986), Associate Professor. Condensed Matter Physics, Optics, Other. Digital imaging and light scattering from equilibrium and nonequilibrium transitions in liquid crystals and complex fluids.

**Susan R. McKay**, Ph.D. (M.I.T., 1987), Professor. Nonlinear Dynamics and Complex Systems. Theoretical condensed-matter physics; nonlinear systems and transitions to chaos; phase transitions and critical phenomena; spin glasses; amorphous magnetism; quenched disorder; pattern formation; systems far from equilibrium; applications of network theory.

**Robert W. Meulenberg**, Ph.D. (University of California, Santa Barbara, 2002), Associate Professor. Condensed Matter Physics, Materials Science, Metallurgy, Nano Science and Technology. Experimental condensed-matter physics: electronic structure of nanoscale materials; surface and interfacial physics of nanostructures; magnetic materials; applications of synchrotron radiation to materials science.

**MacKenzie R. Stetzer**, Ph.D. (University of Pennsylvania, 2000). Associate Professor. Physics and other Science Education. Physics education: research on teaching and learning, curriculum development and assessment. Student understanding of analog electronics in physics and engineering. Troubleshooting in electronics. The development of student reasoning skills and metacognitive skills in physics and the application of findings and theories from cognitive science to student reasoning in physics.

**John Thompson**, Ph.D. (Brown, 1998), Professor. Physics and other Science Education. Research interest: Physics Education. Research on teaching and learning, curriculum development and assessment, primarily at the upper division (thermal physics, electricity and magnetism, and quantum mechanics). Student use of mathematics, mathematical methods, and mathematical reasoning in physics (e.g., differentials, derivatives, and integrals in single variable, multivariable, and vector calculus); analysis via specific difficulties, symbolic forms, and conceptual blending.

**Michael C. Wittman**, Ph.D. (Maryland, 1998), Professor. Physics and other Science Education. Physics education. Research on teaching and learning. Learning theory development, curriculum development and evaluation, use of mathematics in physics, and teacher knowledge of student thinking, both at the college and the K-12 level, in particular middle school. Student and teacher understanding of energy and accelerated motion in middle school and in high school.

**Lipping Yu**, Ph.D (North Carolina State University, 2009). Assistant Professor. Materials Science, Metallurgy, Nano Science and Technology. Inverse materials design; defects in solids; semiconductor physics; energy materials (e.g., photovoltaics, catalysts, batteries, supercapacitors); flexible 2D electronics; surface and interface physics and chemistry; application of density functional theory and high-throughput computation.

## Research and Associate Graduate Faculty

**George Bernhart**, Ph.D. (Maine, 1994), Lecturer/Research Scientist (FIRST).

**Thomas Stone**, Ph.D. (Maine, 2010). Associate Professor of Mathematics and Physics, Husson University. Theoretical condensed matter physics.

## Cooperating Graduate Faculty

**Jayendra C. Rasaiah**, Ph.D. (Pittsburgh, 1965), Professor. Statistical mechanics of electrolytes and polar fluids, computer simulation studies of solutions, fluctuation-dominated kinetics in heterogeneous media, theory of electron transfer reactions, and molecular biophysical chemistry.

## Plant Science

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

### Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

### Master of Science

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

### Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoosporic fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator- prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

### **Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

### **Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley.



Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

### **Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: [umbiosci@maine.edu](mailto:umbiosci@maine.edu), <https://sbe.umaine.edu/>.

## **Graduate Faculty**

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Benildo G. de los Reyes**, Ph.D. (Oklahoma State University, 1999), Professor. Plant molecular genetics and functional genomics; molecular basis of plant responses to environmental stresses.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

**Eleanor Groden**, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

**David Hart**, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

**Clarissa Henry**, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of

segmentation and muscle development in Zebrafish.

**Rebecca Holberton**, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

**Michael T. Kinnison**, Ph.D. (University of Washington, 1999), Professor. Microevolution, aquatic ecology, population and conservation genetics, fish ecology (including salmonids).

**Danielle Levesque, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor.** Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

**Joyce E. Longcore**, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

**Brian McGill**, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

**Brian Olsen**, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.

**Jasmine Saros**, Ph.D. (Lehigh University, 1999). Professor. Paleolimnology, phyto-plankton ecology, lake ecosystem response to global change.

**Michelle Smith**, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

**Kristy Townsend**, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

**Mary S. Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in *Drosophila*; educational multimedia materials.

**Seth Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

## Cooperating Faculty

**Susan H. Brawley**, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

**William O. Bray**, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

**Jim Dill**, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

**David Hiebeler**, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

**Sara Lindsay**, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

**William H. Livingston**, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

**James D. McCleave**, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

**Paul Rawson**, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

**Alan M. Rosenwasser**, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

**Walter C. Shortle**, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

**Rebecca J. Van Beneden**, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

**Robert G. Wagner**, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

## Plant, Soil, and Environmental Sciences

Within the School of Food and Agriculture multidisciplinary research and graduate training programs emphasize the biogeochemistry and sustainability of agricultural, forested, horticulture, and wetland ecosystems. Areas of emphasis for graduate work include nutrient dynamics in agricultural and forest ecosystems, soil chemistry and plant nutrition, horticulture, soil microbiology, crop physiology, diversified cropping systems, weed ecology and management, wetland ecology, crop genetic resource conservation and management, and plant pathology. Thesis problems may be developed in a wide range of subject areas within the broad disciplines listed above. Facilities are available for laboratory, greenhouse, farm field, forest stand, and watershed-scale research.

Graduate students working in the areas of plant, soil, and environmental sciences can earn the Master of Science degree through programs in Plant, Soil, and Environmental Sciences; Horticulture; and Ecology and Environmental Sciences. The Doctor of Philosophy degree can be pursued through programs in Ecology and Environmental Sciences, Biological Sciences, Forest Resources, Plant Biology, and Plant Sciences. Several of our faculty have cooperating appointments in other departments, providing some of our students with additional degree options. Graduate training programs in these areas are built from foundations in soil science, agronomy, plant physiology, ecology, microbiology, plant pathology, and statistics. Prospective graduate students should have completed course work in chemistry, mathematics, and biology, and in subject matter areas closely related to interests of the student and his/her advisor.

Prospective students should contact faculty who might serve as their supervisors to discuss which degree option is appropriate for their particular interests and goals. To apply, go to the Graduate School's website, [www.umaine.edu/graduate](http://www.umaine.edu/graduate) and click on the "Admissions" tab and follow the guidelines.

A limited number of departmental assistantships, involving both teaching and research, are available on a competitive basis. Additional opportunities for assistantship support are associated with faculty working on extramural grants and research contracts. Prospective graduate students are urged to contact faculty who might serve as supervisors for their graduate degree work to determine the availability of assistantship support. Additional information concerning graduate studies in these degree programs may be obtained from Dr. Bryan J. Peterson the Graduate Coordinator ([bryan.j.peterson@maine.edu](mailto:bryan.j.peterson@maine.edu)) and from the website (<http://umaine.edu/foodandagriculture/>).

## Graduate Faculty

**Stephanie Burnett**, Ph.D. (University of Georgia, 2004), Associate Professor of Horticulture.

**Lily Calderwood**, Ph.D. (University of Vermont, 2015), Extension Wild Blueberry Specialist and Assistant Professor of Horticulture.

**Eric R. Gallandt**, Ph.D. (University of Wisconsin-Madison, 1994), Professor of Weed Ecology and Management. Sustainable agriculture, cropping systems, and weed ecology and management.

**David Handley**, Ph.D. (University of New Hampshire, 1993), Cooperating Professor of Horticulture. Vegetable and small fruit variety evaluation, and integrated pest management strategies.

**Jainjun (Jay) Hao**, Ph.D. (University of California, Davis, 2000) Associate Professor of Plant Pathology. Epidemiology and management of potato diseases. Soil microbial communities associated with soil and plant health. Utilizing beneficial microorganisms to manage plant diseases.

**Mark Hutton**, Ph.D. (University of New Hampshire, 1988), Associate Professor of Vegetable Crops and Vegetable Extension Specialist. Vegetable production, season extension technologies, disease and insect management, vegetable genetics and varietal evaluation.

**John M. Jemison**, Ph.D. (Pennsylvania State University, 1991), Cooperating Professor in Plant, Soil, and Environmental Sciences. Water quality Specialist, Cooperative Extension Service.

**Ellen Mallory**, Ph.D. (University of Maine, 2007), Professor of Sustainable Agriculture. Sustainable agriculture, soil quality, nutrient management, cover crops.

**Renae E. Moran**, Ph.D. (University of Arkansas, May 1996) Professor. Variety evaluation and post harvest fruit quality.

**Bryan J. Peterson**, Ph.D. (Iowa State University, 2013). Associate Professor of Horticulture. Propagation, selection, and responsible use of woody ornamental plants. Ecology, ecophysiology, and conservation of native taxa.

**Gregory A. Porter**, Ph.D. (Pennsylvania State University, 1985), Professor of Agronomy. Crop physiology, dry matter partitioning in crop plants, plant pest interactions, and crop management.

**Rachel Schattman**, Ph.D. (University of Vermont, 2016), Assistant Professor of Sustainable Agriculture. Agroecology, climate change, vegetable and small fruit production, water use efficiency, decision making, behavior, risk assessment, mixed methods research.

**Matthew Wallhead**, Ph.D. (University of New Hampshire, 2016), Extension Ornamental Horticulture Specialist and Assistant Professor of Horticulture.

## **Prevention and Intervention (Emphasis)**

### **Prevention and Intervention Studies (Ph.D. in Education concentration)**

Prevention and Intervention Studies is a concentration within the Ph.D. in Education. The concentration focuses on issues related to risk, resilience, prevention, and intervention to increase positive academic and social-behavioral outcomes for preK-12 children and their families. Experiences are designed to prepare candidates to assume positions in teacher education, preK-12 schools, and local, state, or federal agencies. Candidates study and conduct research on risk and protective influences on development, as well as on evidence-based interventions to promote academic achievement and positive social behaviors in school. Potential candidates include special educators, classroom teachers, curriculum coordinators, administrators, and counselors who are committed to the goal of improving outcomes for preK-12 students who are at-risk for academic or social-behavioral difficulties. Study in this area may be of particular interest to individuals involved with design, implementation or evaluation of Multi-Tiered Systems of Support (MTSS) in school or early childhood settings. Applicants must have a prior masters or C.A.S./Ed.S. degree in an educational field relevant to their intended area of research and prior experience working in preK-12 schools.

Program experiences generally take place within cohorts to enable students to experience directly the benefits of collaborative learning, and to model how the complex, real-world problems faced by schools can be addressed through collaboration among professionals who view education through different theoretical and practical lenses. Cohorts begin periodically depending on demand and availability of resources so potential applicants should contact the program coordinator, James Artesani ([arthur.artesani@maine.edu](mailto:arthur.artesani@maine.edu)), before submitting an application.

## **Professional Science Masters Engineering and Business Electrical Engineering Technology**

Professional Science Masters (PSM) degree in Engineering and Business consists of 15 credit hours of engineering courses, nine credit hours of business courses, and six credit hours of applied field experience (GEE 694).

On-line business courses include (must take three):

1. MBA 620: Law, Business, and Society (3 cr.hr.)
2. MBA 626: Management of Contemporary Organizations (3 cr.hr.)
3. BUA 601: Data Analysis for Business (3 cr.hr.)
4. MBA 670: Managerial Marketing (3 cr.hr.)
5. ACC 400: Introduction to Accounting (3 cr.hr.) or its equivalent

The anchor course for the 15 credit hours of engineering courses is ENM 586 Advanced Project Management (3 cr.hr.). This is a required core competence as engineers move into management positions. For this track, the remaining 12 credits of engineering courses would focus on the student's engineering discipline.

Electrical Engineering Technology Concentration of PSM Degree A new concentration on Electrical Engineering Technology (EET) will be added into the PSM degree.

Students of the electrical engineering technology concentration will take the following four core courses:

EET 514: Printed Circuit Board Design (3 cr.hr.)

EET 515: Automation and Integration (3 cr.hr.)

EET 560: Renewable Energy and Electricity Production (3 cr.hr.)

EET 584: Engineering Economics (3 cr.hr.)

With permission, other courses may be substituted for those listed for a track. Prior graduate courses that have been taken by students will be considered on a case by case basis. All four required EET courses are funded through DLL. They have been taught for many semesters and continued DLL funding is anticipated. This graduate program consists of 30 total credit hours.

For more information please contact [ray.hintz@maine.edu](mailto:ray.hintz@maine.edu)

## **Professional Science Masters in Bioinformatics**

The Professional Science Master's (P.S.M.) in Bioinformatics is a 100% online and asynchronous graduate program targeting working professionals offered through the Graduate School of Biomedical Science and Engineering (GSBSE) department.

Bioinformatics is the application of mathematical, statistical, and computational approaches to understand biological processes. The PSM in Bioinformatics brings together interdisciplinary classes across the fields of computer science, spatial information science and engineering, and molecular and cell biology taught by affiliated faculty across the GSBSE research consortium from the University of Maine, The Jackson Laboratory, Mt. Desert Island Biological Laboratory, University of New England, and Maine Medical Center Research Institute.

The PSM provides an opportunity for advanced training directly relevant to current knowledge for their professional careers. Students entering the program are expected to come from a cell and molecular biology background and require more intensive training in math, computer and information science, or from the mathematics, computer or information sciences disciplines and need training in cell and molecular biology. The program requires 30 credit hours for completion.

The home of the program is the GSBSE department which is a multidisciplinary research consortium connecting four external research organizations with the University of Maine as the degree-granting institution. The over 150 affiliated faculty conduct research in a variety of topics, including biomedical engineering, computational biology, bioinformatics, biophysics, bioengineering and nanotechnology, molecular and cell biology, neuroscience, and the molecular mechanisms of disease. The GSBSE contributes to learning and discovery on the emerging frontier of the biological, physical, clinical, and behavioral sciences, preparing new faculty, training scientists and engineers, and furthering Maine's biotechnology and biomedical infrastructure.

In addition to the PSM in Bioinformatics, the GSBSE also offers a Ph.D. in Biomedical Science and a Ph.D. in Biomedical Engineering.

More information on our program can be found on our website at: [gsbse.umaine.edu](http://gsbse.umaine.edu).

## **Professional Science masters in Computer Engineering**

# **Engineering and Business**

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a BS in engineering or engineering technology who want to advance into management positions.

The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer.

On-line tracks in:

- Electrical engineering technology
- Surveying engineering

On-campus tracks in:

- Structures/engineering mechanics
- Computer engineering
- Wireless engineering
- Electrical engineering

### **Educational Objectives:**

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
- Increased potential for career advancement.

### **Required courses (6 credits):**

- ENM 586: Advanced Project Management (3 credits)
- GEE 694: Professional Science Masters in Engineering and Business Internship

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For more information please email: [umaine-engineering@maine.edu](mailto:umaine-engineering@maine.edu)

## **Professional Science Masters in Electrical Engineering**

# **Engineering and Business**

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a BS in engineering or engineering technology who want to advance into management positions.

The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer.

On-line tracks in:

- Electrical engineering technology
- Surveying engineering

On-campus tracks in:

- Structures/engineering mechanics
- Computer engineering
- Wireless engineering
- Electrical engineering

**Educational Objectives:**

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
- Increased potential for career advancement.

**Required courses (6 credits):**

- ENM 586: Advanced Project Management (3 credits)
- GEE 694: Professional Science Masters in Engineering and Business Internship

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For more information please email: [umaine-engineering@maine.edu](mailto:umaine-engineering@maine.edu)

## **Professional Science Masters in Engineering and Business Surveying Engineering**

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a B.S. in engineering or engineering technology who want to advance into management positions. The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer. There are tracks in astronautics, computer engineering, wireless engineering, electrical engineering, and surveying engineering. Additional tracks will be added. The latest list of tracks may be found at: <https://online.umaine.edu/grad/professional-science-masters-in-engineering-and-business/>

**Surveying Engineering Concentration**

Select 4 courses from the following (12 credits):



- SIE 509: Principles of Geographic Information Systems (3 credits)
- SVT 501: Advanced Adjustment Computations (3 credits)
- SVT 511: Geodetic US Public Land Survey Computations (3 credits)
- SVT 512: Advanced Boundary Law (3 credits)
- SVT 531: Advanced Digital Photogrammetry (3 credits)
- SVT 532: Survey Strategies in Use of Lidar (3 credits)
- SVT 541: Geodesy (3 credits)
- SVT 542: Applied Hydrographic Surveying (3 credits)

For more information about the Surveying Engineering concentration, contact Ray Hintz, Program Coordinator, at [ray.hintz@maine.edu](mailto:ray.hintz@maine.edu).

### **Admission**

### **Requirements**

- A bachelor's degree in engineering, engineering technology, math, physics, or equivalent from an accredited program
- A minimum of a 2.5 GPA (3.0 or higher preferred)

### **Application Materials**

When you are ready to apply, please first review these application instructions, then submit the following:

- Online application
- Official academic transcripts

## **Professional Science Masters in Marine Sciences**

# **Professional Science Master's (PSM) Degree in Marine Sciences**

The Professional Science Masters (PSM) degree is a non-thesis, professional practice degree designed to allow students to advance their scientific knowledge while simultaneously developing or enhancing their abilities to apply scientific knowledge in a variety of professional settings, including but not limited to government or non-governmental organizations (NGOs) and private industry. This two-year program includes graduate-level coursework and an approved internship.

The Marine Science PSM degree program is open to qualified traditional and non-traditional students. The prospective student must have a BA or BS from an accredited institution and be able to demonstrate, via transcripts and other means, preparation for graduate-level courses in science and the other requirements of the Marine Science PSM program. **For more information, please contact SMS Associate Director Heather Hamlin at [heather.hamlin@maine.edu](mailto:heather.hamlin@maine.edu)**

### **Advisor**

Students will be first accepted by an advisor prior to their formal acceptance into the PSM Program. Students generally are not admitted "at large," but must have identified a major professor (advisor) who agrees to direct and help guide them through the program. In most cases this advisor will work with the student throughout his or her degree program. The student should discuss professional development interests with the advisor, and if their interests are misaligned, the student should pursue a change of advisor as early as possible in the program, although such changes are unusual.

*\*\*Advisor-advisee relationships are unique and different for each student. Some advisors and advisees get along remarkably well and have a strong friendship as well as a strong sense of mentoring, while some advisors and students have a strictly professional relationship. Some advisors are "hands-on" in their approach to mentoring students, while other advisors take a more distant approach. Each student will have a different chemistry with the advisor. The key to having a good relationship is to have open lines of communication. A lot of frustration and confusion occurs because either the student or advisor miscommunicated. Sometimes an outside member of the faculty or program coordinator can help to smooth over a difficult relationship. \*\**

Following successful admission through the UMaine Graduate School, students will be accepted to the PSM program once his/her advisor has been identified and confirmed. An advisory committee is not required in this program.

This advisor must be a member of the SMS Graduate Faculty. In his/her first semester and in consultation with their advisor, the student will create a plan of study that identifies the skill sets s/he is seeking to develop and the courses and internship that will enable him/her to achieve those competencies.

### **Program of Study**

The PSM in Marine Sciences requires a minimum of 30 semester credit hours, including 5 credit hours in an internship (details below).

- A minimum of **15 course credit hours** must be completed from List #1 below - six of these credits must come from a set of core courses. Up to six of the 15 credits may be 400-level courses. The student's advisor and PSM program coordinator may approve substitute courses for those in List #1, if (1) the course is highly relevant to the student's career goals, and (2) the student's background in marine sciences is deemed otherwise sufficient for a Master's degree in this field. Relevant non-marine science course areas include but are not limited to anthropology, communications, biology and ecology, business administration, conservation biology and wildlife ecology, climate science, engineering, mathematics and statistics, psychology, public policy, resource economics, and sociology.
- A minimum of 9 course **credit hours** of professional skills coursework is required (List #2). Students must also take one credit of the marine sciences graduate seminar, SMS 691. Finally, a minimum of five credits of an approved internship is required for completion of this program.
- The internship (**5 credits**) is an important part of the PSM degree and must make a meaningful contribution to the individual's professional development. The purpose of an internship is to immerse the student in an area of professional practice.
  - In the case of an individual on leave from work, the internship may take place at that person's place of employment, but must involve marine science and policy activities that go beyond the individual's normal scope of work and responsibilities.
  - The student's advisor will work with him/her to help identify and develop the internship. Internship hosts may include a local, state or federal government agency; non-profit organization, or private business. Potential opportunities also exist within the University of Maine System, through units such as the Center for Cooperative Aquaculture Research; Darling Marine Center; University of Maine Sea Grant Extension Program; and University of Maine School of Law. PSM candidates are free to identify other internship possibilities in or beyond Maine. While faculty will help identify and develop opportunities, it is ultimately the student's responsibility, with guidance and approval of the student's advisor, to arrange the internship.

Specific requirements are outlined below. SMS course descriptions are provided elsewhere in the Graduate Catalog.

### **Degree Requirements**

1. *Course List #1: Fifteen (15) credits in marine science and policy* <sup>[1]</sup>, to include:

1. Marine Science Core (3 credits, e.g., one course, from among the following):

SMS 500 Marine Biology

SMS 501 Biological Oceanography

SMS 520 Chemical Oceanography

SMS 525 Marine Biogeochemistry

SMS 541 Physical Oceanography

SMS 484 Estuarine Oceanography

-

1. Marine Policy Core (3 credits from among the following. Another course may be substituted with permission from the advisor and program coordinator):

SMS 552 Coupled Natural and Human Systems

SMS 563 Fisheries Policy

SMS 567 Knowledge and Participation in the Science Policy Process

SMS 598 Decision making under Uncertainty

SMS 598 Marine Resource Management

1. Other Science and Policy Courses (9 credits, 3 must be at the 500-600 level)

SMS xxx Includes any course at the 400 level or above not already selected from the list of marine science and policy core courses listed in (1) or (2)

SMS 514 Ecology of Marine Sediments

SMS 531 Coral Reef Ecology

SMS 540 Satellite Oceanography

SMS 544 Oceanography and Natural History of the Gulf of Maine

SMS 550 Fisheries Oceanography

SMS 553 Institutions and the Management of Common Pool Resources

SMS 560 Marine Geology

SMS 562 Fisheries Population Dynamics

SMS 585 Marine System Modeling

SMS 595 Data Analysis Methods in Marine Sciences

INT 510 Marine Invertebrate Zoology

*A student may select one from among the following:*

SMS 597 Independent Study

SMS 598 Special Topics in Marine Science

SMS 692 Problems in Marine Science I (Fall)

SMS 693 Problems in Marine Science II (Spring)

SMS 697 Readings in Marine Science

*SMS 400-level courses of potential interest:*

SMS 401 Critical Issues in Aquaculture

SMS 402 Oceans and Climate Change

SMS 409 Shellfish Aquaculture

SMS 420 Fish Aquaculture I

SMS 421 Fish Aquaculture II

SMS 422 Biology of Fishes

SMS 425 Applied Population Genetics

SMS 480 Invertebrate Biology

SMS 373/598 Marine and Freshwater Algae

SMS 491 Fisheries Ecology

*Courses outside of SMS are also an option:*

A student may elect to take up to three 400-600 level science or policy courses through another school or department at the University of Maine provided that (1) the selection is approved by the student's advisor and the program coordinator, and (2) the student is considered to have an otherwise adequate background in marine sciences for a PSM in Marine Sciences.

2. **Course List #2. Nine (9) credits of professional skills coursework.** These courses may come from any unit at the University of Maine. Students are encouraged to gain competency in multiple professional skill areas, including but not limited to Science Communication; Analysis of Large Data Sets; Data Visualization;

Participatory and Co-production of Research; and Facilitation. UMaine graduate programs that offer relevant courses to fulfill this requirement include but are not limited to: Business Administration, Civil and Environmental Engineering, Communication, Computer Science, Economics, Education, Mathematics and Statistics, Public Administration, Resource Economics and Policy, Spatial Information Engineering.

3. *One (1) credit graduate seminar, SMS 691.*
4. *Five (5) credits of internship as approved by student's advisor.*
5. **Participation in the SMS Graduate Symposium during each year of full-time study (part-time students must participate at least every other year).**

Participating faculty include all members of the SMS Graduate Faculty. Please see <https://umaine.edu/marine/smspeople/> for an up to date list.

Per the policies of the UMaine Graduate School, grounds for dismissal or probation of a student are as follows:

1. Any grade lower than a "B-" in a course prescribed by the student's Advisory Committee
2. Any report to the Marine Biology degree program faculty from the Advisor or any faculty member indicating dissatisfaction with the student's progress. In this case, the report must be discussed at a meeting of a quorum of Marine Biology degree program faculty, who shall vote on any subsequent action.

<sup>[1]</sup> Note that some of these courses have specific requirements that would need to be met before enrollment.

## **Professional Science Masters in Structures Engineering Mechanics**

## **Engineering and Business**

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a BS in engineering or engineering technology who want to advance into management positions.

The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer.

On-line tracks in:

- Electrical engineering technology
- Surveying engineering

On-campus tracks in:

- Structures/engineering mechanics
- Computer engineering
- Wireless engineering
- Electrical engineering

**Educational Objectives:**

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
- Increased potential for career advancement.

**Required courses (6 credits):**

- ENM 586: Advanced Project Management (3 credits)
- GEE 694: Professional Science Masters in Engineering and Business Internship

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For more information please email: [umaine-engineering@maine.edu](mailto:umaine-engineering@maine.edu)

## **Professional Science Masters in Wireless Engineering Engineering and Business**

The Professional Science Masters (PSM) in Engineering and Business is intended for students who have a BS in engineering or engineering technology who want to advance into management positions.

The degree combines advanced engineering and business courses with applied field experience. The applied field experience integrates the new skills learned by the student with their needs and the needs of their employer.

On-line tracks in:

- Electrical engineering technology
- Surveying engineering

On-campus tracks in:

- Structures/engineering mechanics
- Computer engineering
- Wireless engineering
- Electrical engineering

#### **Educational Objectives:**

- Increased technical knowledge in the student's area of engineering practice.
- Meet the education requirements to become a Project Management Professional as certified by the Project Management Institute.
- Enhanced personnel and financial management skills.
- Technical and management skills that are integrated with the needs of their employers.
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- ENM 586: Advanced Project Management (3 credits)
- GEE 694: Professional Science Masters in Engineering and Business Internship

Students must complete an additional 12 credits of approved advanced engineering courses and 9 credits of approved business or economics courses.

For more information please email: [umaine-engineering@maine.edu](mailto:umaine-engineering@maine.edu)

## **Psychology**

The Department of Psychology offers graduate study leading to the M.A. and Ph.D. degree in Psychological Sciences (including social, cognitive, and biological psychology) and to the Ph.D. degree in Clinical Psychology.

Candidates for admission are expected to meet the general requirements of the Graduate School and to have completed fundamental courses in psychology as undergraduates, including a laboratory course in research methods of psychology and a course in basic statistics. Applications for the Clinical Psychology program are due Dec. 1, and all other programs are due Dec. 31, for a September admission.

The Department of Psychology believes the best graduate education involves close working relationships between faculty and students. Thus, a high faculty-to-student ratio and small class size characterize our graduate programs. Every incoming student works directly with a faculty mentor as a means of gaining valuable research, teaching, and professional experience. There also are opportunities for individualized study and experience in directed readings, research, and supervised teaching. A faculty committee, selected to represent the student's interest, will assist the student in planning an appropriate program of study.

The programs leading to the Ph.D. in Psychological Sciences and Clinical Psychology include a residence requirement as specified in the general section of the graduate catalog. However, the time required to complete course work and a dissertation based upon an original investigation ordinarily is longer than that required for residence.

#### **Program in Psychological Sciences**

The goal of this program is to prepare students for careers in teaching and research. All students are expected to demonstrate a high level of competence in one of the specialty areas listed below. Students are also expected to demonstrate competence in statistics and experimental design, and in several areas of general psychology outside their

specialty area. Competence is assessed in terms of performance in courses, research projects, teaching, and a comprehensive examination. The comprehensive exam is given at the end of the second year of graduate study or at the end of the first year for students entering with a master's degree from another university. The Department offers the following specialty areas within Psychological Sciences:

#### *Cognitive and Biological Psychology*

This program covers several basic areas of experimental psychology, including cognition, perception, biopsychology, and behavioral neuroscience. Students develop research skills and conduct research in at least one specialty area. Students also become familiar with areas of general psychology outside their specialty, and with statistics and experimental design. Students work closely with a research advisor and begin research involvement in the first year. There are many opportunities for individualized study and directed readings. Opportunities for teaching are available to advanced graduate students. Applicants should write to faculty members in their area of interest, with whom they might want to do research. (Faculty: Cobo-Lewis, Ell, Fremouw, Robbins)

#### *Social Psychology*

By emphasizing basic and applied research at the Ph.D. level, the social psychology program aims to produce well-rounded academicians and practitioners by fostering a solid understanding of theory and research in social psychology, as well as knowledge of how social research may be applied to solve practical problems. The program operates on an apprenticeship model by which students work closely with faculty members on theory-driven research. Students are trained to think conceptually and to acquire proficiency in research methodology, statistics, scholarly writing, oral presentation, and teaching. Faculty research specializations include stereotyping and prejudice, personal and social identity management, social cognition, political attitudes, attraction, person perception, nonverbal communication, and health disparities. (Faculty: LaBouff, McCoy, Ruben)

#### **Program in Clinical Psychology**

The Clinical Psychology Training Program prepares students for the doctorate (Ph.D.) in psychology and for careers combining research and clinical practice. While students earn a master's degree (M.A.) on the way to earning their Ph.D., a terminal M.A. program in Clinical Psychology is not available. The program is accredited by the American Psychological Association and adheres to the scientist-practitioner model.

An academic core provides the foundation of knowledge in the areas of general and experimental psychology as well as psychotherapy, psychopathology, assessment, professional issues and ethics, and clinical research methods. Clinical training is centered on course work, individual tutorials in research, and clinical experiences supervised by professional models actively engaged in careers in those areas. Students are given increasing responsibility for the content and emphasis of their training by being encouraged to sample a wide variety of training opportunities at the University and in the community. They are encouraged to articulate career objectives early in training, and to contribute to modifications in the program to meet their goals. Applicants are urged to match their interests with those of the clinical psychology faculty and to specify areas of compatibility. All training is based on a generalist model, in which students are broadly trained to work with children, adolescents, and adults. Building on this foundation, students may also choose to specialize by completing one of two emphases; child clinical and neuropsychology. The Psychology Department's Psychological Services Center serves as the primary practicum training site with additional practicum experiences available at inpatient, outpatient, community, and hospital settings elsewhere in Maine. Core training in the traditional areas of clinical psychology is supplemented with opportunities for innovative approaches to psychotherapy and community involvement; geographic considerations permit special attention to rural problems.

Ph.D. training culminates with the doctoral dissertation and a full-year internship in an approved clinical setting. (Faculty: Ahmed, Erdley, Goodhines, Haigh, Hecker, MacAulay, Nangle, Schwartz-Mette)

#### **Research Facilities**

Facilities for experimental and clinical research include laboratories for the study of human and animal behavior, cognition, perception, and emotion. Departmental research foci include mood disorders, peer relations, developmental psychopathology, cognitive aging, neuropsychology, and biological, social and cognitive factors influencing health and



well-being. There are rooms designed for observation and audio-visual recording of behavior, as well as electrically shielded rooms for psychophysiological recordings. The department also operates a psychology clinic (Psychological Services Center). Through faculty affiliation with Northern Light Healthcare Systems, research opportunities may also be available through Eastern Maine Medical Center, Acadia hospital as well as other local health service providers.

## **Graduate Faculty**

**Fayeza Ahmed, Ph.D.** (University of Georgia, 2011). Assistant Professor. Adult and geriatric neuropsychology, health factors/behaviors and risk for cognitive decline, dementia caregiver stress, and wellness/aging in place.

**Alan B. Cobo-Lewis, Ph.D.** (University of Wisconsin, 1992), Associate Professor. Visual perception; language development; statistical and computational methods.

**Shawn Ell, Ph.D.** (University of California, Santa Barbara, 2003), Associate Professor. Neurobiology of learning and memory, categorization, skill learning, implicit and explicit memory, computational modeling, working memory, basal ganglia, cognitive neuroscience.

**Cynthia A. Erdley, Ph.D.** (University of Illinois, 1992), Professor. Social cognition, children's peer relationship experiences and psychological adjustment.

**Thane Fremouw, Ph.D.** (University of Utah, 1998), Associate Professor. Cognition, brain, & behavior; auditory neurophysiology; auditory perception; neural basis of cognition, learning, and memory.

**Patricia A. Goodhines, Ph.D.** (Syracuse University, 2022), Assistant Professor. Health disparities, sleep, substance use.

**Benjamin Guenther, Ph. D.** (University of Georgia, 2011). Sensation and perception, visual attention, human-computer interaction.

**Emily A.P. Haigh, Ph.D.** (Kent State University, 2009), Associate Professor and Director of Clinical Training. Cognitive vulnerability to mood disorders, biological correlates of the cognitive model of depression.

**Jeffrey E. Hecker, Ph.D.** (University of Maine, 1986), Professor. Sexual offending risk assessment; anxiety disorders. Currently serving as Provost and Vice-President for Academic Affairs.

**Jordan P. LaBouff, Ph.D.** (Baylor University, 2011) Assistant Professor. Social psychology of religion and spirituality, intergroup bias, and humility; pedagogy and research methodology.

**Rebecca MacAulay, Ph.D.** (Louisiana State University, 2016). Assistant Professor. Aging, cognition, and emotion regulation across the adult life span, biopsychosocial models of cognitive aging and risk and resiliency for dementia, and neuropsychological assessment and foundations in clinical psychology training.

**Shannon McCoy, Ph.D.** (University of California, Santa Barbara, 2003), Associate Professor. Social psychological study of the self, social identity, and social stigma.

**Douglas W. Nangle, Ph.D.** (West Virginia University, 1993), Professor. Child and adolescent peer relations; close relationships and psychological adjustment; social skills assessment and intervention.

**Michael A. Robbins, Ph.D.** (University of Maine, 1985), Research Associate Professor. Biopsychosocial correlates of cognitive aging.

**Mollie Ruben, Ph.D.** (Northeastern University, 2014), Assistant Professor. Social psychology of perceiving others accurately; nonverbal communication in social and professional (i.e., patient-provider) interactions; physical pain; LGBTQ health disparities.

**Rebecca Schwartz-Mette, Ph.D.** (University of Missouri, 2013). Associate Professor. Psychopathology and peer relationships in adolescence; interpersonal theories of depression; ethics and graduate training in clinical psychology.

## Resource Economics and Policy

The **Master of Science in Resource Economics and Policy** program emphasizes how economic theory and tools can be applied to environmental theory and quantitative methods with specialized environmental, natural resource, agricultural, and energy economics and policy training. Graduate Economics creates numerous opportunities for graduate students to expand their horizons by involving them in ongoing research projects, partnerships,

Graduates from the Resource Economics and Policy program acquire strong analytical, quantitative, and communication skills, which prepare them for consulting firms, businesses, and non-profit organizations. The program includes thesis and non-thesis options and prepares students for positions in various issues.

### Admission Requirements

Admission to the School of Economics is competitive. An undergraduate degree in economics or a related field is desirable, but not essential for previous work. Below is a list of **required** and **recommended courses**. Applicants seeking *admission* generally achieve a B or better in these courses and have a **3.5 GPA** or higher. Applicants with lower grades/GPA may be admitted/funded, especially if they have unique experiences that demonstrate Economics.

Required Courses (UMaine equivalent\*):

- Intermediate Microeconomic Theory (ECO 350)
- Statistics (STS 215 or 232)
- Calculus I (MAT 126)

Strongly Recommended but Not Required (UMaine equivalent\*):

- Calculus II (MAT 127)
- Calculus III (MAT 228)
- Linear Algebra (MAT 262)
- Mathematical Economics (ECO 480)
- Econometrics (ECO 485)
- Computer Programming experience (e.g., R, Matlab, Python)

*\*Descriptions for UMaine equivalent courses can be found in the UMaine Undergraduate Catalog: <http://catalog.umaine.edu/>*

In addition to the required and recommended courses listed above, we expect: 1) a strong, well-written personal **essay** that clearly communicates professional goals; the essay should also demonstrate the potential for the applicant to succeed when faced with challenges; 2) strong **letters of recommendation** (from an advisor, job supervisor, etc.), which demonstrate the applicant's ability to be successful in a rigorous graduate program; 3) a well-written and clear statement of purpose. Faculty evaluate applications where there is uncertainty about potential success in the program. They are recommended but not required. GRE scores are not required.

Official English proficiency examination scores are required unless you received a degree from an English-speaking institution. For more information, see the International Student Services website. TOEFL scores must be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher. To obtain **funding**, scores must be above 92, 237 or 580 (on the internet, computer or paper-based exams, respectively), or IELTS scores to be 6.9 or higher.

Other general admission criteria are described in the Admission section of this catalog.

## Degree Requirements

Successful completion of 30 credit hours of course work is required for the Master of Science in Resource Economics and Policy Degree. Students have the opportunity to complete an independent research project under the guidance of an economics faculty member. The non-thesis option is designed for students who prefer electives.

The core required ECO courses for this M.S. degree provide students with the tools and problem-solving skills applicable to the economic analysis of environmental issues.

Graduate students in this program are required to complete the following sequence of courses (credits in parentheses):

- ECO 514 Microeconomic Theory (3)
- ECO 530 Econometrics (3)
- ECO 531 Advanced Econometrics and Applications (3)
- ECO 571 Advanced Environmental and Resource Economics I (3)
- ECO 572 Advanced Environmental and Resource Economics II (3)
- ECO elective credits (3-6\*)
- Additional elective credits (6-9\*)
- ECO 699 Graduate Thesis (6\*)

\*The THESIS track requires 6 credits of ECO 699 (the non-thesis track does not), which reduces the number of ECO elective credits to 3 and additional elective credits to 6-9.

Elective coursework, independent studies, and thesis work are developed in consultation with the student's advisor(s). The areas of interest, background, and career goals of the student are taken into account.

\*Descriptions for all UMaine Graduate level courses can be found in the UMaine Graduate Catalog: <http://gradcatalog.umaine.edu/>

## Funding Support

The School of Economics awards graduate assistantships to qualified students on a competitive basis. Graduate assistantships may be awarded for up to 12 months. Scholarship funding is also available. The faculty nominates top-ranking applicants for these awards. Funding support includes a stipend, tuition, and travel. Graduate assistantships require 20 hours of work per week. For details on funding opportunities visit the School of Economics Graduate Program website: <http://economics.umaine.edu/graduate>

## Dual Degree in Global Policy and Economics

The School of Policy and International Affairs and the School of Economics offer an interdisciplinary dual degree program in Global Policy and Economics.

The dual-degree program is intended for students interested in the application of economics and policy in an international setting. The course of study consists of one in *International Environmental Policy* and one in one of our Economics or Resource Economics and Policy degrees.

Students are required to complete the requirements for a master's degree in one of the economic sciences (Economics; Resource Economics and Policy).

Six hours of each degree can be counted as electives for the other (i.e., a total of 12 credits can be double counted); as a result, a total of only 51 credits are required for the dual degree.

### Thesis / Internship options for the dual degree:

1. For thesis students in the Economics program: a thesis is written for the economics degree; an internship is completed for the Global Policy and Economics degree.
2. For non-thesis students in the Economics program: six credit hours in coursework replace the thesis requirement for the economics degree; an internship is completed for the Global Policy and Economics degree.
3. A separate thesis may be written for the economics degree and for the Global Policy degree.

Students in the dual-degree program will have two graduate coordinators, one from SPIA and one from SOE. Graduate advising committees, which are developed and approved by the respective unit's committee (SPIA and SOE) and the respective graduate program coordinators by the end of the integrated SPIA/SOE committee with two co-chairs (one from SPIA and one from SOE).

The programs of study will be designed to meet the requirements of BOTH degrees in which they are enrolled. However, the dual degree program

### **Graduate Faculty**

The School of Economics Graduate Faculty includes faculty with economics, engineering, law, psychology, public policy, and human ecology expertise.

**Mario Teisl**, Ph.D. (University of Maryland), Professor and Director. Information economics, food safety, environmental and social marketing, and food systems.

**Christine Beitzl**, Ph.D. (University of Georgia) Cooperating Assistant Professor of Anthropology, Ph.D. Ecological and Environmental Anthropology.

**Kathleen Bell**, Ph.D. (University of Maryland), Professor. Environmental economics, public economics, and spatial economics.

**James Breece**, Ph.D. (Boston College), Associate Professor. Macroeconomics, international trade, economic forecasting.

**Andrew Crawley**, Ph.D. (University of Glamorgan) Associate Professor in Regional Economic Development. Economic impact, economic modeling.

**Adam Daigneault**, Ph.D. (The Ohio State University) Cooperating Assistant Professor of Forest, Conservation, and Recreation Policy. Freshwater resources.

**Angela Daley**, Ph.D. (Dalhousie University) Associate Professor of Health Economics and Policy. Health and labor economics, poverty and income inequality.

**Keith S. Evans**, Ph.D. (Iowa State University) Associate Professor. Search; learning; Information sharing; fishery management; nonmarket valuation.

**Todd Gabe**, Ph.D. (Ohio State University), Professor. Regional and community economic development and public finance.

**Sharon Klein**, Ph.D. (Carnegie Mellon University), Associate Professor. Technical, economic, environmental, and social/policy impacts of renewable energy.

**Jessica Leahy**, Ph.D. (University of Minnesota) Cooperating Professor of Human Dimensions of Natural Resources. Environmental attitudes and behavior.

**Jonathan Malacarne**, Ph.D. (University of California-Davis) Assistant Professor. Development Economics, Agricultural Economics.

**Caroline Noblet**, Ph.D. (University of Maine), Associate Professor. Environmental economics and psychology.

**Jonathan Rubin**, Ph.D. (University of California-Davis), Professor. Environmental regulation and design, economics of alternative transportation.

**Philip Trostel**, Ph.D. (Texas A & M University), Professor. Human capital and savings, public economics, and labor economics.

**Tim Waring**, Ph.D. (University of California-Davis), Associate Professor. Sustainability, cultural evolution, and human culture and cooperation.

**Tommy Wiesen**, Ph.D. (University of Georgia), Assistant Professor. Macroeconomics, Time Series Analysis, Econometric Methods, Financial Economics.

## **Response to Intervention for Behavior (RTI-B) (Certificate)**

**Response to Intervention (RTI)** is a model that focuses on evidence-based methods of prevention and intervention combined with data-based decision making to improve student behavioral and academic outcomes. The purpose of this certificate is to provide a sequence of courses that prepares school personnel to lead the development, implementation, evaluation, and sustainability of a three-tiered continuum of behavioral support and intervention in school settings.

This certificate program will provide a sequence of coursework based on a multi-tiered service delivery model consistent with requirements of federal and state law. Students will have the knowledge and skills to provide support to students with intensive behavioral needs, provide leadership to their schools, serve as "coaches" in supporting school implementation in their schools. Visit the Education and Human Development website for additional information.

## **Rural Integrated Behavioral Health in Primary Care**

This graduate certificate is designed to be completed in a single year by learners in both psychology and social work programs. It is supported by a \$1.48 million grant from the Health Resources and Services Administration (HSRA). Ten of sixteen counties in Maine have a shortage of mental health professionals, with this certificate addressing this shortage through developing experiential learning opportunities of social work and clinical psychology in rural health care settings.

This program can only be completed by those currently enrolled in Psychology or Social Work.

## **Science and Mathematics Education (MST)**

The Master of Science in Teaching (MST) is offered by the University's Center for Research in STEM Education. The MST program is a content rich research based master's degree for the improvement of learning in science and mathematics. The program is designed to increase the number of qualified teachers in science and mathematics and to offer a research-based professional development opportunity for pre- and in-service teachers seeking Master's degrees. The program also attracts doctoral students interested in improving their knowledge of teaching.

The MST is a 31-credit Master's program requiring specific coursework, a research thesis, and guided teaching experiences in introductory science and mathematics courses on campus. Students will participate in and understand the results of education research in their discipline(s) and its application to teaching and learning. Students may use the degree to work toward teacher certification by choosing electives that meet some certification requirements, including a student teaching experience in a secondary classroom. The MST's initial certification track for secondary science and mathematics is approved by the National Council for Accreditation of Teacher Education.

### MST Concentrations

Concentrations currently available:

- Earth Science
- Mathematics
- Physics and Astronomy
- Generalist

The Master of Science in Teaching program is designed for:

- Recent graduates from science, mathematics, and engineering programs who want to prepare for a career in secondary science or mathematics teaching.
- In-service teachers desiring a Master's degree containing courses that integrate content with research-based science or mathematics instruction.
- Scientists, mathematicians, engineers, and those in related fields wishing to make career changes into secondary science or mathematics teaching.

### Program Highlights

- The MST coursework is rich in discipline-specific content and focused on the integration of that content with research-based instructional "best practices." Coupling this coursework with thesis research into student learning and supervised teaching experiences prepares MST students to engage in research-based instruction and develop teaching and learning philosophies consistent with it.
- Each MST student is required to conduct a thesis project based upon original research related to the teaching and learning of science or mathematics. Additional research opportunities exist for MST students through a UMaine collaboration with the Jackson Laboratory in Bar Harbor and through independent study projects in the UMaine science and mathematics departments.
- Courses are offered late in the day and rotated through the summer sessions, so part-time students may tailor their study to their individual schedules. Practicing teachers are encouraged to develop thesis projects that take advantage of the teaching and learning in their own classrooms. Since full-time students generally receive teaching or research assistantships, some teachers might find it beneficial to take a year's sabbatical and spend it on campus completing part of the requirements for the MST, while being supported by a graduate assistantship.

Participants in this program will:

- Strengthen their backgrounds in the subjects that they teach;
- Study topics included in the Learning Results but often not covered in traditional introductory science and mathematics courses;
- Learn science and mathematics in courses taught using research-guided pedagogy and curricula, including hands-on, inquiry based methods;
- Participate in courses that combine content and methods, rather than taking separate content and methods courses;
- Learn how to design, conduct, and interpret science and mathematics education research;
- Obtain training in the effective use of technology in the secondary classroom;
- Have supervised teaching experience in classrooms implementing best practices indicated from research; and
- Work toward certification to teach at the secondary level in their field (if desired).

### Assistantships

Teaching and research assistantships, including stipends and tuition waivers, are available for students accepted for full-time MST study.

### Applications

Applications are considered for full- or part-time study, beginning in the spring or fall semester. The MST application deadline is rolling, although, for full consideration for an assistantship, applications for fall admission should be received by January 15th and for spring admission should be received by October 31<sup>st</sup>. Applications received later will be considered for financial support if funds are still available.

Application and additional information may be obtained from:

- UMaine Graduate School Website: [www.umaine.edu/graduate](http://www.umaine.edu/graduate)
- MST Website: <https://umaine.edu/risecenter/graduate-studies/>

- Professor Deborah Shulman, Director of the Center for Research in STEM Education and MST Graduate Coordinator, [mstinfo@maine.edu](mailto:mstinfo@maine.edu)

Further information about the MST program may be found at:

<https://umaine.edu/risecenter/graduate-studies/>

### MST Prerequisites

The prerequisites for the MST program differ for each of the concentrations, but generally include:

- An undergraduate degree in a field closely related to science, mathematics, or secondary education
- A course in psychology
- Grades of B or better in undergraduate introductory science and/or mathematics courses (see the MST website for the specific requirements for each concentration)
- Passing score on all required Praxis exams (for students working toward certification)

## RiSE Graduate Faculty

**Asli Sezen-Barrie**, Ph.D. (Penn State University), Assistant Professor of Science Education

email: [asli.sezenbarrie@maine.edu](mailto:asli.sezenbarrie@maine.edu)

**Francois Amar**, Ph.D. (University of Chicago, 1979), Associate Professor of Chemistry

email: [amar@maine.edu](mailto:amar@maine.edu)

**David Batuski**, Ph.D. (University of New Mexico, 1986), Chair, Dept. of Physics & Astronomy & Professor of Physics

email: [batuski@maine.edu](mailto:batuski@maine.edu)

**Elizabeth Hufnagel**, Ph.D. (Pennsylvania State University), Assistant Professor of Science Education

email: [Elizabeth.hufnagel@maine.edu](mailto:Elizabeth.hufnagel@maine.edu)

**Justin Dimmel**, Ph.D. (University of Michigan), Assistant Professor of Mathematics Education and Instructional Technology

email: [Justin.dimmel@maine.edu](mailto:Justin.dimmel@maine.edu)

**Mitchell Bruce**, Ph.D. (Columbia University , 1985) Associate Professor of Chemistry

email: [mitchell.bruce@umit.maine.edu](mailto:mitchell.bruce@umit.maine.edu)

**Robert Franzosa**, Ph.D. (Wisconsin, 1984), Professor of Mathematics

email: [franzosa@math.umaine.edu](mailto:franzosa@math.umaine.edu)

**Christopher Gerbi**, Ph.D. (University of Maine, 2005), Assistant Professor of Mineralogy/Rheology, Department of Earth Sciences

email: christopher.gerbi@maine.edu

**Franziska Peterson**, Ph.D. (University of Wyoming, 2016), Assistant Professor of Mathematics

email: franziska.peterson@maine.edu

**Sara M. Lindsay**, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Science

email: slindsay@maine.edu

**Sarah J Nelson**, Ph.D. (University of Maine, 2007), Associate Research Professor in Watershed Biogeochemistry

email: sarah.j.nelson@maine.edu

**Susan McKay**, Ph.D. (Massachusetts Institute of Technology, 1987), Director, Center for Research in STEM Education and Professor of Physics

email: Susan.McKay@umit.maine.edu

**Eric Pandiscio**, Ph.D. (University of Texas at Austin, 1994), Associate Professor of Mathematics Education

email: eric.pandiscio@umit.maine.edu

**John Thompson**, Ph.D. (Brown University, 1998), Assistant Professor of Physics and Cooperating Assistant Professor of Education

email: Thompsonj@maine.edu

**Molly Schauffler**, Ph.D. (University of Maine, 1988), Assistant Professor, Climate Change Institute

email: mschauff@maine.edu

**Natasha Speer**, Ph.D. (University of California at Berkeley, 2001), Assistant Professor of Mathematics Education

email: speer@math.umaine.edu

**MacKenzie Stetzer**, Ph.D. (University of Pennsylvania, 2000), Assistant Professor of Physics

email: mackenzie.stetzer@maine.edu

**John Thompson**, Ph.D. (Brown University, 1998), Assistant Professor of Physics and Cooperating Assistant Professor of Education

email: John.Thompson@umit.maine.edu

**Michael Wittmann**, Ph.D. (University of Maryland, College Park, 1998), Associate Professor of Physics and Cooperating Associate Professor of Education

email: Michael.Wittmann@umit.maine.edu

More information on RiSE Center graduate faculty can be found here: <https://umaine.edu/risecenter/about-us/faculty-page/>

Further information, including research interests, may be found on the MST program website.

## Secondary Education

Curriculum, Assessment and Instruction (M.S., M.Ed., Ed.S.)



**Master of Science (M.S.):** The M.S. is a research-oriented degree which culminates in conducting a master's thesis, guided by a committee of three faculty from the program or related fields. This is a 30-credit-hour program, including six credits of thesis research. Four courses (12 credits) are the same as for the M.Ed., as follows:

EHD 521 - Classroom Practice to Improve Learning  
EHD 533 - Dynamics of the Curriculum  
EHD 519 - Formative Assessments: Research, Practice and Policy  
EHD 541 - Prevention and Intervention in School Settings

M.S. only requirement:

EHD 510 - Introduction to Educational Research

In addition, students must complete six credits of thesis and three credits of research methods (Educational Research (EHD 575); Statistical Methods in Education (EHD 573); or Qualitative Research: Theory, Design, and Practice (EHD 571), as well as a three-course area of specialization chosen in consultation with the adviser and approved by the thesis committee. Depending on the student's prior coursework, experience, and the thesis topic, the thesis committee may require a second research methods course in place of one of the specialization courses.

**Master's of Education (M.Ed.):** The Master of Education program in Curriculum, Assessment and Instruction is designed for teachers who, while continuing a career in classroom teaching, seek to assume responsibility and leadership roles in enhancing standards in the areas of curriculum, assessment and instruction. The degree requires a minimum of 33 credit hours and is offered either completely online or through a combination of online and on-campus courses. The following six online courses (18 credits) are required of all students:

EHD 521 - Classroom Practice to Improve Learning  
EHD 533 - Dynamics of the Curriculum  
EHD 519 - Formative Assessments: Research, Practice and Policy  
EHD 541 - Prevention and Intervention in School Settings  
EHD 586 - Seminar: Action Research in PreK-12 Schools - offered Fall only.  
EHD 587 - Practicum: Action Research in PreK-12 Schools - offered Spring only.

The **Education Specialist (Ed.S.)** provides a cohesive program of professional development beyond the master's level for educational specialists. A master's degree in the Ed.S. subject matter or related area is required for admission. The program of study is individually planned by the student and the student's advisor. For candidates with a master's degree in the subject matter, a minimum of 30 credit hours of work beyond the master's level is required to earn the Ed.S. Candidates without a master's degree in the subject matter will be required to complete additional credits beyond the program's minimum degree requirements. Candidates must complete a minimum of 12 semester hours in professional education coursework at the 500- and/or 600-level at the University of Maine. All work for the Ed.S. must be completed within six years.

## Social Work

The School of Social Work offers graduate study leading to the Master of Social Work (MSW) degree. The goal of the program is to prepare graduates for advanced practice from a generalist perspective in a wide range of social work settings. Using a combination of cognitive work in the classroom and guided experience in field practicums, the curriculum covers five course content areas: human behavior in the social environment, social welfare policies and services, research, social work practice, and field education. The curriculum provides opportunity for students to acquire, test, and refine the knowledge, skills, and values necessary for practice as professional social workers. There

are two avenues to the Master of Social Work degree, the regular program and the advanced standing program. The MSW requires 63 credit hours of study for the regular program and 46 credit hours for the advanced standing program, and may be taken on a full-time or part-time basis. (Both the School's full-time and part-time programs are considered full time by the Graduate School and Financial Aid Office.)

Upon completion of the MSW degree, graduates are prepared to seek licensing as Licensed Master Social Workers (LMSW) by successfully completing the examination offered by the Maine State Board of Social Work Licensure. After a prescribed period of satisfactory, supervised post-MSW practice in a mental health setting, graduates who have met certain academic requirements are qualified to be examined for licensing as Licensed Clinical Social Workers (LCSW). The regular program consists of 45 credit hours of classroom work and 18 credits of supervised practicum. The practicum includes a minimum of 900 clock hours divided between two agency settings. The full-time (two-year) program is designed to be completed in four semesters. The part-time extended (four-year) program is designed to be completed in four years. The full-time (one-year) program for advanced standing students includes a nine-week online summer session and two semesters. The part-time (two-year) advanced standing program includes the nine week summer session and four semesters.

Each year the School of Social Work offers a three-year (including summers) online-blended Program. Most classes are taught asynchronously online, but each class has two in-person meetings on Saturday on the Orono campus. The seminars that accompany the field practicums are taught synchronously on line on Monday evenings. Advanced standing students may join the online-blended program for the final two years, after completing their summer bridge courses. The online-blended program is available only to residents in Maine, New Hampshire and Vermont

Except for the online-blended program, classroom courses are offered in Orono on consecutive weekdays. Practicum sites are, when possible, selected near students' home communities.

Students with BSW or BASW degrees obtained no more than seven years prior to application, from undergraduate social work programs accredited by the Council on Social Work Education may be eligible for advanced standing upon meeting general eligibility requirements and submitting the following additional materials from their undergraduate program director: a statement that the student has had 400 or more clock hours in field practicums, a description of the field experience, and the student's final field evaluation. Advanced standing students usually complete the program with 46 credit hours (36 credit hours of classroom work and 10 credits of supervised practicum). This includes three online bridging courses in the summer. Applicants who have completed some foundation content coursework in another CSWE accredited program within the past five years may request a review of that coursework for possible equivalency or elective credit. In no case can academic credit be given for prior work or life experience.

The MSW program was first accredited by the Council on Social Work Education in 1990 and has been reaccredited consistently since then, most recently in 2019.

To be considered for fall admission, completed applications are due by January 1 of that year. We will continue to review applications after that date until our programs are full. If you are planning to apply to the MSW Program, please contact Lynne Gamperle, Administrative Specialist, School of Social Work, 112 Social Work Building (207 581-2389) or e-mail ([lynne.gamperle@maine.edu](mailto:lynne.gamperle@maine.edu)) to make sure that there is still room in your preferred program. For more information about the School of Social Work, visit <http://www.umaine.edu/socialwork/>

## **Graduate Faculty**

**Elizabeth Armstrong**, Ph.D. (University of Michigan, 2017). Assistant Professor. Intimate partner violence, substance abuse, research methodologies.

**Sandra S. Butler**, Ph.D. (University of Washington, Seattle, 1991), Professor, Interim Director, and MSW Coordinator. Gerontology, Social policy, poverty, homelessness, advocacy.

**Elizabeth DePoy**, Ph.D. (University of Pennsylvania, 1988), Professor in Social Work and Disabilities Studies Program. Social work in health settings, disability, research methodology.

**Stephen, Gilson**, Ph.D. (University of Nebraska, 1991), Professor and Coordinator of Disability Studies, disability, health policy, legislative advocacy.

**Ann Hartman**, M.S.W. (University of Maine, 1998). MSW Distance Program Coordinator, School social work, trauma-informed care, clinical services for survivors of sexual assault, inclusive teaching practices.

**Kelly Jaksa**, M.S.W. (Boston University, 1994), Lecturer and BSW Coordinator. Practice with children and families.

**Judith Josiah-Martin**, PhD (Smith College, 2017). Lecturer, Cultural diversity, substance abuse, practice with marginalized populations.

**Lenard Kaye**, Ph.D. (Columbia University, 1982). Professor and Director of Center on Aging, Gerontology, Administration, Strategic Planning

**Leah Maxwell**, M.S.W. (University of Maine, 2003). Field Coordinator. Child and family services, developmental disabilities.

**Robin Russel**, Ph.D. (University of Illinois, 1986), Professor. Spirituality and social work practice/education, child welfare, family violence, women's health.

#### **Emeritus Faculty**

**Cleo S. Berkun**, D.S.W. (University of California at Berkeley, 1981), Associate Professor Emeritus. A School of Social Work. Adult development, minority and women's issues, issues of middle age and aging.

**Diane C. Haslett**, Ph.D. (University of Illinois, Chicago, 1991), Associate Professor Emeritus. Group work, women's issues, adolescence and teenage pregnancy.

**Jay Peters**, Ph.D. (University of Maine, Orono, 2003). Assistant Professor Emeritus, research methods, trauma, child welfare.

**Donald M. Pilcher**, Ph.D. (University of California, San Diego, 1976), Professor Emeritus. Research and social policy.

**Gail B. Werrbach**, Ph.D. (University of Texas, Austin, 1988), Associate Professor Emeritus. Families and children, mental health, child welfare.

## **Spanish**

# **Master of Arts in Teaching Spanish**

The M.A.T. in Spanish (30 credits) has been redesigned with the collaboration of the campuses of the University of Maine System specifically to meet the needs of Maine's schools. The programs offer full-time instruction during the academic year to meet the requirements of pre-service teachers and an intensive institute during the summer for in-service teachers. Candidates take seven to eight courses (21-24 credits) in language, literature, culture and linguistics in the target language, one course in language pedagogy (MLC 466/566) and one course on teaching the exceptional student in English (SED 500). An oral exam and a professional teaching portfolio which illustrate the candidate's familiarity with Maine's teaching standards and his/her readiness to teach a second language in the K-12 classroom are the final requirements for both degrees.

Practicing teachers who are already certified to teach Spanish may opt to take additional courses in their target language, or they may resume the study of a second foreign language at the advanced (400 or 500) level in lieu of taking courses leading to certification.

The Graduate School  
5775 Stodder Hall Room 42  
University of Maine  
Orono, ME 04469-5755  
207-581-3291  
graduate@maine.edu

Dept. of Modern Languages & Classics  
University of Maine  
214 Little Hall  
Orono, ME 04469  
207-581-2095  
carlos.villacorta@maine.edu

## Graduate Faculty

**Carlos Villacorta Gonzales**, Ph.D. (Boston University, 2009), Assistant Professor and Graduate Coordinator. Twentieth and 21st Century Latin American Literature and Culture; Contemporary Peruvian Poetry; Post-modernism in Latin American, Urban Studies.

**Zachary Ludington**, Ph.D. (University of Virginia, 2014), Assistant Professor of Spanish. Modern and Contemporary Spain, the international Avant-Garde, La Edad de Plata, Translation.

**Susan Pinette**, Ph.D. (University of California, Irvine, 1999), Associate Professor and Director, Franco-American Programs. Francophone literature. Eighteenth century French literature.

**Frédéric Rondeau**, Ph.D. (McGill University, 2010), 20th Century Quebec Literature and Culture; Counter-Culture (transnational perspective); Post-68 Literature, Culture, and Politics (France-Quebec); Francophone Literature of North America; Quebec Poetry and Literary Journals; Literary Avant-gardes; Contemporary French philosophy

**Jane S. Smith**, Ph.D. (Washington, 1994), Associate Professor and Department Chair. French linguistics. North American French dialects. Morphology. Language policy. Foreign language pedagogy.

## Associate Faculty

**Andrea Mercado**, M.S./M.A. (Florida International University, Miami, FL 2009) Instructor. Specializations in teaching English language learners, Underrepresented populations, Student with Limited/Interrupted Formal Education, Family and Community Partnerships

**Maria Sandweiss**, M.L.S. (Maine, 2010), Lecturer in Spanish. Hispanics in the U.S. and foreign language pedagogy.

**Kathryn E. Slott**, Ph.D. (Pennsylvania, 1980), Associate Professor. Nineteenth and 20th century poetry. Nineteenth century novel. Twentieth century theatre. Poetics. Québec literature.

# External Faculty

**Nancy Erickson**, Ph.D. (Michigan, 1992), Associate Professor, University of Southern Maine. French Renaissance literature. French women writers.

**Jean-Claude Redonnet**, Doctorat d'Etat és Lettres (1979). Director of Research & Professor Emeritus, Université de Paris-Sorbonne. International collaboration in higher education and cultural exchange.

# Emeriti Faculty

**Eugene F. Del Vecchio**, Ph.D. (University of Washington, 1979), Professor. Nineteenth and early 20th century Spanish literature. Comparative literature. Literary and genre criticism.

**Kathleen N. March**, Ph.D. (SUNY at Buffalo, 1979), Emerita Professor. Contemporary Hispanic literature. Literature and society. Peninsular and Latin-American narrative and poetry.

**Kristina Passman**, Ph.D. (Iowa, 1982), Emerita Associate Professor. Mythology. Latin literature. Women in the Ancient World. Greek.

**Raymond J. Pelletier**, Ph.D. (Massachusetts-Amherst, 1977), Emeritus Associate Professor and former Director, Canadian-American Center. Graduate Coordinator. Eighteenth century French literature. Foreign language pedagogy. Franco-American literature and culture. Bilingualism and bilingual education.

**James Troiano**, Ph.D. (SUNY at Buffalo, 1973), Professor Emeritus. Contemporary Latin-American theatre and short story.

# Spatial Informatics

The master-of-science degree in Spatial Informatics (MSSI) provides an "all e-learning" "all coursework" degree for place-bound students that desire strong theory, computational, cognitive, analytical, policy and technical foundations in geographic information science and systems. As a general rule, students may view class videos and accomplish assignments at any time throughout a week in any of the offered program courses and have the weekly opportunity (or requirement) to participate in a one to two hour "live" discussion session at a mutually convenient time for distance class members prior to due dates for weekly assignments. The *MS Spatial Informatics* graduate degree is an "online only" version of the existing on-campus research-focused or project-focused *MS in Spatial Information Science and Engineering* degree.

The program focuses on advancing knowledge about spatial information particularly with respect to concepts needed in next-generation information systems. Emphasis is placed on learning and developing novel concepts and methods in the broad fields of spatial and geographic information science for sensing, storing, accessing, analyzing, and managing spatial data as well as modeling, extracting, integrating, visualizing, and communicating spatial information.

Spatial Informatics may be viewed as a field of study merging knowledge drawn from geographic information science, information science, cognitive science, computer science and engineering. Students build on foundations in computer science, mathematics, physics, geography, cognitive science, neuroscience, artificial intelligence, engineering and related fields to study spatio-temporal phenomena, design intelligent spatial information systems and develop human-centered accessible technologies. In addition, the design of spatial information technologies requires a comprehensive understanding of the social, legal, economic, and institutional issues affecting such systems, a commitment to human users and ethical uses of such systems, dedication to the ethics of broad access to information, and commitment to quality of information. We view spatial informatics as a true systems science within the broader conceptual framework of spatial computing.

The program is designed to meet the growing demand in society for graduates with high-level geospatial technology skills. This student centered curriculum provides a path for women and men from diverse fields to rapidly transition to information system career paths by providing them with foundation graduate level courses in information systems and geographic information science. Similar to an MBA or Law degree, the spatial informatics graduate program accommodates students from wide ranging undergraduate degree backgrounds.

### **Objectives**

Students develop knowledge and technical skills in foundation areas of formal methods, programming, information system design, human computer interaction and information law and ethics. All of these general information systems graduate courses draw on spatial technology examples or contextual environments. Based on the foundation, a wide variety of in-depth skills are developed in the areas of web-based database systems design and development, real-time data stream processing, spatial cognition, geosensor networks, spatial data science, ontology frameworks and virtual/augmented reality. Students gain working familiarity with one or more programming languages if not already acquired. The online graduate program specializes in preparing graduates to better utilize location information, geographic information systems, sensors, sensor networks and mobile technologies in accomplishing the day-to-day tasks of businesses and government and to help advance new innovations in these domains. In addition, students may propose courses within their program of study that provide an understanding of business and engineering applications and thus provide further foundations for effective communication with end users.

### **Master of Science in Spatial Informatics**

The Master of Science in Spatial Informatics is available only to distance students. The program consists of the same courses as taken by on-campus graduate students in Spatial Information Science and Engineering taught by the same instructors. Online students view lectures and class discussions at times of their own choosing while deadlines for electronic delivery of assignments are often the same as for on-campus students. There is no thesis required although students may propose pursuit of a project-based course as part of their graduate program if desired.

As required by the University, all work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Spatial Informatics.

## **Degree Requirements**

The Master of Science in Spatial Informatics (MSSI) consists of 30 credits, all earned in course work. The program consists of five three-credit required core courses and a minimum of fifteen additional credits from a list of elective courses approved for the program drawn from a range of disciplines but primarily from distance courses offered by the School of Computing and Information Science. If some required courses are duplicate of courses that may have been taken in the student's undergraduate degree program or another graduate program, those courses need not be repeated, and the student will select in consultation with the MSSI Graduate Coordinator and MSSI Steering Committee additional approved courses to arrive at the total of 30 credit hours.

## **Required Courses**

The following five courses must be taken and all count toward the graduate degree.

- SIE 507 - Information Systems Programming Credits: 3
- SIE 515 - Human Computer Interaction Credits: 3
- SIE 525 - Information Systems Law Credits: 3
- SIE 550 - Design of Information Systems Credits: 3
- SIE 505 - Formal Foundations for Information Science Credits: 3

## **Elective Courses**

Students must take at least fifteen additional credits that are approved in advance by the MSSI Steering Committee from the following approved elective course listings in order to arrive at the total required of 30 credits.

Among courses that are regularly available for distance students include:

- SIE 508 - Object Oriented Programming Credits: 3
- SIE 509 - Principles of Geographic Information Systems Credits: 3
- SIE 510 - Geographic Information Systems Applications Credits: 3
- SIE 512 - Spatial Analysis Credits: 3
- SIE 516 - Interactive Technologies for Solving Real-World Problems Credits: 3
- SIE 517 - Spatial Interaction Design Credits: 3
- SIE 554 - Spatial Reasoning Credits: 3
- SIE 555 - Spatial Database Systems Credits: 3
- SIE 557 - Database System Applications Credits: 3
- SIE 558 - Real-Time Sensor Data Streams Credits: 3
- SIE 559 - Geosensor Networks Credits: 3
- SIE 580 - Ontology Engineering Theory and Practice Credits: 3
- SIE 590 - Information Systems Internship Credits: 3
- SIE 693 - Graduate Seminar Credits: 1

Students may propose additional elective graduate courses than those listed to be included on their program of study on a case-by-case basis or added to the list. Some of the elective graduate courses may require prerequisites in addition to the minimum required for general admission to the MSSI graduate program.

## **Detailed Requirements**

- Programs of Study are approved for each student by the Steering Committee for the MSSI graduate program. This committee consists of the MSSI Graduate Program Coordinator and two additional graduate faculty members in the department or affiliated with the program.

- Each student's Program of Study must include the five required core courses with the remainder of courses to be selected from an approved course list maintained by the department or proposed by the student and assessed for possible approval. The MSSSI Steering Committee assesses the reasonableness of such requests and makes the final decision on whether specific additional courses serving the objectives of the MSSSI program and the needs of the student may be included. Each student's Program of Study must be approved in advance by the MSSSI Steering Committee. Students should NOT assume that any combination of program courses will be approved by the Steering Committee.
- At least 15 credits of the 30 required on a student's program of study must be at the 500 level or above.
- Up to two courses may be taken at other universities by distance methods or otherwise if contained on the student's graduate program of study and approved in advance by the MSSSI Steering Committee.
- Up to two graduate courses may be transferred into the student's graduate program of study if taken prior to admission to the Graduate School, the courses did not count towards a previous undergraduate or graduate degree, and the courses are approved by the MSSSI Steering Committee.
- The MSSSI Graduate Coordinator serves as the advisor for each student admitted to the program and the MSSSI Steering Committee serves as the graduate committee for each student in the program.
- All students must complete the entire M.S. graduate program of study within a six-year period (as established by the Graduate School).

### **Admission Requirements**

Admission to the University of Maine Master of Science in Spatial Informatics is competitive but on a rolling basis. In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully and achieve positions of leadership in the private or public sectors. While the submission of GRE scores and letters of recommendation are encouraged, they are not required. We generally seek an undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a four-year international equivalent. Within their curriculum, all applicants should have completed a university course in Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are recommended but not required. The review committee considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School. The entire application packet including transcripts, test scores (if required), essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued typically. To be considered for Fall admission, completed applications should be received if at all possible 8 weeks prior to the beginning of the term.

**Concurrent Graduate Certificate Applications:** Applicants applying for the MS Spatial Informatics that desire to acquire Graduate Certificate in GIS, Information Systems, and/or Data Science and Engineering along the way to acquiring the MS, should apply additionally for the Graduate Certificate(s) prior to completing the MS course requirements.

Students applying for Graduate Certificate programs are not required to submit GRE scores. Students that successfully complete a graduate certificate program in Information Systems, Geographic Information Systems, or Data Science and Engineering (all offered on-campus and by distance) and received a B or better in all of their certificate courses are not required to submit a GRE score for admission to the full non-thesis MS programs in Information Systems (offered on-campus and by distance), Spatial Informatics (offered by distance only) and Spatial Information Science and Engineering-Project Option (offered on campus only). All or most of such graduate courses completed for these graduate certificates may count toward the 10 courses required for the full MS degree.

**Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students**

High performing undergraduate students from any discipline at the University of Maine may apply for early admission, preferably early in the junior year, to the MS Spatial Informatics degree program. Applicants to the Accelerated Four



Plus One should submit the Application for Admission to the SIE or MSIS Four Plus One Program. Such applications are not accepted after the senior year has commenced.

### **Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor, Spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, PhD (Toronto, 2013), Associate Professor. Spatial informatics, spatial ontologies as test bed for research about formal ontologies and their development, knowledge representation, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## **Spatial Information Science and Engineering**

Graduate Programs, Certificates, Specializations, Emphases

The graduate programs in Spatial Information Science and Engineering focus on advancing knowledge about spatial information particularly with respect to concepts needed in next-generation information systems. Emphasis is placed on developing novel concepts and methods in the broad field of geographic information science for sensing, storing, accessing, analyzing, and managing spatial data as well as modeling, extracting, integrating, visualizing, and communicating spatial information.

Students build on a solid foundation in computer science, mathematics, physics, geography, cognitive science, artificial intelligence, engineering and related fields to study spatio-temporal phenomena and design intelligent spatial information systems. In addition to these concepts, the design of spatial information technologies requires a comprehensive understanding of the social, legal, economic, and institutional issues affecting such systems, a commitment to human users and ethical uses of such systems, dedication to the ethics of broad access to information, and commitment to quality of information.

The research interests of our faculty are currently predominantly in the area of Spatial Computing, including spatial cognition, spatio-temporal reasoning, spatial ontologies, spatio-temporal data streams, geosensor networks, spatial data science, and location privacy.

Graduate programs offered include the Ph.D. in Spatial Information Science and Engineering, Master of Science in Spatial Information Science and Engineering, Master of Science in Spatial Informatics, and Graduate Certificate in Geographic Information Systems.

### **Program Objectives:**

The core objectives of the graduate programs include interdisciplinary study of the nature and function of spatial information systems, and the technical study of the design and evaluation of methods and processes to capture, represent and analyze spatial information.

Graduate courses cover formal representations of spatial phenomena, database systems, geographic information systems, human-centered design, and information policy. Research topics may be selected from any of the principal areas ranging from geographic information science, spatial cognition and spatial interface design, spatial database systems, artificial intelligence involving spatial information, geosensor networks, to legal and policy studies addressing location technology uses and advancements. Many research topics require an interdisciplinary approach and, therefore, courses taught in other graduate programs complement the programs offered.

Supplemental information supporting the program and course requirements that follow may be found in the current edition of the Graduate Student Guide available through the Spatial Informatics website.

### **Master of Science in Spatial Information Science and Engineering**

The School of Computing and Information Science offers both a thesis and project option in the Master of Science in Spatial Information Science and Engineering. All work for a master's degree must be completed within six years. The timing starts with the first semester of registration after admission to the Master of Science in Spatial Information Science and Engineering.

The thesis option is the scientific track, typically requiring a strong engineering, computer science, human-computer interaction, or mathematics undergraduate background. Prospective master's students with other disciplinary backgrounds are expected to make up the requisite math and engineering courses that would allow them to succeed in an engineering graduate curriculum. The thesis option includes a substantial piece of individual research as a basis for a master's thesis.

The project option is aimed at students who desire to focus primarily on course work rather than research at the master's level. The formal coursework is complemented by a one-semester project in which the student must demonstrate that he or she can apply the acquired knowledge for implementing a particular solution.

### **Degree Requirements**

#### **Master (Project Option)**

Minimum of 30 graduate course credits (i.e., 400 level or above) on a program of study approved by advisors that includes:

- No more than 6 course credits, if any, at the 400 level
- At least 18 graduate course credits in SIE
- No more than 6 credits of independent study courses (SIE 598, SIE 698, or equivalent independent study courses in other graduate programs)
- SIE 589 Graduate Project (3 credits)
- SIE 507 Information System Programming

- INT 601 Responsible Conduct of Research (1 credit)
- Breadth Requirement: at least one 3-credit graduate course from 4 out of the 5 following breadth areas as specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy
- At least 3 graduate faculty on the advisory committee
- At least 2 must be SIE tenured or tenure-track faculty

### **Master (Thesis Option)**

Minimum of 30 graduate course credits (i.e., 400 level or above) on a program of study approved by advisors that includes:

- At least 24 graduate course credits
- At least 6 thesis credits - SIE 699
- No more than 6 course credits, if any, at the 400 level
- At least 18 graduate course credits in SIE
- No more than 6 credits of independent study courses (SIE 598, SIE 698 or equivalent independent study courses in other graduate programs)
- SIE 501 Introduction to Graduate Research (1 credit)
- SIE 502 Research Methods (1 credit)
- SIE 507 Information System Programming (3 credits)
- SIE 693 Graduate Seminar (1 credit)
- INT 601 Responsible Conduct of Research (1 credit)
- Breadth Requirement - at least one 3-credit graduate course from 3 out of the 5 breadth areas as specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy
- At least 3 graduate faculty on the advisory committee
- At least 2 must be SIE tenured or tenure-track faculty
- Master's Thesis Defense

For either master's degree, a maximum of six credit hours of graduate course work taken prior to enrollment in the master's program, whether at this university or another, may be counted toward the master's degree. If the course did not count toward a completed undergraduate or graduate degree and if the student's graduate advisory committee formally approves acceptance of the courses on the student's Program of Study, then the credit hours may be transferred to apply toward the master's degree.

In order to meet the University of Maine Graduate School residency requirement, at least 50 percent of the coursework toward the degree must be taken through the University of Maine, whether on-campus or online. Requirements for on-campus presence for research and project work are at the discretion of the student's first advisor and advisory committee.

### **Doctor of Philosophy in Spatial Information Science and Engineering**

The Ph.D. degree is the highest of academic degrees. The Ph.D. in Spatial Information Science and Engineering is awarded to those demonstrating outstanding achievement in Spatial Information Science and Engineering scholarship

and primarily for demonstrated ability for independent research in the field. The preparation and defense of a dissertation embodying the results of an original investigation in a specialized area of Spatial Information Science and Engineering are essential features of the program.

All work for a doctoral degree must be completed within eight years. The timing starts with the first semester of registration after admission to the Ph.D. in Spatial Information Science and Engineering. Students must be admitted to candidacy within four years of registration for the first work presented for satisfaction of degree requirements. To be admitted to candidacy, the student must develop a dissertation proposal and orally defend it successfully in front of the student's graduate advisory committee. The dissertation proposal and its defense must demonstrate the student's knowledge related to the student's dissertation topic. The dissertation must be completed within four years of admission to candidacy. A full oral defense of the dissertation is required upon successful completion of the student's work.

For admission, students normally are expected to hold a Master's degree with a strong technical and analytical background, typically in engineering, computer science, cognitive science, mathematics, geography, or another area related to their prospective advisor's research area. Graduate students without a Master's degree may be considered for direct admission to the Ph.D. program with approval by the graduate program faculty. Any student enrolled in the PhD program who completes the requirements for the MS degree (project option) before the Ph.D. may be awarded the MS.

### **Degree Requirements**

A minimum of 12 dissertation credits (SIE 699) and 30 graduate course credits (i.e., 400 level or above) on a program of study approved by the student's graduate advisory committee that includes:

- Up to 24 transfer credits of graduate course work
- SIE 507 Information System Programming
- At least 5 credits in Research Skills, including all of the following:
  - SIE 501 Introduction to Graduate Research (1 credit)
  - SIE 502 Research Methods (1 credit)
  - INT 601 Responsible Conduct of Research (1 credit)
  - SIE 693 Graduate Seminar (1 credit)
  - SIE 694 Doctoral Seminar (1 credit) once per year starting the year after completion of SIE 693
- *Breadth Requirements:* at least one 3-credit graduate course from 4 out of the 5 following breadth areas as specified in the unit's current Graduate Student Guide:
  - Formal Representations of Spatial Phenomena
  - Spatial Cognition and Interaction
  - Database Systems
  - Geographic Information Systems
  - Information Policy
- *Depth Requirement:* At least 12 graduate credits (400 level or above) not counted towards the breadth requirement. These credits must be in areas relevant to the student's dissertation topic as determined by the student's advisory committee, with at least 6 of those credits from SIE courses.
- At least 5 graduate faculty on the advisory committee
- At least 3 must be SIE tenured or tenure-track faculty
- Dissertation Proposal Defense

A maximum of 24 credit hours of graduate course work taken prior to enrollment in the Ph.D. program, whether at this university or another, may be counted towards the Ph.D. degree. If the student's graduate advisory committee formally approves acceptance of a course on the student's Program of Study, then the credit hours may be transferred toward the doctoral degree.

The University of Maine Graduate School minimum residency requirement for the Ph.D. is automatically met by four semesters of course enrollment in the program beyond the baccalaureate degree, whether by on-campus or online

enrollment. Requirements for on-campus presence for research and project work are at the discretion of the student's first advisor and advisory committee.

### **Admission Requirements**

Admission to the University of Maine Spatial Information Science and Engineering graduate programs is competitive. In its admission process, the graduate faculty considers the potential of applicants to complete the program successfully and achieve positions of leadership in the private or public sectors. Unless the GRE requirement is waived for a qualifying student, we generally seek students that score at the mean or above on the verbal, quantitative and analytical segments of the GRE exam and in the 50th percentile or above on the exam overall. We generally seek an undergraduate grade point average of 3.0 or above. Exceptions are considered on a case-by-case basis.

At a minimum, an applicant must have a four-year U.S. bachelor's degree from an accredited college or university, or a four-year international equivalent. Within their curriculum, all applicants should have completed a university course in Algebra as a minimum math prerequisite for admission. Previous programming courses or experience are recommended but not required. The graduate faculty considers both the curriculum completed and the institution attended in its assessment.

All students apply through the Graduate School and typically the entire application packet including transcripts, test scores, essay, and a current resume that includes contact information for three references must be received before a formal acceptance will be issued. To be considered for Fall admission, completed applications should be received 8 weeks prior to the beginning of the term.

### **Accelerated Four Plus One Program: Early Admission for UMaine Undergraduate Students**

Undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the *MS Spatial Information Science and Engineering (Project Option)* graduate degree program. Applications for conditional "early admission" should be received preferably by the middle of the first semester of the junior year and are not accepted after the senior year has commenced. The final year in completing the Master's degree may be taken either on-campus or online.

By taking a course overload of three credits in the second semester of the Junior year and course overloads in each of the semesters of the Senior year, a motivated student typically may acquire 9 credits (but no more than 12) for graduate school (at undergraduate tuition rates) prior to acquiring their undergraduate degree assuming that they receive a B or better in the courses. These courses, if chosen appropriately, may double count towards both the undergraduate and graduate degree. By taking a 3-credit Information Systems Internship graduate course with a corporation, agency or non-profit organization during the summer, a student may readily complete the coursework master's degree in a single year after their undergraduate degree. This master's degree will be highly complementary to an undergraduate degree in almost any field and attractive to employers.

To apply for early admission before or during the junior year, an applicant should expect to have an overall minimum undergraduate grade point average of 3.25, must have completed the University of Maine General Education Requirement in Math and must have three letters of recommendation from current or previous university instructors. Apply using the Application for Admission to the SIE or MSIS Four Plus One Program. Continuation in the graduate program is based primarily on performance in the graduate courses and overall grade point average upon graduation from the undergraduate program. Accepted *Four Plus One* students must complete the full graduate application in their senior year. The GRE exam is typically waived for these accepted high performing students. Below a 3.0 accumulated undergraduate grade point average should be assumed cause for discontinuation in the graduate program.

Students with two or fewer semesters remaining to complete their undergraduate degree program do not qualify for the accelerated "four-plus-one program" but their applications will be considered as applications within the regular

graduate admissions process. In this case, one may transfer up to two graduate courses prior to formal admission assuming those courses did not count toward another degree.

### **Financial Assistance**

In addition to University fellowships and scholarships listed elsewhere in this Catalog, the School of Computing and Information Science offers graduate research assistantships to qualified students on externally funded research projects. A very limited number of teaching assistantships may be available. Consult as well Funding at the Graduate School web site.

### **Spatial Computing and Information Systems Graduate Faculty**

**M. Kate Beard-Tisdale**, Ph.D. (Wisconsin, 1988), Professor. Geographic information systems, map generalization, data quality and its visualization, geographic information retrieval, spatio-temporal phenomena and information integration.

**Max J. Egenhofer**, Ph.D. (Maine, 1989), Professor. Qualitative reasoning, spatio-temporal reasoning, user interfaces for geographic information systems, design of spatial database systems, and mobile spatial information appliances.

**Nicholas A. Giudice**, Ph.D. (Minnesota, 2004), Professor and Director of the VEMI Lab. Human computer interaction in real and virtual reality environments, indoor navigation, multimodal spatial cognition, information-access technology and human-vehicle collaboration for autonomous vehicles.

**Torsten Hahmann**, Ph.D. (Toronto, 2013), Associate Professor. Ontologies, especially spatial ontologies with application to earth and geoscience applications, ontology engineering, knowledge representation, automated reasoning, information extraction, artificial intelligence, and logic.

**Silvia Nittel**, Ph.D. (Zurich, 1994), Associate Professor and Director of Geosensor Networks Lab. Stationary and mobile sensor networks, decentralized in-network data collection algorithms for geosensor networks, management of distributed sensor data streams in real-time.

**Harlan J. Onsrud**, J.D. (Wisconsin, 1982), Professor and Graduate Coordinator. Legal, ethical, and institutional issues affecting creation and use of databases, ethics driven information systems design, assessment of social and societal impacts of spatial technologies.

**Nimesha Ranasinghe**, Ph.D. (Singapore, 2013), Assistant Professor. Research interests include multi-sensory interactive media, augmented reality, and human-computer interaction.

## **Special Education**

The **Special Education** graduate programs integrate research with practice, support students as social advocates, advance education, community, and research to enhance the quality of life for persons with disabilities and their families. Our online programs are a flexible option and provide a foundation for education within a variety of settings, including business, educational and research centers, and national and state agencies. Students analyze current teaching strategies and evidence-based practices, learning and mentoring methods, and examine critical issues in special education. The Special Education graduate programs will expand career options and help to bring positive change to the education system.

Graduate programs in Special Education prepare educators to meet national standards of excellence in communication skills, professional knowledge, and teaching competence. Programs of study are offered for both entry-level and experienced professionals and include certification and non-certification options. The M.Ed. program offers

concentrations in High Incidence Disabilities, Low Incidence Disabilities, Dual Low and High Incidence Disabilities, Early Intervention, and Individualized.

## **State Certification Options**

### **Teacher of Students with High Incidence Disabilities (M.Ed.)**

This 33-credit hour program prepares you to provide high-quality education to students with mild to moderate disabilities such as learning disabilities and/or emotional/ behavioral disorders. You'll learn how to use the latest evidence-based strategies to adapt the general education curriculum in areas such as reading, math, writing. You'll also learn how to create safe, inclusive, and culturally responsive classrooms. By understanding how to apply best practices, you can provide students with the proper attention, assistance, and instruction to help them succeed. This is a 33-credit online program and provides a pathway to state certification as a Teacher of Students with Disabilities-282 (PK-8 or 7-12).

### **Educational Specialists for Students with Low Incidence Disabilities (M.Ed.)**

This 33-credit hour program leads to state certification as a Teacher of Students with Severe Disabilities (286). This program prepares you to serve students with autism spectrum disorder, significant intellectual disabilities, and students with multiple disabilities. This program is appropriate for undergraduate majors in elementary and secondary education as well as related fields such as child development, psychology, communication disorders, occupational and physical therapy, and nursing. You will learn how to use the latest evidence-based strategies to develop needs-appropriate curricula and create safe, inclusive, and culturally responsive classrooms. By understanding how to apply best practices, you can provide students with the proper attention, assistance, and instruction to help them succeed. Courses are delivered via distance education technology.

### **Early Intervention/ Early Childhood Special Education Personnel (M.Ed.)**

This 33-42 credit program provides a foundation in the field of early intervention/early childhood and preparation for leadership roles. You'll learn how to use the latest evidence-based strategies and advanced teaching methods, support and nourish family relationships, collaborate with other professionals, and gain hands-on teaching experience. The curriculum is designed to prepare students in the fundamentals of professional practice in early intervention for inclusive environments, provide students with advanced content in a variety of research areas (e.g., early childhood, early childhood special education, family relationships, collaborative consultation), and place students in practicum experiences with high needs children ages birth-5 and their families. The concentration is appropriate for students with a bachelor's degree in early childhood education or a related field who are currently working with, or have a desire to serve, high needs children with disabilities, ages birth to five, and their families. The program leads to state certification as Teacher of Children with Disabilities (282, birth to school-age 5). Courses are delivered online both synchronously and asynchronously.

## **Individually Designed**

**M. Ed. or Ed. S.:** Individually designed programs are for professionals who already hold certification in special education or are not interested in certification as a special education teacher. M.Ed. programs require a minimum of 33 credit hours of study. Ed.S. programs require a minimum of 30 credit hours for those with a master's degree in Special Education; 33-42 credit hours for those with a master's degree in a related field.

Potential candidates include:

- Experienced special educators who want to pursue more specialized study of a particular disability or topic (e.g., autism spectrum disorders, positive behavior interventions and supports, learning disabilities), or to combine study in Special Education with study in another field (e.g., Educational Leadership, Instructional Technology, Literacy);
- General education teachers who want to increase their expertise in working with students with disabilities in general education classrooms; and
- Related services personnel who want to increase their understanding of educational policies and practices pertaining to students with disabilities (e.g., instructional strategies, educational assessments, special education law).

With a faculty advisor, students select courses around their unique needs and interests. Courses are drawn from Special Education and other areas in the College of Education and Human Development, although at least 50 percent of the student's credits for the degree must be in Special Education.

**Graduate Certificates- see the certificate program descriptions within this catalog or visit the web links below for more information.**

Positive Behavior Intervention and Support: RTI for Behavior Certificate

Graduate Certificate in Autism Spectrum

Graduate Certification: High Leverage Practices to Promote Inclusion

Graduate Certificate in Special Ed Leadership: Assistant Special Ed. Director

### **Field Work, Research and Service for all Special Education Courses**

Field work and internships are an important component of all graduate programs in Special Education. Faculty and students are an integral part of the social and educational service community in Maine, and close relationships are maintained with public schools and community agencies. Students also have the opportunity to participate in faculty research and service projects.

### **Admission**

For admission to a graduate program in Special Education, students must meet basic standards of the Graduate School and special eligibility requirements of the program.

Applicants seeking admission to programs that lead to certification must submit scores on Praxis Core Academic Skills for Educators with their applications (<https://www.ets.org/praxis/about/core/>). Candidates who are already certified in Maine and have taken Praxis previously may submit a copy of their certificates to document that they have met state standards on the test. For out of state candidates, Maine has reciprocity agreements with most states.

Applicants may be invited for a personal interview with the Special Education faculty. Students should request financial aid information from the University's Student Financial Aid Office. Special Education scholarships are sometimes available for candidates with documented financial needs. To be eligible, applicants must have applied for financial aid through the University's Office of Student Financial Aid.



## State Certification

Teacher certification is granted by the Maine Department of Education, not by the University of Maine. Students who successfully complete ALL the requirements including documentation of fingerprinting, background check, and passing scores on Praxis II in Special Education will be eligible for certification. Specific information regarding certification is available from the Maine Department of Education, Certification Services, State House Station 23, Augusta, ME 04333.

## Four Plus One Programs

The Special Education program offers students throughout the University of Maine system the opportunity to earn a Bachelor's degree in a student's focus area and a Master's degree (M.Ed.) in Special Education at the University of Maine, Orono in five combined years of study (the Four Plus One option, an accelerated MEd program).

### Core Program Requirements:

Students enrolled in the Four Plus One option earn a bachelor's degree at the end of their senior year and graduate with their class. In the Four Plus One option, the M.Ed. is earned after the fifth year, through the combined graduate work completed in their undergraduate senior year and in the one additional graduate-level year (15 months).

During the senior year, which serves as a bridge year between the undergraduate and graduate programs, students may enroll in 9 credits of graduate-level course credits at the 500-level or above that count toward both degrees. Students must earn a grade of "B" or better to be counted toward the M.Ed. degree. Over the course of earning the MEd degree, students are permitted a maximum of two 400-level courses in their field or concentration.

### Four Plus One Coursework and Project:

Students must complete 33 credit hours of course work for the graduate degree. *At least 24 credit hours must be taken at the graduate level.* Special education faculty will work closely with the student and the student's undergraduate advisor to select courses that will support a student's interests and career path. The Special Education program offers multiple options for coursework, providing students pathways that will enhance their understanding, awareness and acceptance of individuals with disabilities

## Four Plus One Admission

Students apply for the Four Plus One during their junior year (at least 60 but no more than 100 completed credit hours applicable towards the undergraduate degree). Student must have an undergraduate GPA of 3.0 or higher. Deborah Rooks-Ellis will be the point of contact for the Four Plus One program.

The application deadline is February 1. Students complete the Four Plus One application (currently on file with UMaine Online and used for the Four Plus One special education program with UMM). Students will submit the application directly to the program point of contact rather than to the Graduate School. The Special Education Program Admission Committee will make admissions decisions no later than March 1.

Please note that admission to the Four Plus One option includes provisional admission to the Graduate School. **Formal application for admission to the MEd program (including payment of the application fee) must be made through the Graduate School and should occur no later than spring of the senior year.** The GRE requirement is not required for students in the Four Plus One option in special education. Also note that students must

maintain a 3.0 GPA or higher through the completion of the undergraduate degree in order to gain full admission to the accelerated M.Ed. program and be allowed to double count credits.

Students who meet the above requirements must matriculate in the M.Ed. program within three months after receiving their undergraduate degree in order to apply the double-counted credits towards the M.Ed. degree. Students in the Four Plus One option must complete the M.Ed. curriculum within 15 months of matriculation. Under extraordinary circumstances, a student may petition to delay matriculation up to an additional 12 months.

Faculty contacts can be found [here](#).

**Contact information:**

Dr. Sarah Howorth, Special Education Program Coordinator

[sarah.howorth@maine.edu](mailto:sarah.howorth@maine.edu) 207-581-2448).

Maine Autism Institute for Education and Research

On January 1, 2014 the Maine Autism Institute for Education and Research (MAIER) was launched as a partnership between the Maine Department of Education and the University of Maine, College of Education and Human Development (COEHD). Our mission is to build statewide capacity to improve outcomes for individuals with autism spectrum disorder (ASD) through leadership, training, professional development, collaboration, and research.

Maine Autism Institute for Education and Research

5766 Shibles Hall, 303

Orono, ME 04469

Phone: 207.581.2352

Fax: 207.581.9510

[maineautisminstitute@maine.edu](mailto:maineautisminstitute@maine.edu)

For more information, see <http://umaine.edu/autisminstitute/>

## **Special Education Leadership: Assistant Special Education Director (Certificate)**

Assistant Special Education Administrators assist the Special Education Directors in decision-making and providing students with disabilities the proper attention, assistance, and education to help them succeed. Graduates of the online Graduate Certificate in Special Education Leadership: Assistant Administration will learn how to: Positively affect the quality and future of special education and promote the general welfare of children with disabilities Serve and support children with disabilities and their families Protect the privacy of students and

families in accordance with State and Federal laws Foster and support maximum self-determination and independence on the part of exceptional children Utilize impartial professional judgment in evaluating the needs of exceptional children and their families.

This certificate can lead to Maine certification in Assistant Administrator of Special Education (035). Earning certification in other states through this program may be very simple. Please visit your state's department of education for information or visit the United States Department of Education website. Specific information regarding Maine certification is available through the Maine Department of Education. Graduates can also find opportunities outside the classroom as educational advocates or consultants or even as political advisers on key legislative topics.

For more information please visit this website.

## **STEM Education (Emphasis)**

### **STEM EDUCATION (PhD in Education concentration)**

The STEM Education Ph.D. is an interdisciplinary program for those who have an interest in improving the quality of science, technology, engineering, or mathematics (STEM) education through research. The program prepares students for faculty positions in STEM education within discipline departments and in colleges of education, or for education research positions in museums, research centers, policy agencies, and think tanks. It requires a minimum of 45 credits of coursework and a dissertation.

The STEM Education Ph.D. is a full-time program in which students are supported through graduate assistantships contingent on available funding and have a day-to-day presence on the University of Maine campus. Students in the program study and conduct research on a broad range of issues related to STEM education through coursework and interdisciplinary research apprenticeships, both of which combine rigorous research methodology with disciplinary perspectives on educational challenges and opportunities. The graduate assistantships may also involve teaching assistantship(s) in undergraduate courses in science, technology, engineering, education, or mathematics.

There are two pathways through the program. Pathway 1 is for interested students who hold both a bachelor's and a master's degree in a relevant field. Candidates for this pathway will likely have experience teaching STEM in K-12 school(s), informal learning center(s), or at the collegiate level; hold undergraduate and master degrees in education, science, or a combination of education and science; and/or have evidence of progressive professional development experiences in STEM education. Pathway 2 is for interested students who have not earned a master's degree in a

relevant STEM field or STEM education. The following are some of the options for the master's degree component of the program:

- MST program at University of Maine
- A master's degree in the Department of Physics & Astronomy with a research thesis in STEM education
- A master's degree in the Department of Mathematics & Statistics with a research thesis in STEM education
- A master's degree from another STEM department at the University of Maine that includes a research thesis in STEM education

In pathway 2, students can enroll concurrently in one of several of UMaine's master's degree programs and the STEM Education PhD program.

For both **Pathway 1** and **Pathway 2**, students will be required to pass milestones in order to continue to advance in the program. Details of these milestones will be provided by the advisor and the program once the student is admitted but entail a qualifying paper their first year, comprehensive exams and their defense at or near the end of coursework, a dissertation proposal and defense, and a dissertation and defense.

Applicants for both pathways are strongly encouraged to look at research profiles of the STEM Education Ph.D. faculty for alignment of research interests. These faculty members are: DRs. Justin Dimmel, Elizabeth Hufnagel, Asli Sezen-Barrie, Janet Fairman, and Natasha Speear.

For further information, contact Dr. Justin Dimmel [justin.dimmel@maine.edu](mailto:justin.dimmel@maine.edu).

## Surveying Engineering (Certificate)

# Surveying Engineering (Certificate)

### Surveying Engineering (Certificate)

Changing technologies in the surveying engineering world require working professionals to return to an academic world to expand their knowledge. Professional Land Surveyors with a BS degree in surveying or related field will expand on their undergraduate knowledge. Similarly professional land surveyors with a non-surveying undergraduate degree will be able to capture knowledge in their chosen second career.

The Graduate Certificate in Surveying Engineering requires completion of a minimum of 12 credits of coursework. The twelve credits of coursework must include four classes selected from this list of nine three credit graduate courses:

- SVT 501 Advanced Adjustment Computations
- SIE 509 Principles of Geographic Information Systems
- SVT 511 Geodetic United States Public Land Survey System
- SVT 512 Advanced Survey Law
- ANT 521 Geographic Information Systems I
- ANT 522 Geographic Information Systems II
- SVT 531 Advanced Digital Photogrammetry
- SVT 532 Survey Strategies in Use of Lidar
- SVT 541 Geodesy
- SVT 542 Applied Hydrographic Surveying

Only courses in which the student obtained a grade of B or higher count towards the completion of the Surveying Engineering Graduate Certificate.

### **Surveying Engineering Graduate Certificate Admission**

Students to be admitted into the Surveying Engineering Graduate Certificate must hold an undergraduate degree and have a cumulative undergraduate GPA of 3.0 or higher. Candidates must submit a transcript of their undergraduate degree, essay, and one reference letter. Students can apply to transfer up to 3 credits of graduate course work into the Surveying Engineering Graduate Certificate. The Surveying Engineering Certificate Coordinator must approve such transfer credits after assessing whether they are appropriate or not.

### **Continuation to Professional Science Masters in Engineering and Business Surveying Engineering Concentration**

Upon completion of the Graduate Certificate in Surveying Engineering a student may apply for admission to the Professional Science Masters in Engineering and Business Surveying Engineering Concentration (PSM) or the Masters of Science in Engineering Technology Surveying Engineering Technology Concentration (MS ET). The twelve credits received in the certificate will count as twelve credits of surveying courses in the PSM or MS ET.

### **Additional Information**

Course Descriptions can be found in this catalog using the navigation in the left menu.

### **Surveying Engineering Graduate Faculty**

**Carlton Brown**, PhD, PE, PLS (University of Maine 2008), Associate Professor , cadastral surveys, land tenure, carlton.brown@maine.edu

**Knud Hermansen**, PhD, JD, PE, PLS (West Virginia University 1989), Professor, boundary law, construction surveying, knud.hermansen@maine.edu

**Raymond Hintz**, PhD, PLS (University of Wisconsin 1983), Professor and Graduate Coordinator , ray.hintz@maine.edu

## **Sustainable Agriculture (Emphasis)**

Agriculture is rapidly changing. While many farming systems continue to specialize and exploit economies of scale, the "locavore" movement of the 2000's has inspired a new generation of farmers, millers, bakers, brewers, distillers and restaurateurs to serve new and growing markets. Demand for local and regional vegetables, fruits, grains, meats, milk and value-added continues to grow. To sustain agriculture, production must balance market demand with environmental stewardship and economic viability and operate within the context of an increasingly global food system and challenging climate variability.

To address these challenges, the University of Maine, through various degree programs, has offered a comprehensive research focus in Sustainable Agriculture since 1988, emphasizing:

- innovative crop production practices that provide opportunities for diversity and added value;
- building soil quality through efficient use of crop rotations, multiple cropping systems, animal manures, and recycled waste products;

- managing pests with multi-faceted, ecologically sound strategies that have minimal reliance on synthetic, broad-spectrum pesticides;
- protecting water quality, worker health, and food safety;
- increasing farm economic resilience and profitability by decreasing the costs of crop and livestock production;
- creating strong rural communities that can be sustained through years of fluctuating crop prices and unpredictable weather.

Graduate students performing research in Sustainable Agriculture at the University of Maine can earn one of the following degrees, depending on their specific interests:

#### **Doctor of Philosophy**

Biological Sciences

Ecology and Environmental Sciences

Plant Science

#### **Master of Science**

Botany and Plant Pathology

Ecology and Environmental Sciences

Entomology

Plant, Soil and Environmental Sciences

Resource Economics and Policy

Course work is drawn from the offerings of many departments. Research activities are conducted at University of Maine research farms in Old Town, Monmouth, Jonesboro or Presque Isle, and on working farms.

For more information about graduate research in Sustainable Agriculture at the University of Maine and the availability of financial assistance, prospective students should contact faculty members who might supervise their studies. General information about the program can be obtained from:

Dr. Eric Gallandt  
School of Food and Agriculture  
5722 Deering Hall  
Orono, ME. 04469-5722  
(207) 581-2933  
gallandt@maine.edu

Program descriptions are also available online:

<https://umaine.edu/foodandagriculture/graduate-programs/>

#### **Graduate Faculty**

**Lily Calderwood**, Ph.D. (University of Vermont, 2015), School of Food and Agriculture. Integrated pest management, sustainable agriculture.

**Philip Fanning**, Ph.D. (University College Dublin, Ireland, 2014), School of Biology and Ecology. Integrated Pest and Pollinator Management, biological control.

**Eric R. Gallandt**, Ph.D. (Wisconsin-Madison, 1994), School of Food and Agriculture. Sustainable agriculture, cropping systems, and weed ecology and management.

**Mark Hutton**, Ph.D. (New Hampshire, 1988), School of Food and Agriculture. Vegetable production, season extension technologies, disease and insect management, vegetable genetics and varietal evaluation.

**John Jemison**, Ph.D. (Pennsylvania State, 1991). University of Maine Cooperative Extension; Cooperating Associate Professor in the School of Food and Agriculture. Water quality, soil nutrient dynamics, nutrient management.

**Ellen Mallory**, Ph.D. (University of Maine, 2007), University of Maine Cooperative Extension and School of Food and Agriculture. Sustainable agriculture, soil quality and organic grain production.

**Gregory Porter**, Ph.D. (Pennsylvania State, 1985), School of Food and Agriculture. Potato cropping systems, crop physiology, soil fertility management, weed-crop interactions.

**Rachel Schattman**, Ph.D. (University of Vermont, 2016), School of Food and Agriculture. Agroecology, climate change, vegetable and small fruit production, water use efficiency, decision making, behavior, risk assessment, mixed methods research.

## Try on Leadership (Certificate)

In the **Try on Leadership Certificate**, educators will be able to receive hands-on instruction from scholarly-practitioners and instructors who are able to help bridge the theory-practice gap that often occurs in education. Students will work closely with their instructor as well as their direct supervisor to best prepare them to know what it is like to serve as an administrator in a Maine school district. Educators will learn about high-quality instructional practices, organizational analysis, time management, and school and special education law.

For more information please visit the program <https://online.umaine.edu/online-graduate-certificate-in-try-on-leadership/>

## Wildlife Ecology and Wildlife Conservation

The Department of Wildlife, Fisheries, and Conservation Biology, College of Natural Sciences, Forestry, and Agriculture offers graduate study leading to a Master of Science in Wildlife Ecology, a non-thesis Master of Wildlife Conservation, and a Doctoral degree in Wildlife Ecology. A broad range of ecosystems, modern laboratory facilities, and a diversified staff provide excellent opportunities for graduate study in wildlife ecology. Emphasis is placed on detailed studies of wildlife species and the habitats in which they live. Research may be conducted in such areas as terrestrial and aquatic ecology, fisheries, physiology, behavior, population dynamics, resource management, and the influence of environmental disturbances. The department is home to federal biologists with the U.S. Geological Survey, Maine Cooperative Fisheries and Wildlife Research Unit. These scientists have faculty appointments and advise graduate students. The Department of Wildlife, Fisheries, and Conservation Biology offers the following degrees:

- Ph.D. in Wildlife Ecology (thesis)
- M.S. in Wildlife Ecology (thesis)
- Master of Wildlife Conservation (non-thesis)

### Admissions

Students are admitted to these graduate programs based on the strength of their academic records, GRE scores, experience, and recommendations. Please note the critical distinction in admission processes between: i) our research based programs (MS; Master of Science and PhD; doctoral) and ii) our MWC (Master of Wildlife Conservation) program.

1. Research based MS and PhD programs: Students are only admitted when teaching or research assistantships are available and are rarely accepted based on application to the Graduate School without prior communication with faculty. Because of this, interested students are strongly encouraged to contact and coordinate with prospective major

professors to assess potential for support before applying. Available assistantships are posted on the Department web page. Note that these advertised assistantships often have unique deadlines and starting dates, different from the University pattern of January application for September starts. These assistantships include stipends and payment of tuition; additional funding is available for research expenses for most projects. For this reason, these positions are very competitive.

2. MWC program: This program is primarily course-work oriented and has no guaranteed financial support. Students seeking this degree are encouraged to apply directly to graduate school. Applications for the Master of Wildlife Conservation program are reviewed from January through March for programs that begin in September. March 31 is the deadline for application. For the most up to date details about specific aspects of the program and the availability of assistantships, visit <http://umaine.edu/wle/graduate-program/> or write to the Department of Wildlife, Fisheries, and Conservation Biology. [wildec0@maine.edu](mailto:wildec0@maine.edu)

## WFCB Graduate Faculty

**Erik J. Blomberg**, Ph.D. (University of Nevada, 2012), Associate Professor. Population dynamics of avian wildlife.

**Aram J.K. Calhoun**, Ph.D. (University of Maine, 1996), Professor. Vernal pool ecology and conservation, wetland ecology.

**Noah Charney**, Ph.D. (University of Massachusetts Amherst, 2010), Assistant Professor. Landscape Ecology, Climate Change Impact Modeling, Vernal Pool Conservation, Urban Ecology, Natural History, Unisexual Salamanders.

**Stephen M. Coghlan, Jr.**, Ph.D. (State University of New York, 2004), Associate Professor. Energetic ecology of Atlantic salmon, brook trout, and smallmouth bass; fish response to dam removal; role of anadromous fishes in stream food webs; ecology of headwater streams; fish foraging; fish-habitat relations.

**Daniel J. Harrison**, Ph.D. (University of Maine, 1986), Professor. Wildlife-habitat relationships, interactions among forest management practices and wildlife populations, predator ecology.

**Malcolm L. Hunter, Jr.**, D. Phil. (Oxford University, 1978), Professor and Libra Professor. Conservation biology, forest wildlife management, landscape ecology, international conservation.

**Jessica S. Jansujwicz**, Ph.D. (University of Maine, 2011), Research Assistant Professor. Human dimensions of natural resources, environmental policy, sustainability science.

**Cynthia S. Loftin**, Ph.D. (University of Florida, 1998), Associate Professor of Wildlife Ecology and Unit Leader, Maine Cooperative Fish and Wildlife Research Unit. Systems ecology, landscape ecology, wetlands ecology, GIS applications.

**Alessio Mortelliti**, Ph.D. (University of Rome "La Sapienza", 2008), Associate Professor. Conservation biology, effects of land-use change on vertebrates, mammalogy, quantitative modelling, wildlife surveys and monitoring.

**Amber M. Roth**, Ph.D. (Michigan Technological University, 2012), Assistant Professor. Forest ecology and land use.

**Joseph D. Zydlewski**, Ph.D. (University of Massachusetts, 1998), Professor and Assistant Leader-Fisheries, Maine Cooperative Fish and Wildlife Research Unit. Physiology, behavior and ecology of migratory fishes both in the laboratory and in the field.



# Zoology

The School of Biology and Ecology offers graduate study leading to the following M.S. and Ph.D. degrees. Independent research under the direction of a faculty advisor is a major component of all of these programs (excepting certain of the Masters degrees which have a non-thesis or literature-research option).

## Doctor of Philosophy

- Biological Sciences
- Ecology and Environmental Sciences
- Plant Science
- Zoology

## Master of Science

- Botany and Plant Pathology
- Ecology and Environmental Sciences
- Entomology
- Zoology
- Four Plus Advantage (Combined BS and MS degrees in Botany, Entomology, and Zoology)

## Research Specializations

Graduate-degree candidates conduct research under the guidance of the School of Biology and Ecology faculty. The expertise of the faculty covers a broad spectrum, ranging from molecular and cell biology, through system- and organism-level biology, to ecology; and it applies to a diversity of organisms from protists and lower plants and invertebrate animals through vascular plants and vertebrates. By choosing a faculty advisor, graduate applicants can associate themselves with any of a number of research specializations:

**Animal Behavior and Behavioral Ecology**, including chronobiology, feeding behavior, foraging, host plant selection, reproductive behavior, behavior and endocrinology of birds, migration, and predator-prey interactions.

**Applied Biology**, including biological control and insect pest management, fisheries, and plant pathology.

**Botany, Plant Biology, Mycology**, including plant and fungal systematics, molecular and morphological phylogeny, reproductive biology, quantitative morphology, molecular basis of plant responses to the environment; plant ecology, marine algal ecology, plant paleoecology, microscopy of zoospore fungi, mycology, and physiology and molecular biology of fungal pathogens.

**Developmental and Cell Biology**, including cell and molecular biology of muscle development, biology, developmental genetics, embryology, cardiac pacemaker mechanisms, and neurobiology.

**Ecology, Environmental Biology, and Paleoecology**, including aquatic, community, insect and plant ecology; biogeochemistry; biodiversity; conservation biology; paleolimnology population dynamics; population modeling; and Quaternary paleoecology.

**Entomology**, including insect ecology and biodiversity, insect pathology, biological control and insect pest management, ecology of aquatic insects, and predator-prey interactions, pollination ecology, and computer simulation of insect population dynamics.

**Fisheries Biology**, including ecology and behavior of fishes, fish microevolution and population ecology, salmonid biology, and aquaculture.

**Freshwater Biology**, including toxicology, ecology and behavior of fishes, lake, stream and river ecology, and paleolimnology.

**Genetics and Molecular Biology**, including behavioral genetics, molecular systematics, pathogen-plant interactions, plant molecular genetics and functional genomics, and the molecular basis of plant responses to the environment.

**Plant Pathology**, including control of fungal pathogens, and pest management.

**Physiology and Physiological Ecology**, including metabolic physiology of vertebrates, environmental physiology of marine invertebrates, fungal physiology, insect-plant interactions, pathogen-plant interactions, endocrine physiology and systemic physiology.

**Science Education**, including course and program assessment and developing innovative instructional techniques.

**Systematics and Evolution**, including microevolution, phylogenetics of plants, fungi, invertebrates, and fishes, and comparative morphology.

### **Special Options**

The School is also associated with the Institute for Quaternary and Climate Studies with which students may arrange cooperative programs of study.

Students of genetics may choose, as an option, study in a Ph.D. program on mammalian genetics offered in cooperation with the Jackson Laboratory. Thesis work may be conducted at the Jackson Laboratory; the doctorate is awarded by the University.

Training in applied fishery science is provided through the Maine Cooperative Fish and Wildlife Research Unit, operated at the University under an agreement among the University, the Biological Resources Division of the U. S. Geological Survey, the Wildlife Management Institute, and the Maine Department of Inland Fisheries and Wildlife. Also, the Migratory Fish Research Institute supports basic research on fishes.

### **Facilities**

Key to the School's research efforts are several facilities providing equipment, space and professional personnel. Among equipment available for graduate-student use, for example, are automated DNA-sequencing equipment, laser confocal and electron microscopes, digital imaging equipment, gas liquid chromatographs, scintillation counters and controlled-environment chambers. Aquatic laboratories for raising fishes and invertebrates, greenhouses, The University of Maine herbarium, an on-campus arboretum, and numerous sites for field research on both managed and natural habitats in marine, freshwater, and terrestrial ecosystems are easily accessible. Sites managed by the Maine Agricultural and Forest Experiment Station include the Blueberry Hill Research Farm in Jonesboro, the Organic Blueberry Research Site in Whitneyville, the Aroostook Potato Research Farm in Presque Isle, The Rogers Sustainable Agriculture Research Farm in Stillwater, and the Demeritt and Penobscot Experimental Forests in Orono and Bradley. Marine research facilities are available through the University's Ira C. Darling Center at Walpole, Maine; through the Huntsman Marine Science Center at St. Andrews, New Brunswick, Canada; and through the Mount Desert Island Biological Laboratory at Salsbury Cove, Maine. In affiliation with the Institute for Quaternary and Climate Studies, the department operates the Laboratory for Paleoecology and Paleohydrology. The Molecular Forensics Laboratory in Murray Hall provides DNA analysis for the Maine Warden Service and other wildlife enforcement agencies.

### **Application**

Applicants need to identify an area of research interest and a potential advisor at the time of application; they should feel free to contact members of the faculty to discuss possible research projects before submission of the application. A research project is a central part of both the M.S. and Ph.D. degrees.

All applicants will be automatically considered for teaching or research assistantships. Many students are supported by research grants to individual faculty members; interested students should contact faculty members directly for further information on grant-supported assistantships.

Additional information is available from the Graduate Coordinator, School of Biology and Ecology, 5751 Murray Hall, Orono, ME 04469-5751, (207) 581-2540, E-mail: [umbiosci@maine.edu](mailto:umbiosci@maine.edu), <http://biology.umaine.edu> .

## Graduate Faculty

**Andrei Alyokhin**, Ph.D. (University of Massachusetts, Amherst, 1999), Professor. Insect behavior and ecology, integrated pest management, biological control.

**Seanna L. Annis**, Ph.D. (University of Guelph, 1995), Associate Professor. Physiological, molecular, and field studies of fungal pathogens of plants and animals.

**Christopher S. Cronan**, Ph.D. (Dartmouth College, 1978), Professor. Biogeochemistry; plant ecology; ecosystem ecology.

**Francis A. Drummond**, Ph.D. (University of Rhode Island, 1986), Professor. Insect quantitative ecology, pest management, population dynamics, simulation modeling, biostatistics, and pollination ecology.

**Adria Elskus**, Ph.D. (Boston University, 1992), Associate Professor. Aquatic toxicology, biomarkers of exposure and effect, development of chemical tolerance, fish health.

**Allison Gardner**, Ph.D. (University of Illinois, Urbana-Champaign, 2016), Assistant Professor of Arthropod Vector Biology. Medical entomology, vector-borne disease ecology, epidemiology.

**Jacquelyn Gill**, Ph.D. (University of Wisconsin-Madison, 2012), Assistant Professor of Paleoecology and Plant Ecology. Climate change, extinction, and biotic interactions through time.

**Hamish Greig**, Ph.D. (University of Canterbury, 2008), Assistant Professor of Stream Ecology. Community ecology, environmental gradients, global change; aquatic ecology, freshwater invertebrates

**Eleanor Groden**, Ph.D. (Michigan State University, 1989), Professor. Insect ecology, insect pathology, biological control.

**David Hart**, Ph.D. (University of California, Davis, 1979). Professor. Watershed science and management.

**Clarissa Henry**, Ph.D. (University of Washington, 2000), Associate Professor. Cell and molecular biology of segmentation and muscle development in Zebrafish.

**Rebecca Holberton**, Ph.D. (State University of New York, Albany, 1991), Professor. The endocrine basis of bird ecology and behavior; reproductive biology, bird migration and conservation.

**Michael T. Kinnison**, Ph.D. (University of Washington, 1999) Professor of Evolutionary Applications. Microevolution, eco-evolutionary dynamics, aquatic ecology, population and conservation genetics, fish ecology.

**Danielle Levesque**, Ph.D. (University of KwaZulu-Natal, 2014), Assistant Professor. Evolutionary and ecological physiology of mammals: energetics, metabolism, temperature, life histories and global change.

**Joyce E. Longcore**, Ph.D. (University of Maine, 1991), Research Associate Professor. Chytridio-mycete systematics and phylogeny; chytrid pathogen of amphibians.

**Brian McGill**, Ph.D. (University of Arizona, 2003), Professor. Large scale ecology and global change.

**Brian Olsen**, Ph.D. (Virginia Tech., 2007), Associate Professor. Avian ecology, behavior, demography, mating systems, and life history evolution.

**Jasmine Saros**, Ph.D. (Lehigh University, 1999). Professor. Paleolimnology, phyto-plankton ecology, lake ecosystem response to global change.

**Michelle Smith**, Ph.D. (University of Washington, 2006). Assistant Professor. Science education.

**Ek Han Tan**, Ph.D. (Washington University, St. Louis, 2011), Assistant Professor of Plant Genetics. Plant genetics and genomics, genome elimination, potato breeding, chromothripsis.

**Kristy Townsend**, Ph.D. (Boston University, 2007), Assistant Professor. Brain and peripheral organs/tissues communication; regulation of energy balance, diabetes, obesity and body weight; adult neural plasticity; neurotrophic factors and neuropathy; CNS fuel utilization and energetics.

**Mary S. Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Developmental biology; organogenesis in vertebrates; morphogenesis in *Drosophila*; educational multimedia materials.

**Seth Tyler**, Ph.D. (University of North Carolina, 1975), Professor. Invertebrate biology; electron and fluorescence microscopy; phylogeny of lower invertebrates, especially meiofauna.

**Yong Jiang Zhang**, Ph.D. (University of Miami, 2012; Chinese Academy of Sciences, 2011), Assistant Professor of Plant Physiology. Plant stress physiology, plant hydraulics, principles regulating plant responses to environmental change, wild blueberries under climate change, ecosystem water and carbon balance, and sustainability science.

## Cooperating Faculty

**Susan H. Brawley**, Ph.D. (University of California, Berkeley, 1978), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Developmental biology and physiology of fertilization; marine ecology; environmental control of reproduction.

**William O. Bray**, Ph.D. (University of Missouri, 1981), Professor of Mathematics and Cooperating Professor of Biological Sciences. Classical analysis, harmonic analysis.

**Jim Dill**, Ph.D. (Purdue University, 1979), Extension Associate Program Administrator and Cooperating Professor of Biological Sciences. Integrated pest management of vegetable and small fruit crops.

**David Hiebeler**, Ph.D. (Cornell University, 2001), Associate Professor of Mathematics and Cooperating Professor of Biological Sciences. Mathematical population ecology, complex adaptive systems, modeling.

**Sara Lindsay**, Ph.D. (University of South Carolina, 1994), Associate Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Marine physiological ecology, marine invertebrate zoology.

**William H. Livingston**, Ph.D. (University of Minnesota, 1985), Associate Professor of Forest Pathology and Cooperating Associate Professor of Biological Sciences. Disease, ectomycorrhizal, and ethylene effects on growth of conifers.

**James D. McCleave**, Ph.D. (Montana State, 1967), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Migratory and transport mechanisms of fishes; fisheries oceanography.

**Paul Rawson**, Ph.D. (University of South Carolina, 1996), Assistant Professor of Marine Sciences and Cooperating Assistant Professor of Biological Sciences. Quantitative and population genetics of marine invertebrates, molecular evolution.

**Alan M. Rosenwasser**, Ph.D. (Northeastern University, 1980), Professor of Psychology. Behavioral neuroscience, chronobiology, and animal models of psychiatric disorder.

**Walter C. Shortle**, Ph.D. (North Carolina State University, 1974), Senior Scientist, U.S. Forest Service, Adjunct Professor of Biological Sciences. Plant pathology, biotransformation and nutrient cycling in forest ecosystem, acid precipitation.

**Robert S. Steneck**, Ph.D. (Johns Hopkins, 1983), Professor of Marine Sciences and Cooperating Professor of Biological Sciences. Ecology and evolutionary biology of benthic marine algae, invertebrates and communities. An emphasis on crustose coralline algae, herbivores and lobsters.

**Rebecca J. Van Beneden**, Ph.D. (Johns Hopkins University, 1983), Professor, Biochemistry and Marine Sciences, Cooperating Professor of Biological Sciences. Environmental toxicology: molecular mechanisms of carcinogenesis, comparative carcinogenesis, aquatic toxicology.

**Robert G. Wagner**, Ph.D. (Oregon State University, 1989), Henry W. Saunders Distinguished Professor in Forestry and Cooperating Professor of Biological Sciences. Forest sustainability, forest regeneration following harvesting.

## Research Resources

### Introduction to UMaine's Graduate Research

#### Introduction to UMaine's Graduate Research

The discovery, synthesis, and dissemination of knowledge are the goals of graduate level study. The University provides varied sources of organized research and learning opportunities through which students are introduced to the concepts of independent thinking in order to reach these goals.

Research expenditures in 2021 totaled an all-time high of \$179.3 million for sponsored research, teaching and public service activities of faculty. These activities include research in areas as diverse as Forestry and the Environment, Marine Sciences, STEM Education, Climate Change, Advanced Materials for Infrastructure and Energy, Civil Engineering, Mechanical Engineering, Electrical and Computer Engineering, Biomedical Science and Engineering, Data Science and Engineering, Nanotechnology, Sensor Systems, Sustainability Solutions and Technologies, Aging Research, Finance Education, Northeastern Americas Humanities Research and Education.

The University of Maine is the state's public research university. Classified as an *R1 Very High Research Activity* Institution by the Carnegie Foundation for the Advancement of Teaching, placing UMaine among the *top 4 percent* of universities engaged in research.

UMaine Research Website: <https://umaine.edu/research/>

### Interdisciplinary Research Centers and Institutes

#### Advanced Structures and Composites Center

**Focus:** The University of Maine's Advanced Structures and Composites Center (ASCC) is an interdisciplinary center for research, education, and economic development, encompassing material sciences, manufacturing, and the engineering of composites and structures. A University of Maine signature research area for Advanced Materials for Infrastructure and Energy, the UMaine Composites Center focuses on developing next-generation solutions that capitalize on Maine's vast natural resources to address the most pressing infrastructure and energy-related challenges.

**Facilities:** The Center is housed in a 100,000 ft<sup>2</sup> ISO 17025-accredited testing facility with fully equipped, integrated laboratories to develop and test durable, lightweight, corrosion-resistant material solutions for a wide variety of industries.

**Website:** [composites.umaine.edu/](http://composites.umaine.edu/)

### **Advanced Manufacturing Center**

**Focus:** The Advanced Manufacturing Center (AMC) is an applied manufacturing research facility that works directly with public and private sector clients to advance manufacturing technologies in the state of Maine.

**Facilities:** The AMC's 30,000 ft<sup>2</sup> facility is home to a host of CNC machines, additive metal manufacturing capabilities, and a full suite of materials testing equipment.

**Website:** [umaine.edu/amc/](http://umaine.edu/amc/)

### **Aquaculture Research Institute**

**Focus:** The Aquaculture Research Institute (ARI) brings together researchers and faculty from multiple disciplines at UMaine, key industry partners, and applied R&D opportunities, to enable innovation within UMaine's aquaculture research.

**Facilities:** The Institute includes some of the nation's most state-of-the-art aquaculture facilities. ARI is part of the UMaine MARINE initiative.

**Website:** [umaine.edu/aquaculture/](http://umaine.edu/aquaculture/)

### **Center for Community Inclusion and Disability Studies**

**Focus:** The Center for Community Inclusion and Disability Studies (CCIDS) works closely with people with disabilities, families, state and local government agencies, community providers and others on projects providing training, technical assistance, service, research, and information sharing.

**Facilities:** The Center is Maine's University Center for Excellence in Developmental Disabilities (UCEDD). There are currently 67 UCEDDs; at least one in every U.S. state and territory.

**Website:** [ccids.umaine.edu/](http://ccids.umaine.edu/)

### **Center for Research on Sustainable Forests**

**Focus:** The Center for Research on Sustainable Forests (CRSF) is currently developing, integrating, and applying emerging geospatial technologies and informatics methods to address current and future issues to support the sustainable management of the region's natural resources.

Facilities: The Center works in forests throughout Maine and developed several interactive databases and tools including the Maine Forest Dashboard. It runs initiatives like the Forest Climate Change Initiative and Spruce Budworm Taskforce.

Website: [crsf.umaine.edu/](http://crsf.umaine.edu/)

### **Center for Undergraduate Research**

Focus: The Center for Undergraduate Research (CUGR) has facilitated faculty-mentored research and creative activities for undergraduate students across all academic disciplines since its inception in 2008.

Facilities: The center is located in the Innovative Media Research and Commercialization Center (IMRC) and coordinates the annual Student Symposium, which provides an opportunity for the public to interact one-on-one with UMaine students as they present their research and creative work.

Website: [cugr.umaine.edu/](http://cugr.umaine.edu/)

### **Center on Aging**

Focus: The Center on Aging promotes and facilitates activities on aging in the areas of education, research and evaluation, and community service to maximize the quality of life of older citizens and their families in Maine and beyond.

Facilities: The Center's central offices are located on the University of Maine at Augusta campus in Bangor. The center runs several statewide programs; the Senior and Retired Volunteer Program, the Senior Companion Program, Encore Leadership Core, and more.

Website: [mainecenteronaging.umaine.edu/](http://mainecenteronaging.umaine.edu/)

### **Climate Change Institute**

Focus: The Climate Change Institute (CCI) is a global leader in interdisciplinary climate change research, conducts climate change research expeditions throughout the world, and both produces and shares software that allows researchers and the public to understand climate change.

Facilities: The Institute supports expeditions and holds the Borns Symposium annually featuring presentations and discussion by Climate Change Institute graduate students and faculty on emerging research and topics related to global environmental change. The institute has a wide array of research laboratories and facilities to support its research.

Website: [climatechange.umaine.edu/](http://climatechange.umaine.edu/)

### **Forest Bioproducts Research Institute**

Focus: The Forest Bioproducts Research Institute (FBRI) advances the understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts as well as to provide and

promote technology validation and partnerships that will meet societal needs for materials, chemicals and fuels in an economically and ecologically sustainable manner.

**Facilities:** The Institute includes the Process Development Center (PDC), a fee-for-service facility on campus devoted to pulp and paper research and development, a nanocellulose production facility, and a pilot paper machine that can be used to explore applications of nanocellulose in papermaking. It also includes the Technology Research Center (TRC), in Old Town, Maine, a commercial-scale facility dedicated to advancing developing fuel, chemical and advanced material technologies from forest bioproducts.

Website: [forestbioproducts.umaine.edu/](http://forestbioproducts.umaine.edu/)

### **Frontier Institute for Research in Sensor Technologies**

**Focus:** The Frontier Institute for Research in Sensor Technologies (FIRST) has been active in carrying out research, teaching, and outreach activities in the broad area of surfaces and interfaces, thin films, microelectronic devices, sensor technology, and nanotechnology. A wide variety of on-going activities span the range from fundamental research to applied development to technology transfer.

**Facilities:** FIRST has an impressive array of instrumentation to synthesize and investigate materials properties at the atomic scale and up to macroscopic dimensions, as well as to fabricate and test a variety of micro/nano electronic devices and micro/nano systems.

Website: [umaine.edu/first/](http://umaine.edu/first/)

### **Innovative Media, Research and Commercialization Center**

**Focus:** The Innovative Media Research and Commercialization (IMRC) Center is an interdisciplinary research and experiential learning facility that supports the creative and innovative intersection of arts and humanities, sciences, and technology.

**Facilities:** The Center provides research and prototyping laboratories, maker spaces, audiovisual production spaces, performance spaces, and classrooms, each designed and staffed to welcome, support, and engage all learners.

Website: [imrccenter.umaine.edu/](http://imrccenter.umaine.edu/)

### **Maine Center for Research in STEM Education**

**Focus:** The Maine Center for Research in STEM Education (RiSE Center) is an interdisciplinary center organized to conduct research, graduate education, professional development, and to build community partnerships focused on improving the research and research-based practice of science, technology, engineering, and mathematics (STEM) education at all levels of instruction.

**Facilities:** Members of the RiSE Center engage in education research across multiple STEM departments and the College of Education at the University of Maine. The RiSE Center provides education and professional development for emerging educators through undergraduate and graduate opportunities, including teaching and research assistantships, a Master of Science in Teaching degree with a teacher certification option, and an interdisciplinary STEM Education PhD program.

Website: [umaine.edu/risecenter/](http://umaine.edu/risecenter/)



### **Maine Sea Grant**

Focus: The University of Maine is one of 34 NOAA Sea Grant programs operating throughout the coastal and Great Lakes states, and it is a federal-state partnership that supports research, outreach and education.

Facilities: Maine Sea Grant and the University of Maine Cooperative Extension partner to form the Marine Extension Team, which works on issues of concern to Maine's coastal communities. It sponsors scientific research that matters to those who depend on Maine's coastal and marine resources and develops tomorrow's marine workforce through formal and informal education programs, fellowships and scholarships.

Website: [seagrant.umaine.edu/](http://seagrant.umaine.edu/)

### **Margaret Chase Smith Policy Center**

Focus: The Margaret Chase Smith Policy Center has engaged in applied public policy research and community engagement with the goal of improving the quality of public discourse grounded in civility and a willingness to engage respectfully across political, social, and cultural differences. The MCS Policy Center's dedication to this nonpartisan mission advances relationships among policymakers, community leaders, and the students, faculty, and staff of the University of Maine System.

Facilities: The Center is based on the Orono campus and provides student fellowships. The Margaret Chase Smith Library is located in Skowhegan, Maine. The Center publishes the *Maine Policy Review*, a timely, independent, peer-reviewed analysis of public policy issues relevant to the state of Maine.

Website: [mcspolicycenter.umaine.edu/](http://mcspolicycenter.umaine.edu/)

### **Senator George J. Mitchell Center for Sustainability Solutions**

Focus: The Mitchell Center for Sustainability Solutions is widely recognized for stakeholder-engaged, solutions-driven, interdisciplinary research to improve human well-being while protecting the environment. In collaboration with diverse stakeholders, the Mitchell Center links knowledge with action to create a brighter economic, social and environmental future in and beyond Maine.

Facilities: The Center provides toolkits and support for sustainable solutions. For more than a decade, the Mitchell Center for Sustainability Solutions has been building its capacity for stakeholder-engaged, solutions-driven research that helps solve pressing problems, working with municipal officials, state legislators, farmers, tribal communities, and the waste management industry.

Website: [umaine.edu/mitchellcenter/](http://umaine.edu/mitchellcenter/)

### **Maine Center for Genetics in the Environment**

Focus: The Maine Center for Genetics in the Environment aims to energize Maine's environmental genetics research community by promoting effective collaborations and new partnerships for transdisciplinary research, innovation and training.

Website: <https://umaine.edu/mcge/>

### **Maine Established Program to Stimulate Competitive Research**

Focus: The Maine Established Program to Stimulate Competitive Research (EPSCoR) develops partnerships between the state's higher education institutions, industry, government and others to effect lasting improvements in their R&D infrastructure, capacity and national competitiveness.

Facilities: Maine EPSCoR at the University of Maine oversees and implements the state's NSF EPSCoR programs.

Website: [umaine.edu/epscor/](http://umaine.edu/epscor/)

### **Institute of Medicine**

Focus: The Institute of Medicine is a transformative and coordinated community of collaborating researchers and educators that in partnership with health care providers and other stakeholders are dedicated to the advancement of human health and wellbeing in the state of Maine and beyond, through discovery and learning in health and life sciences, from basic and translational research, to clinical practices and healthcare workforce development.

Facilities: The Institute provides seminars and works with healthcare organizations around the state to collaborate and innovate.

Website: <https://umaine.edu/medicine/>

### **Research Initiatives**

#### **Experiential Programs Innovation Central (EPIC)**

Focus: Cutting-edge student-centered undergraduate education is the key focal point of the University of Maine Experiential Programs Innovation Central - UMaine EPIC. UMaine is the home to more than 9000 undergraduate students who are able to choose from 100 undergraduate majors and academic programs. With EPIC they have the opportunity to gain in-depth learning and invaluable skills through high impact experiential learning programs that have been closely integrated and coordinated for maximum educational impact.

Website: <https://umaine.edu/epic/>

### **UMaine AI**

Focus: The University of Maine Artificial Intelligence Initiative (UMaine AI) is a unique Maine-based venture that brings together university, industry, government, and community collaborators from Maine and beyond to advance the field of artificial intelligence, and through development of innovative technologies and applications find transformative solutions to enhance human life and societal well-being in Maine and beyond.

Website: <https://ai.umaine.edu/>

### **UMaine Arctic**

Focus: UMaine Arctic develops and strengthens partnerships with other institutions and individuals in the region, participating in the New England Arctic Network, which operates as a regional hub for institutions in New England and have been members of the University of the Arctic (UArctic), a cooperative network of universities, colleges, research institutes and other organizations concerned with education and research in and about the North.

Website: <https://umaine.edu/arctic/>

## **UMaine Arts**

Focus: The University of Maine Arts Initiative is a collaborative of faculty, administrators, staff, and students committed to the principle that the arts play an integral role in public research institutions. We seek to increase resources and support for the arts in order to reinforce their significance and enhance their visibility on campus and beyond. Through innovative and interdisciplinary collaborations we seek to build a diverse, inclusive, sustainable, and equitable community of art researchers, practitioners, supporters, and promoters.

Website: <https://arts.umaine.edu/>

## **UMaine FOREST**

Focus: UMaine FOREST provides strategic planning and seamless integration of research, education and outreach across the University of Maine System (UMS) to facilitate partnerships and the sustainable growth of Maine's forest-based economy. Through the use of a dedicated forest sector ombudsman, UMaine FOREST establishes direct and consistent connections across Maine's businesses, development groups, educators and communities. Working across and above the UMS organizational structure to better understand its administrative vision and goals, current and potential programs, facilities, equipment and professional capabilities across each university and between campuses, UMaine FOREST strives to provide integrated systems-based solutions to challenges facing Maine's forest-based economy.

Website: <https://umaine.edu/forest/>

## **UMaine MARINE**

Focus: Created on the foundation of its nationally and internationally recognized marine programs, world-class research, and cutting-edge facilities, the University of Maine Marine Aligned Research, Innovation, and Nationally-recognized Education or UMaine MARINE is a unique Maine-based initiative that brings together university, industry, government, and community collaborators who through integrated and innovative transdisciplinary marine research, education, and outreach are dedicated to the enhancement of social and economic wellbeing in Maine and beyond.

Website: <https://marine.umaine.edu/>

## **Portland Gateway**

Focus: The Portland Gateway provides a one-stop connection and point of access to the vast array of innovative research, education and outreach resources, programs and services at the state's research university in Orono and its facilities statewide. The Portland Gateway offers opportunities for tailored partnerships to advance specific business or corporate needs, outreach and community engagement opportunities, and professional careers in connection with the UMaine Research enterprise.

Website: <https://maine.edu/portland>

## **Managing Offices & Services**

### **The Office of the Vice President for Research and Dean of the Graduate School**

The Office of the Vice President for Research and Dean of the Graduate School (OVPRGS) supports research and graduate study programs by providing services, oversight and resources. It is responsible for developing policies for research and related activities. It provides administrative oversight for 17 research centers and institutes; the Office of Research Administration; the Office of Research Compliance; the Office of Research Development; UMaine Coordinated Operating Research Entities (CORE); Advanced Research Computing, Data Security, and Information Management (ARCSIM); Research Initiatives; and the Graduate School. The Vice President for Research is the university-designated Scientific Misconduct Officer and monitors financial conflicts of interest in externally-funded research.

#### **The Office of Research Administration**

The Office of Research Administration has broad responsibilities for fostering and encouraging research and other scholarly activities throughout the campus. The office provides support services to faculty and staff seeking extramural funding for research, teaching, or public service projects, and to those who direct extramurally funded projects. On behalf of the University, the office oversees the submission of proposals and shares with the Principal Investigator or Project Director responsible for the management of grants, contracts, and cooperative agreements.

#### **The Office of Research Compliance**

The Office of Research Compliance's mission is to promote a culture of ethics, integrity, and compliance with applicable laws, regulations, and policies governing research. The office provides comprehensive regulatory guidance to the UMaine research community regarding specific components of research compliance, including protection of human subjects, humane care and use of animals, use of recombinant or synthetic nucleic acid molecules or infectious agents, financial conflict of interest, responsible conduct of research, and export control regulations.

#### **The Office of Research Development**

The Office of Research Development aims to enhance grant-seeking activities and facilitate internal and external collaborations to promote a culture of research excellence and extramural funding success. They are a resource to faculty and researchers who wish to increase their success in grant writing. The office also oversees the management and administration of internal grant programs and assists in the implementation of strategic initiatives.

#### **Coordinated Operating Research Entities**

The Coordinated Operating Research Entities (CORE) office oversees the management of major research equipment and facilities at the University of Maine. The mission of CORE is to serve as UMaine's central repository for major research equipment and facilities, and to enable researchers and industrial partners from around the State to have easy access to state-of-the-art technology and services for their scientific research and scholarly activity. CORE research services are delivered by experts on a fee-for-service basis to enable, facilitate and enhance the research mission of UMaine.

#### **Advanced Research Computing, Data Security, and Information Management**

UMaine ARCSIM strives to provide its research user community the best possible service in the most timely and cost-effective manner. Its primary goal is to support the advancement of research and discoveries of global impact and local relevance that are enabled through technological solutions.

## **Additional Research Resources**

**The Department of Industrial Cooperation.** ORED's Department of Industrial Cooperation (DIC) arranges all fee-for-service work and industry-sponsored collaborative research, matching companies with the appropriate UMaine

expertise and facilities. DIC helps UMaine achieve its goals of research and public service, while avoiding conflicts of interest with the private sector and ensuring that the university is compensated for private use of its state-supported resources.

**The Office of Innovation and Economic Development.** (OIED) helps support new and existing businesses by linking them with industry experts; facilitating commercialization activities, such as new innovations developed at UMaine; and transferring university research and development into marketable products and services. Their work helps innovation across Maine grow, creates future innovators and new jobs, and enhances the state economy. The office is also a responsive liaison, facilitating the relationship between the University of Maine at large and elected officials.

#### **University of Maine Cooperative Extension.**

University of Maine Cooperative Extension's community presence creates unparalleled opportunities for innovative work-study, internships and assistantships for students. UMaine Extension supports the university's public education and service role by delivering research-based outreach programs in every county in the state. Based in Orono, county offices across the state, and five farms of the Maine Agricultural and Forest Research Station, UMaine Extension includes almost 200 staff and thousands of volunteers who provide community-based education, with a focus on the Maine food system and 4-H, the most successful out-of-school youth development program in Maine.

UMaine Extension is part of a nationwide system, supported by a three-way partnership among the U.S. Department of Agriculture, the land grant colleges and universities, and county governments. It conveys community issues, needs and opportunities to inform University of Maine research and development. UMaine Extension's reach is amplified via partnerships with Maine Sea Grant, the Maine Food and Agricultural Center, ~~and~~ the Maine Agricultural and Forest Experiment Station, and collaborative programming with UMaine academic and departmental colleagues.

UMaine Extension engages young people in a variety of roles. Students have achieved success and helped UMaine Extension move forward in such diverse areas as communications and marketing; Native American awareness and connections; and Maine 4-H Science, Technology, Engineering and Math (STEM) program development while working collaboratively with faculty and developing partnerships with community groups. In addition, UMaine Extension has had students work in personnel management, publications, IT support and new media development.

More information is available on our website, ([extension.umaine.edu](http://extension.umaine.edu)) or by contacting UMaine Extension at [extension@maine.edu](mailto:extension@maine.edu); 207.581.3188.

## **University Resources**

#### **Raymond H. Fogler Library**

Raymond H. Fogler Library, Maine's largest library, is essential to education, research, and public service at the University of Maine and beyond. The library offers millions of print and physical items in addition to more than 1.5 million e-books, 160,000 online journals, 350 research databases, and 240,000 digital media items. Through Fogler Library, UMaine patrons can borrow print and digital materials from libraries throughout the state and around the world.

The library's staff serve as information experts who help patrons discover, use, and expand knowledge. The Reference and Information Literacy Department is a central location for research support on campus. Each academic program has a subject librarian who can provide individual consultations, classroom instruction, and subject-matter expertise across the different areas of study at UMaine. The department provides research support in-person, by phone, and online via email and live chat (<https://library.umaine.edu/ask-a-librarian/>).

Fogler Library's Special Collections Department maintains an extensive collection of published bibliographical, historical, and descriptive works on Maine, as well as literary titles by Maine authors. These documents provide extensive insights into Maine cities, towns, counties, people, and institutions. The department also houses rare books and University of Maine publications and records. Special Collections staff support the research pursuits of students, faculty, and scholars at UMaine and around the world.

Fogler Library is also a regional depository for federal government publications; an official depository for Canadian federal and Maine state government publications; the designated State Research Library for Business, Science, and Technology; and the only Patent and Trademark Resource Center in Maine.

Access library resources, services, expertise, collections, and general information at <https://library.umaine.edu>. The general telephone number for the library is 207.581.1666.

## Information Technology

### University Services: Information Technology

The University of Maine System's Information Technology organization (US:IT) is committed to providing high-quality technology services for UMaine and UMaine Machias students, faculty, and staff, and supporting the technology needs of the University's land-grant and sea-grant mission of creating and disseminating knowledge to improve the lives of its students and Maine citizens through teaching, basic and applied research, and public service activities.

### US:IT List of Locations & Services:

*IT Support Services Center* (Fogler Library - Room 130, telephone 207.581.2506)

- Telephone, walk-in, and email assistance for UMS accounts (Google apps, MaineStreet, networking/wireless access, Brightspace, OneDrive, etc.), software applications, and all operating systems.
- Guidance for identifying computer viruses and malware, and providing data backup assistance.
- For more information or to request support call 207.581.2506. You can also visit our website at <https://www.umaine.edu/it>.

### *Public IT Computer Clusters*

- A computer cluster is available at the Fogler Library Information Commons. Both PC and Mac devices are available in this location.
- Available software includes Microsoft Office Professional suite, UMaine licensed applications used to support classwork such as ArcGIS, JMP, SAS, SPSS, Mathematica, MatLab, ChemDraw, Adobe Creative Cloud, etc.

### *Printing*

- Every student receives \$16.00 in print funds applied to their MaineCard each semester to use for printing via US:IT-supported printers.
- Print locations: Graduate School Print Station in Stodder Hall and IT *Print From Anywhere* release stations located in Fogler Library, Union Central (Memorial Union), York Dining Hall, Hilltop Dining Hall, and Wells Common Dining.
- Visit the UMaine IT website at <https://umaine.edu/it/umaine-it-printfromanywhere/> for instructions on printing from a personal device via the Print From Anywhere web portal.

*Media Services* (Shibles Hall - Room 19, telephone 207.581.2500)

- Classroom technology equipment support including audio and video equipment assistance.
- Video and web conferencing support for classes and meetings.
- Equipment-On-Loan at Fogler Library, Circulation Desk
  - To reserve Audio Visual equipment, call the Fogler Library Circulation Desk at 207.581.1641.
  - A valid MaineCard is required to sign out AV Equipment.
- To reserve a video conferencing room, call 207.581.1610.
- For additional information or to request support call 207.581.2500.

The **College of Education and Human Development** is setting a course through research, service and innovation. Alumni are leading in classrooms, schools and school districts throughout Maine, across the country and around the globe. They're changing lives as teachers, administrators, nonprofit and community leaders, and as student support professionals on college and university campuses. The athletic training and exercise science graduates are setting a course for professional, college and high school athletes, as well as creating lifelong wellness and personal fitness enthusiasts. Human development professionals are changing the world through intervention programs, advocacy, and social and community services. <https://umaine.edu/edhd/>

The **College of Natural Sciences, Forestry, and Agriculture's** programs advance society's understanding of the natural world and the health of its citizens and communities. Our faculty, whose research spans both the health and natural sciences, represent the largest assemblage of scientific expertise in Maine. The College's extensive teaching and research facilities host some of the most sophisticated research equipment available and are spread throughout Maine to take advantage of the state's diverse opportunities for discovery. From Maine's rural hospitals and forests, to the depths of the Gulf of Maine and glaciers of Antarctica, our faculty and graduate students conduct science that transforms lives and informs decisions that will create a bright future for our world. [www.nsfa.umaine.edu](http://www.nsfa.umaine.edu)

The **College of Engineering.** As Maine's leading engineering program, the college prepares an educated workforce, conducts research that turns knowledge into innovative solutions, and provides outreach that includes STEM initiatives. The mission of the College of Engineering at the University of Maine is to produce the graduates and new technologies needed to move Maine's economy forward. As a UMaine signature area, the College continues to play a vital role in our state and beyond and is a key element in assisting several other signature areas. The College of Engineering at the University of Maine is Maine's only educational institution to offer 11 ABET accredited engineering and engineering technology degree programs. Our reputation is known world-wide, our facilities are world-class, and our research contributes significantly to scientific discoveries and economic development in Maine and beyond. Innovating engineering excellence since 1865. <https://engineering.umaine.edu/>

The **College of Liberal Arts and Sciences** is the heart of the University of Maine, contributing to the education of every undergraduate student on the Orono campus. Courses in our college provide the foundation in critical reasoning, communication skills and core knowledge needed to thrive in an ever changing, globalized world. With the diversity of a large institution and the friendly atmosphere of a small liberal arts college, UMaine's College of Liberal Arts and Sciences offers a broad range of disciplinary and interdisciplinary majors and minors in the humanities, fine and performing arts, social sciences and sciences. Scholars and creative artists work closely with undergraduate and graduate students in first rate facilities to advance understanding and appreciation of the human experience, the natural world, and the arts. Our goal is to ignite intellectual curiosity, to develop skills needed to pursue answers, and to cultivate creativity to pose the next generation of questions. It's learning that lasts a lifetime. <https://umaine.edu/las/>

*The School of Forest Resources*, in the College of Natural Sciences, Forestry, and Agriculture, offers graduate study leading to a non-thesis Master of Forestry, a Master of Science in Forest Resources and a Ph.D. in Forest Resources. Maine, the most heavily forested state in the United States, sets the context for SFR research, though projects reach beyond state and national boundaries. Much of the research in the SFR is field oriented, and there are a variety of ecosystems and socioeconomic conditions available for investigation. The NSFA College is responsible for the management of the Dwight B. Demeritt Forest, a 1,700-acre tract adjoining the campus, the 4,000-acre Penobscot Experimental Forest, and nearly 4,000 acres of other forest properties in Maine. In addition, Maine contains millions of acres of forestland that are under diverse management by large ownerships, forest industries, small ownership parcels, state and federal forests, and Acadia National Park. Through the cooperation of these diverse landowners, opportunities exist for silvicultural, on-site wood processing, and ecological studies. Maine's systems of land use regulation and forest taxation and the state's long-standing reputation as a "vacationland" for forest recreation provide other categories of potential research interest.

The *Barbara Wheatland Geospatial Analysis Laboratory* provides a center of excellence for geospatial analysis in student and faculty research, along with state-of-the-art resources for university education and professional development. The Lab houses computer workstations equipped with high-end image processing and GIS software, and research leverages a data acquisition and image analysis program using manned and unmanned aircraft. The program supports numerous basic and applied research projects with the primary focus on exploring innovative ways to leverage remote sensing and geospatial technology for forest and natural resource management, environmental monitoring and conservation, forest ecosystem science and climate change research.

The Forest Resources graduate study opportunities are strengthened by association with strong research programs within the SFR College of Natural Sciences, Forestry and Agriculture, elsewhere on the Orono campus, and in the region.

The *Center for Research on Sustainable Forests (CRSF; <https://crsf.umaine.edu/>)* was founded in 2006 to build on a history of leading forest research and to enhance our understanding of Maine's forest resources in an increasingly complex world. Forest research and its application are rapidly evolving due to unprecedented availability of data provided by emerging technologies such as high-resolution digital imagery and GPS. CRSF seeks to lead the development, integration, and application of these emerging technologies to address current and future issues in natural resources. Its mission is to conduct and promote leading interdisciplinary research on issues affecting the management and sustainability of northern forest ecosystems and Maine's forest-based economy. CRSF scientists study a variety of areas, including forest-based research, nature-based tourism, and climate change. CRSF organizes and hosts several workshops, conferences and other events each year as a means to communicate directly with stakeholders, research partners and the public.

The *Cooperative Forestry Research Unit (CFRU; <https://umaine.edu/cfru/>)* is a stakeholder-driven research cooperative and is a core research program of CRSF at UM. It includes 35 member organizations representing over 8 million acres of Maine's forest (half of all forestland in the state). CFRU Cooperators include Maine forest landowners, wood processors, conservation organizations, and others that support the mission and objectives of the CFRU. The CFRU is funded by voluntary financial and in-kind contributions from its members to The University of Maine. For 40 years, CFRU has shaped the evolution of forest practices in the state and advanced the principles of sustainable forest management. Current CFRU research focuses on silviculture, forest productivity, growth & yield modeling, remote sensing, and wildlife habitat issues related to the management of Maine's commercial forestlands. Closely related to CFRU is the *Maine Adaptive Silviculture Network (MASN)*, a statewide series of operational-scale silvicultural treatments where future research on forest productivity and sustainability will be studied. Currently, there are 6 MASN sites established throughout Maine and plans to increase it to 12 sites by 2023.



**The Center for Advanced Forestry Systems (CAFS; <https://crsf.umaine.edu/forest-research/cafs/>)** is a National Science Foundation Industry-University Cooperative Research Center (IUCRC). CAFS is one of the larger IUCRCs within NSF as it has 8 university sites and over 100 members throughout the entire US. UM has been a CAFS site since 2008, and the lead center since 2017. CAFS received a \$0.5M, 5-year Phase III funding in December of 2018 with a primary priority being the creation a national research agenda that will benefit the forest industry, recruiting non-profit members such as private foundations, and ensuring sustainability for the membership-based program after NSF funding ends. CAFS, like CFRU, brings important industry linkages.

Graduate students studying in the area of wood science & technology and bioproducts have access to world class equipment and researchers through strong ties to two research units on campus. The *Advanced Structures and*

*Composites Center* (<https://composites.umaine.edu/>) houses a 100,000 ft<sup>2</sup> state of the art facility for materials and wood/composites engineering research. The Forest Bioproducts Research Institute's ([www.forestbioproducts.umaine.edu](http://www.forestbioproducts.umaine.edu)) mission is to advance understanding of the scientific underpinnings, system behavior and policy implications for the production of forest-based bioproducts.

Within SFR, the *Laboratory of Renewable Nanomaterials (LRN)* focuses on alternative applications of cellulose nanomaterials aimed at large volume production and end uses. Established in 2013, the LRN is well equipped for the production and characterization of advanced bio-composites and bioproducts. The *Bio-energy Laboratory* focuses on advanced technologies to improve the energy efficiency of energy-intensive wood industry and timber-based building sector, innovative carbon-neutral bioproducts, such as engineered wood products and mass timber panel products, numerical analysis of hydrothermal behavior of wood and engineered wood products; and utilization of sustainable and renewable biomass as bioenergy resources.

A federally funded Acadian Forest Ecosystem Research Program carries on long-term research on the nearby Penobscot Experimental Forest. The USDA Forest Service research program in Orono (a branch of the Northern Forest Experiment Station) employs scientists who hold appointments among the College's graduate faculty. A scientist from the USDA Forest Products Laboratory (FPL) is also stationed at UMaine facilitating scientific and research interactions with FPL scientists. Cooperative relationships also are common between the School of Forest Resources and several other University of Maine departments

### **The Maine Agricultural and Forest Experiment Station.**

For more than 135 years, the Maine Agricultural and Forest Experiment Station has undertaken research for Maine and its people. Originally devoted to research for Maine's farm community, the Experiment Station is now Maine's most important center for research in agriculture, nutrition and food science, forestry and wood products, marine fisheries and aquaculture, freshwater fisheries, wildlife, rural economic development, and tourism. The Experiment Station maintains its offices and principal research laboratories in Orono. Additional research facilities include Aroostook Farm in Presque Isle, Highmoor Farm in Monmouth, Blueberry Hill Farm in Jonesboro, J.F. Witter Teaching and Research Center in Old Town and Stillwater, the Lyle E. Littlefield Ornamentals Trial Garden and the Roger Clapp Greenhouses in Orono, and the Dwight B. Demeritt Forest in Old Town and Orono. The off-campus facilities of the Experiment Station provide an essential platform for applied field research that is integrated with research at campus laboratories. Many students carry out Experiment Station research as part of their graduate program.

The Experiment Station's research programs improve the quality of life for Maine people by enhancing the profitability and sustainability of Maine's natural-resource-based industries and by protecting Maine's environment and the health of

its citizens. Station scientists use cutting-edge tools to address current challenges for Maine's natural resource-based industry and provide the new knowledge that fuels innovation. Discoveries are translated into new production methods, new pest-management and disease treatments, new value-added products, and new programs to improve the nutrition of Maine citizens. <http://umaine.edu/mafes/>

Many College of Natural Sciences, Forestry, and Agriculture graduate students receive a significant portion of their funding from the Experiment Station. Some students conduct a portion or all of their data collection at the Experiment Station facilities off-campus, as well as at other areas of the state. See the College Research Map to view a sampling of research projects - <https://nsfa.umaine.edu/research/research-map/>.

**The Pulp and Paper Foundation.** Supported by private funding from more than 60 companies located in over 40 states as well as several hundred individual donations and endowment gifts annually, the \$31 million foundation encourages a strong teaching and research program in Chemical Engineering, with a significant undergraduate scholarship program available to qualified students throughout the College of Engineering and the School of Engineering Technology.

**The School of Marine Sciences (SMS)** is a large unit of the University residing in the College of Natural Sciences Forestry and Agriculture. SMS is the focal home of both graduate and undergraduate academic programs, research, and public service activities related to scientific policy and resource topics of marine and coastal zone environments. At present, approximately 48 faculty are affiliated with SMS including full-time, part-time, and cooperating appointments. SMS, by its very nature, is an interdisciplinary unit dedicated to research, education and public service. Current areas of expertise and research include oceanography, aquaculture, marine biology, marine geology, seafloor ecology, fish and fisheries biology, fish pathology, seaweed biology, marine resource development and policy, and ocean engineering.

The School of Marine Sciences offers graduate programs leading to the degrees of M.S. and Ph.D. in Oceanography, M.S. and Ph.D. in Marine Biology, M.S. in Marine Policy and Masters in Professional Sciences.

Faculty of SMS provide leadership in research programs with emphasis on the Gulf of Maine, its related coastal zone, and in other cold-water and global systems. SMS faculty are headquartered at both the University's Orono campus and its coastal marine laboratory campus, the Ira C. Darling Center (see below).

The School also develops and maintains relationships with other marine research institutions within the region. Examples include Maine Maritime Academy, the Mount Desert Island Biological Laboratory, Bigelow Laboratory, the Maine Department of Marine Resources, and the Maine Geological Survey.

**The Darling Marine Center (DMC)**, the University's marine laboratory, is located on the Damariscotta River estuary, approximately 100 miles south of the Orono campus in mid-coast Maine. Approximately 45 faculty, postdoctoral associates, graduate students, and support staff are in residence at the DMC and conduct research on a wide array of themes including aquaculture and marine fisheries; biogeochemistry and microbial ecology; biological, chemical and physical oceanography; invertebrate biology and biodiversity; and marine ecology, conservation science and policy. A variety of unique field-oriented undergraduate and graduate courses are offered annually at the DMC including: Semester By the Sea, Summer University, and specialized Ph.D. and professional-level training workshops in the marine and environmental sciences. The DMC is a full service marine field station with two flowing seawater laboratories equipped with ambient, heated, and chilled seawater for the culture of marine organisms. The laboratories have resident and visitor lab spaces, state-of-the-art instrumentation, and teaching classrooms. A small boat fleet (19' to 42') enables researchers to access a wide variety of near and offshore marine and estuarine habitats. Also available are oceanographic sampling gear, SCUBA support, and a marine library, as well as housing, meal service and meeting space for scientific and educational conferences. More information is available at <https://dmc.umaine.edu/>

**The Lobster Institute**, a unit within the College of Natural Sciences Forestry and Agriculture, fosters research, outreach, and education in support of the sustainability and profitability of the iconic lobster industry of the northeastern US and Atlantic Canada. The Institute serves to maximize the engagement of UMaine faculty, students and facilities with stakeholders in the fishery, working with industry leaders, scientists and policy makers to identify and address new challenges and opportunities.

**The Department of Psychology.** Facilities for experimental and clinical research include laboratories for the study of human and animal behavior, cognition, perception, and emotion. Among departmental research foci are depression and anxiety disorders, peer relations, developmental psychopathology, cognitive aging, and socio-cognitive factors influencing health and well-being. There are rooms designed for observation and audio-visual recording of behavior, as well as electrically shielded rooms for psychophysiological recordings. The department also operates a psychology clinic (Psychological Services Center) for instructional and research purposes. Through faculty affiliation with Eastern Maine Healthcare, research opportunities are also provided at Eastern Maine Medical Center.

**The Psychological Services Center**, maintained and administered by the Department of Psychology, has three interrelated functions. It is a community mental health clinic which serves central Maine residents of all ages through the provision of psychotherapy, and psychological assessment on site. Referrals are accepted from area physicians, family members, other mental health agencies/professionals, and from clients themselves. Graduate students in the Clinical Psychology doctoral program serve as clinic staff under direct supervision of licensed psychologists. Facilities for direct observation of treatment and audio-video recording are available. The clinic also provides mental health consultation services to community agencies. These services may involve consultation to agency staff on mental health matters, provision of direct services to individuals served by various agencies, and the provision of workshops and training seminars for residents and staff. The third function of the clinic is to serve as a clinical research facility. From time to time specialized treatment/research programs may be offered to the community free of charge. These programs aim to identify particular client populations and provide new and innovative approaches to the treatment of specific disorders.

**The Canadian-American Center.** Founded in 1968, the Canadian-American Center is one of the leading institutes in the United States for studying Canada. Designated a National Resource Center in Canada by the U.S. Department of Education in 1979, the Center coordinates all Canadian Studies activities at The University of Maine. The Center organizes international conferences, promotes student and faculty exchanges with Canadian universities, coordinates outreach activities in schools and in the community, and supports graduate research on Canadian-American topics.

The principal graduate programs in Canadian Studies are in the Department of Modern Languages, which offers an M.A. in North American French studies, and in the Department of History, which has a Canadian concentration at both the master's and doctoral levels. Individualized graduate programs are also available in many departments. The Canadian collection at the Fogler Library is outstanding. Holdings include numerous journals, newspapers, the pre-1900 Canadian series, government documents, dissertations, and the Mason Wade collection.

Each year, the Canadian-American Center offers awards to Graduate students, organizes cultural activities, and provides study abroad opportunities.

Students interested in graduate study on Canada or a Canadian-related field may contact the Canadian-American Center, 154 College Avenue, or contact Canadian Studies faculty in Anthropology, Business, Economics, English, Modern Languages, History, and the Climate Change Institute.

**The Maine Folklife Center** is a unit of the College of Liberal Arts and Sciences. The staff teaches courses through the Department of Anthropology, and conducts research in folklore, oral history and related subjects. Undergraduate work-study students and interns conduct work in the podcasting studio and assist with other projects. Graduate assistantships are sometimes available; students should contact the Center for more information. The Center is located in South Stevens and is open by appointment. For further information, email: [folklife@maine.edu](mailto:folklife@maine.edu), telephone 581-1891 or visit our website: [www.umaine.edu/folklife](http://www.umaine.edu/folklife).

**The Center for Poetry and Poetics (CPP;** formerly the **National Poetry Foundation**, or NPF) is a center for research on twentieth- and twenty-first-century poetry. Established in 1971 by Carroll F. Terrell (1917-2003) as a center for Ezra Pound scholarship, the CPP's mission was expanded by Burton Hatlen (director from 1990 until his death in 2008) to include the entire tradition of innovative poetry from modernism to the present day. CPP publishes a scholarly journal, *Paideuma*, which is devoted to scholarship on modernist and postmodernist poetry, as well as books of poetry and scholarly books on modern poetry. Poets whose collections have been published by CPP/NPF include Helen Adam, Joanne Kyger, Evelyn Scott, Ted Enslin, Armand Schwerner, and Constance Hunting. NPF also published the Modern Poets Series, which consists of substantial volumes of biographical and critical commentary on such poets as Louis Zukofsky, George Oppen, Basil Bunting, William Carlos Williams, Marianne Moore, H.D., T. S. Eliot, Hugh MacDiarmid, Mina Loy, and many others. Fifteen volumes have been published in this series, the most recent on Ronald Johnson. Graduate students have regularly found opportunities to provide editorial assistance in the development of CPP publications. CPP also organizes conferences that bring to the University of Maine major poets and poetry scholars. Past participants have included Allen Ginsberg, Carl Rakosi, Lewis Simpson, Ruth Stone, Hugh Kenner, Marjorie Perloff, Rachel Blau DuPlessis, Joan Retallack, Charles Bernstein, and many other distinguished poets and critics. University of Maine graduate students regularly participate in these conferences. For more information, go to the Center's blog: <https://nationalpoetryfoundation.wordpress.com>

**The Child Development Learning Center**, in the College of Education and Human Development, offers observational facilities and a setting in which to work with young children. Individuals have an opportunity to be involved in teacher training programs, curriculum development, and research focused on topics related to child and family development. Research may be interdisciplinary with other departments such as Communication Sciences and Disorders and Psychology. Graduate assistantships are available and assistants become part of the Center staff. <http://www.umaine.edu/edhd/professionals/katherine-m-durst-child-development-learning-center/>

**The Madelyn E. and Albert D. Conley Speech Language and Hearing Center**, located in Dunn Hall, is a center for clinical education and research as well as a facility for comprehensive state-of-the-art speech, language and hearing services. Both the Speech-Language Clinic and the Audiology Clinic provide services for individuals across the lifespan. The Speech-Language Clinic offers both evaluation and treatment services as well as outreach services to preschools, public/private schools, hospitals and group homes. The Audiology Clinic offers comprehensive services including hearing testing, hearing aid evaluations and hearing aid fittings. Additionally, the Conley Center offers speech therapy telepractice training and speech therapy services to children and adults across Maine and internationally. Graduate students in Communication Sciences and Disorders complete supervised clinical practicum experiences in both Speech-Language Pathology and Audiology at the Conley Center. Additionally, graduate students complete clinical placements in hospitals, rehabilitation centers, nursing homes and community speech and hearing centers. The Master's Program at the University of Maine is accredited by the **Council on Academic Accreditation in Audiology and Speech-Language Pathology (CAA)** of the American Speech-Language-Hearing Association, 2200 Research Boulevard #310, Rockville, Maryland 20850, 800-498-2071 or 301-296-5700.

**The Bureau of Labor Education (BLE)** The Bureau of Labor Education is a department within the University of Maine's Division of Lifelong Learning. The Bureau maintains an undergraduate Minor in Labor Studies as well as a Labor Studies Track that is part of the Bachelor of University Studies degree. The Bureau also conducts educational programs and research on issues of interest to workers, labor unions and policy makers. Topics include labor and employment law, labor history, labor relations, political economy, collective bargaining, arbitration and administrative hearing advocacy, mock arbitration, Robert's Rules of Order, union officer training and leadership development.

**The Virtual Environments and Multimodal Interaction (VEMI) Laboratory**

The VEMI Lab is an educational, research, and development facility based on a collaborative model where faculty, undergraduate, and graduate students from across more than a dozen disciplines learn about emerging technologies, scientific research, and creative problem solving. VEMI's mission is to conduct world-class research and to provide students with the training they need to be leaders in today's IT workforce or research-driven careers. For more information, please visit: <https://umaine.edu/vemi/>

### **Graduate Interdisciplinary Endeavors at The University of Maine**

The University of Maine is firmly and deeply committed to the expansion of knowledge and understanding by encouraging various forms of interdisciplinary academic endeavor. Such activities have become the hallmark of academic excellence and a clear indicator of the intellectual vitality of modern institutions of higher learning. The University of Maine accordingly boasts a vibrant array of interdisciplinary activities that provide an exceptionally wide range of opportunities for all members of the University community - undergraduate students, graduate students, faculty members, staff members, administrators - to participate in scholarly undertakings that involve multiple academic disciplines. The following list covers opportunities currently available to graduate students at the University of Maine; other endeavors may be in the planning stages, and the University actively fosters the expansion of this critical aspect of its overall mission of teaching, research, and public service. For more information, click [here](#).

#### **I. Interdisciplinary Graduate Programs**

Aquaculture and Aquatic Resources

Autism Spectrum Disorders (graduate certificate)

Digital Curation (graduate certificate)

Disability Studies (graduate specialization and certificate)

Earth and Climate Sciences

Ecology and Environmental Sciences

Financial Economics

Food and Nutrition Sciences (Ph.D. program)

Gerontology (graduate certificate)

Forestry (MFY {non-thesis}, M.S., Ph.D.)

Interdisciplinary Ph.D. (various concentrations available, e.g., Engineering in the Natural Sciences)

Intermedia (MA and MFA)

Landscape Horticulture emphasis within the M.S. degree program in Horticulture

Master of Arts in Global Policy (SPIA)

Master of Arts in Interdisciplinary Studies (including New Media, Intermedia, Maine Studies and Peace Studies tracks)

Master of Science in Teaching (concentrations in Physics, Earth Sciences, Mathematics, or Generalist Option)

Plant Science (Ph.D. program; multi-departmental)

Professional Science Master's (PSM) degree

Quaternary and Climate Studies

Marine Policy (M.S.)

Marine Sciences and Marine Policy Dual Degree Program (3 years: with an M.A. in Policy and and M.S. in one of the marine sciences)

#### **II. Other Interdisciplinary Endeavors**

Academy of Public Service (joint endeavor of UM Dept. of Political Science; M.C. Smith Center, and the Muskie Institute of USM)

Advanced Structures and Composites Center

Canadian-American Center  
Center for Community Inclusion and Disabilities Studies  
Cooperative Extension  
Division of Lifelong Learning  
Forest Bioproducts Research Institute  
Franco-American Center  
Climate Change Institute  
ITHCRA (Interdisciplinary Training for Health Care for Rural Areas Project)  
Frontier Institute for Research in Sensor Technologies  
Maine Folklife Center  
Margaret Chase Smith Center for Public Policy  
Pulp and Paper Process Development Center  
Research Collaborative on Violence Against Women  
Senator George J. Mitchell Center for Environmental and Watershed Research  
Solar Vehicle Team (College of Engineering)  
University of Maine Center on Aging  
Wabanaki Center  
William Cohen Center for Public Policy and Commerce

### **Cooperative Research Relationships**

The University of Maine maintains active cooperative research relationships, formally and informally, with a variety of institutions and agencies in Maine, the United States and other countries. A partial listing follows:

Augusta Mental Health Institute  
Bangor Counseling Center  
Bangor Mental Health Institute  
Bigelow Laboratory for Ocean Sciences  
Center for Learning Disabilities  
Eastern Maine Medical Center  
Huntsman Marine Laboratory, St. Andrews, New Brunswick, Canada  
Jackson Laboratory  
Maine Cooperative Wildlife Research Unit  
Maine Department of Inland Fisheries and Wildlife  
Maine Geological Survey  
Maine Medical Center  
Maine Municipal Association  
Mount Desert Island Biological Laboratory  
U.S. Fish and Wildlife Service  
U.S. Forest Service  
The U.S. Geological Survey  
Veterans Administration Hospital, Togus

## **Catalog Home**

**Welcome to the University of Maine's electronic Graduate Catalog!**

**Information in this Catalog covers the academic year 2022-2023**

The University of Maine reserves the right to revise, amend, or change items set forth in the catalog as needed. Accordingly, readers of this catalog should inquire as to whether any such revisions, amendments, or changes have been made since the date of the publication. The University of Maine reserves the right to cancel course offerings, to

set the minimum and maximum sizes of classes, to change the designated instructors in courses and to make decisions affecting the academic standing of anyone participating in a course or program offered by the University of Maine.

This catalog is based on information received by departments and other academic units as of August 1, 2022. Modifications to the catalog will only be done to correct inaccurate information, or to add new courses for the current academic year. Students should check individual program websites for specific academic policies.

The navigation menu on the left will guide you through useful information on admission requirements, policies, programs and courses, financial information and much more.

Comments or questions may be emailed to [graduate@maine.edu](mailto:graduate@maine.edu)

## Award Recipients

### Alumni Association Distinguished Maine Professor Award Recipients

2022 Daniel Sandweiss	1987 Brian Green
2021 Hemant P. Pendse	1986 Anne P. Sherblom
2020 Richard Powell	1985 John A. Alexander
2019 Sandra Caron	1984 John W. Toole
2018 Francis A. Drummond	1983 Martin R. Stokes
2017 John F. Mahon	1982 Eugene A. Mawhinney
2016 Paul B. Roscoe	1981 Mary S. Tyler
2015 Bill Davids	1980 Malda Brandt
2014 Mary Jane Perry	1979 Michael H. Lewis
2013 Robert J. Lad	1978 Charles W. Smith
2012 Joseph M. Genco	1977 Melvin Gershman
2011 Alfred A. Bushway	1976 Donald A. Grant
2010 Paul A. Mayewski	1975 Erling R. Skorpen
2009 James M. Acheson	1974 William G. Valteau
2008 Janice V. Kristo, John F. Vetelino	1973 John H. Dearborn
2007 Ivan J. Fernandez	1972 Constance H. Carlson
2006 David J. Townsend	1971 Douglas A. Gelinas
2005 Robert A. Strong	1970 Joseph Scimecca
2004 Eric N. Landis	1969 Robert Thomson
2003 Kevin Boyle	1968 Jonathan Biscoe
2002 James W. Warhola	1967 David W. Trafford
2001 Keith Hutchison	1966 Richard G. Emerick
2000 Douglas M. Allen	1965 Vincent A. Hartgen
1999 Brenda M. Power	1964 Benjamin Speicher
1998 Fred H. Irons	1963 Walter S. Schoenberger
1997 Irving Kornfield	
1996 Malcolm L. Hunter, Jr.	
1995 Habib J. Dagher	
1994 Dana N. Humphrey	
1993 George H. Denton	
1992 Raymie E. McKerrow	
1991 Stephen A. Norton	
1990 Alan J. Kimball	

1989 Fred B. Knight  
1988 Dana W. Birnbaum

#### **Presidential Outstanding Teaching Award Recipients**

2022 Karl Kreutz	2000 Owen F. Smith
2021 Judith Josiah-Martin	1999 Keith W. Hutchison
2020 Sara Lindsay	1998 Sandra L. Caron
2019 Jennifer Tyne	1997 Fred H. Irons
2018 Senthil S. Vel	1996 Paul B. Roscoe
2017 Harvey A. Kail	1995 Barbara J. W. Cole
2016 Howard M. Gray	1994 William E. Glanz
2015 Kirsten E. Jacobson	1993 Sandra L. Gardner
2014 J. Malcolm Shick	1992 Christina L. Baker
2013 Richard H. Borgman	1991 Kristin M. Langellier
2012 Mary E. Rumpho	
2011 Douglas W. Nangle	
2010 Judith R. Pearse	
2009 Leonard J. Kass	
2008 Gail B. Werrbach	
2007 Irving Kornfield	
2006 Mary S. Tyler	
2005 Patricia A. Burnes	
2004 Kim K. McKeage	
2003 Robert Franzosa	
2002 Eric N. Landis	
2001 Constance M. Perry	

#### **Presidential Public Engagement Award Recipients**

2022 Kelley Strout	1996 Alfred A. Bushway
2021 James Dill	1995 James H. Breece
2020 Jean MacRae	1994 Ray B. Owen
2019 Susan McKay	1993 Edward D. "Sandy" Ives
2018 Ivan J. Fernandez	1992 Lucille A. Zeph
2017 Marcella H. Sorg	1991 William H. Whitaker
2016 Amy Fried	1990 Herbert Hidu
2015 Laura A. Lindenfeld	1989 David F. Wihry
2014 Bruce E. Segee	1988 Robert C. Bayer
2013 George Markowsky	1987 James A. Wilson
2012 Karen J. Horton	1986 Vaughn H. Holyoke
2011 Kathleen March	1985 Barbara A. Barton
2010 Thomas E. Christensen	1984 Richard J. Campana
2009 Kathryn J. Olmstead	1983 Patricia M. Pierson
2008 Alan B. Cobo-Lewis	1982 Richard C. Hill
2007 Herbert L. Crosby	
2006 Carol B. Gilmore	
2005 David H. Lambert	
2004 Todd M. Gabe	
2003 Harlan Onsrud	
2002 Sandra L. Caron	



2001 Ann Schonberger  
2000 Walter G. McIntire  
1999 George L. Jacobson, Jr.  
1998 Dana N. Humphrey  
1997 Sheila J. Pechinski

#### **Presidential Research and Creative Achievement Award Recipients**

2022 Xudong Zheng	1992 J. Malcolm Shick
2021 Elizabeth Allan	1991 Merrill F. Elias
2020 Bob Steneck	1990 Stephen A. Norton
2019 Jasmine Saros	1989 William J. Baker
2018 Yong Chen	1988 Michael D. Bentley
2017 Daniel H. Sandweiss	1987 John H. Dearborn
2016 Neal R. Pettigrew	1986 Colin E. Martindale
2015 Richard W. Judd	1985 Richard D. Blake
2014 M. Kate Beard-Tisdale	1984 Harold W. Borns, David C. Smith
2013 Francis A. Drummond	1983 No Award
2012 Hemant P. Pendse	1982 Bruce L. Nicholson
2011 John F. Mahon	1981 Carroll F. Terrell
2010 Paul B. Roscoe	1980 John F. Vetelino
2009 Owen F. Smith	1979 James D. McCleave
2008 Mary Ellen Camire	1978 Peter Csavinsky
2007 Elizabeth DePoy	1977 William Pease, Jane Pease
2006 Kyriacos C. Markides	1976 Robert J. Jensen
2005 James M. Acheson	1975 George H. Denton
2004 Robert J. Lad	1974 Geddes Simpson
2003 Habib-J Dagher	
2002 Max J. Egenhofer	
2001 Kevin Boyle	
2000 Janice V. Kristo, Rosemary A. Bamford	
1999 Charles T. Hess	
1998 Douglas M. Allen	
1997 Gary M. King	
1996 Burton N. Hatlen	
1995 Erdogan Kiran	
1994 C. Stewart Doty	
1993 William N. Unertl	

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The University of Maine System Board of Trustees consists of 16 members, 15 of which are appointed by the Governor and approved by the Maine Legislature.

The Maine Commissioner of Education serves as a member ex officio. Members are appointed for a five-year-term and may be reappointed once. A student member of the Board is appointed for a single two-year term.

The Board of Trustees can be contacted at:  
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