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2019 Program Review
B.A. in Biology: General
Option



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1. SUMMARY

B.A. in Biology: General Option Mission

The mission of the Biology program, in support of and aligned with the missions of the University and College, is to provide a broad and challenging curriculum in the biological sciences. This curriculum prepares students for an expansive spectrum of careers in the life and health sciences.

Curriculum Map and Student Learning Outcomes (SLOs) B.A. in Biology: General Option

The B. A. degree in Biology has six (6) core courses as part of the requirements for the major. They prepare students to achieve the following expected learning outcomes: biology knowledge, laboratory/field skills, critical thinking/scientific reasoning/problem solving, awareness of current issues, communication skills, career awareness and preparation to enter post-graduation programs in health professions. These six core courses provide a sound backbone of the discipline with regard to the research and theoretical aspects of biology as well as the various areas of study within these fields. As such, these core courses are the primary vehicle for assessing the knowledge of our students. Beyond the core courses, students take at least two other elective courses. The faculty center assessment on the core knowledge of biology within the six core courses. Each core course has assessment tools such as exams, research and reflective writing assignments, portfolio work, and group work products as part of the evaluation process, and the program has used results of assessment for making improvements to program practices aimed at increasing student learning. In addition, an evaluation of comprehensive exam and national credentialing results demonstrates that students have areas of weakness that need to be reinforced.

Assessment Data Review for B.A. in Biology General Option

Assessment has occurred at several levels in the B.A. in Biology Program over the past several years. Pre- and post-tests were developed for several Biology Core courses indicated that students had difficulty with reading graphs and a 14% decrease in math skills but had a stronger understanding of basic scientific principles and use of the scientific method. A faculty-developed lab report writing rubric in BIO 1300 and 1400 (General Biology I and II) showed that overall ability to write a laboratory report following the rubric guidelines improved between the first and second drafts. Additional evaluation of writing, presentation and critical thinking skills occurred in the Capstone Senior Seminar course (BIO 4970) using adapted rubrics from the General Education. Data showed that students scored higher in writing and speaking with more practice, i.e. first draft vs. second draft. Student suggestions for program improvements included a smaller advisor : advisee ratio, fewer adjuncts, updated facilities and more sections of science classes with a greater variety of course time offerings. Results from these surveys should be used by faculty as they update course offerings and pursue opportunities for student internships,

research and experiential learning. In addition, faculty should be encouraged to creatively incorporate transformative learning activities in their classrooms to help students improve critical thinking and graphing skills. Moreover, the program has received additional faculty lines for full-time lecturers and should work to assign advisees to allow increased one-on-one interaction between faculty and students.

2. MISSION, STUDENT LEARNING OUTCOMES, AND CURRICULUM MAP

Mission

The mission of the Biology program, in support of and aligned with the missions of the University and College, is to provide a broad and challenging curriculum in the biological sciences. This curriculum prepares students for an expansive spectrum of careers in the life and health sciences. Students are immersed in an integrated curriculum of scientific concepts and principles and master modern technological laboratory skills. The curriculum provides a strong foundation in classical and modern biology and prepares students to be lifelong learners ready to meet the challenges of an ever-changing global society.

The program provides preparation in elementary or secondary school teaching, in life science positions for industry and government, and post graduate studies in biology and allied health professions. The program also has opportunities for significant research experience to interested and qualified students. In addition, students in this major are prepared to pursue the graduate degrees in biological and health sciences.

Program Student Learning Outcomes (SLOs) – as aligned with KU SLOs derived from the Institutional Mission* and GE SLOs.** (Data from direct measures collected each semester in BIO 1300, Bio 1400 and BIO 4970)

Students who graduate with a B.A. degree in Biology should be able to:

SLO1: Acquire knowledge of fundamental principles (diversity of living organisms/biological fundamentals/evolutionary biology)

Direct Measure: Laboratory Practical in BIO 1400 and Final Presentations Speech & Writing in BIO 4970

(KU 1, 2, 4) (GE K1, S5)

SLO2: Acquire the laboratory and field skills to gather and analyze data related to biological questions

Direct Measure: Lab Report in BIO 1300

(KU 1, 2, 4) (GE K1, S3, S4, S5)

SLO3: Develop skills in critical thinking, scientific reasoning, and problem solving

Direct Measure: Lab Report in BIO 1300, and Final Presentation – Speech and Writing in BIO 4970

(KU 1, 2, 4) (GE K2, S1, S3, S4, S5)

SLO4: Develop the ability to apply biological principles to understand current issues

Direct Measure: Final Presentation – Speech & Writing in BIO 4970
(KU 1, 2, 4) (GE K1, S3, S4, S5)

SLO5: Develop the ability to apply effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication

Direct Measure: Laboratory Practical in Bio 1400, Lab Report in BIO 1300 and Final Presentation – Speech and Writing in BIO 4970
(KU 1, 2, 4) (GE K1, S1, S2, S3, S4, S5)

SLO6: Develop an awareness of careers and professions available in the biological sciences

Direct Measure: Final Presentation – Speech & Writing in BIO 4970
(KU 2, 3, 4) (GE S4, S5)

SLO7: Acquire adequate preparation to enter health professional programs and/or the work force in related fields

Direct Measure: Final Presentation – Speech & Writing in BIO 4970
(KU 2, 3, 4) (GE K1, K4, S5)

*** KU Student Outcomes: Kean University graduates should be able to:**

1. Think critically, creatively and globally;
2. Adapt to changing social, economic, and technological environments;
3. Serve as active and contributing members of their communities; and
4. Advance their knowledge in the traditional disciplines (GE) and enhance their skills in professional areas (Prof. Programs)

****General Education Student Learning Outcomes**

Student Learning Outcomes – Knowledge: Students will demonstrate proficiency in knowledge and content by:

- (K1) applying the scientific method to understand natural concepts and processes;
- (K2) evaluating major theories and concepts in social sciences;
- (K3) relating historical references to literature; and
- (K4) evaluating major theories and concepts in the fine arts.

Student Learning Outcomes – Skills: Students will demonstrate the skills necessary to:

- (S1) write to communicate and clarify learning ;
- (S2) communicate effectively through speech;
- (S3) solve problems using quantitative reasoning;
- (S4) think critically about concepts in multiple disciplines; and
- (S5) show information literacy.

Curriculum Map

The B.A. Biology/General Option curriculum prepares students to achieve the expected student learning outcomes identified by the program or discipline. The following table demonstrates how learning activities in specific courses map to these learning outcomes.

Key: I-Introduced R-Reinforced M-Mastery A-Assessment

Required CORE Courses	Knowledge SLO1	Lab/Field Skills - SLO2	Critical Thinking, Scientific Reasoning, Problem Solving -SLO3	Current Issues SLO4	Oral, Visual Written Communication SLO5	Career Awareness SLO6	Preparation to Enter Health Professions (Post Grad) Programs SLO7
Bio 1300: General Biology I	I, A	I, A	I, A	I, A	I, A	I	I
Bio 1400: General Biology II	I, A	I, A	I, R, A	I, A	I, A	I	I
Bio 2500: Principles of Botany	I, R, A	I, R, A	R, A	I, R, A	R, A	I	I
Bio 3400: Zoology, Forms & Function	I, R, A	I, R, A	R, A	I, R	R, A	I	I
Bio 3614: Principles of Ecology	I, R, A	I, R, A	R, A	I, R, A	R, A	I	I
Bio 3709: Principles of Genetics	I, R, A	I, R, A	R, M, A	I, R, M, A	R, A	I, R, A	I, R, A
Bio 4970, Seminar in Integrative Biology	M, A	M, A	A	A	M, A	M, A	M, A

NOTE: Evidence is collected during Assessment.

3. ACADEMIC PROGRAM DESCRIPTION AND COURSE SYLLABI

Catalog Description of the Academic Program

The Biological Sciences Program offers a B.A. degree with three options, and a B.S. Biology Degree with three options. A Minor in Biology is also available. Both majors The must obtain a 2.5 grade point average (GPA) to be admitted into the Major and to graduate.

The B.A. options are traditional liberal arts degrees that prepare students for teaching in elementary or secondary schools and for life science positions in industry or government. The B.S. Biology Cell & Molecular option is a degree program in the biological sciences focused on students looking to pursue advanced graduate or professional degrees within the areas of biotechnology, molecular biology, biomedical research, microbiology, medicine, etc.

The choice of whether to pursue a B.A. or B.S. in Biology should be done in consultation with a faculty advisor. Kean University maintains articulation agreements with Rutgers University. The former allows Kean students in the appropriate B.A. track to apply at Rutgers University for admission to the Master of Science Physician Assistant program. The B.S Biology Health Professions Option offers science courses required for a Bachelor of Science in Biology. Students choose courses within a select specialization in Physical Therapy, Occupational Therapy or Physician Assistant, depending on their profession of interest. Such graduate programs have a unique set of admission requirements. The B.S. Biology program is a good choice for those pursuing a pre-medical or pre-dental path.

Kean also offers Medical Technology, also know as Clinical Lab Science, and Health Information Management programs. Clinical Laboratory Scientist (CLS) and Medical Laboratory Scientists (MLS) and Medical Technologists (MTs) are clinical laboratory professionals and members of the health care team who participate in the diagnosis of disease through the use of

sophisticated instruments and techniques. CLS and MTs are needed to fill positions in hospitals, clinics and research laboratories in New Jersey and across the country.

Kean University recognizes the need for qualified medical laboratory scientists in the region's workforce, as well as a desire among its student population to pursue such careers. After three years at Kean students complete the clinical preceptor at one of our affiliate hospital programs:

The Valley Hospital School of MLS, Jersey Shore University Hospital's Florence M. Cook School of MLS, or Monmouth Medical Center School of MLS. The University also recognizes that duplication of certain health education programs is costly and unnecessary. Thus, Kean has a joint degree with Rutgers University School of Health Professions (SHP). CLS students can apply to Rutgers to complete the clinical preceptor. After completion of the clinical preceptor, students are eligible to take the American Society for Clinical Pathology (ASCP) exam for Certification.

For Health Information Management(HIM), students will also attend Rutgers. This four-year baccalaureate degree program with Kean and Rutgers is completed in two stages with the first stage completed at Kean University and the second stage to be completed at the Rutgers School of Health Related Professions (SHRP), which is part of Rutgers Biomedical Health Sciences in Newark. In the first stage, students complete general education courses and all pre-professional courses at Kean University. The professional courses in Health Information Management are then completed at Rutgers-SHRP. Prior to the start of the professional phase of the program at Rutgers, students are required to submit a formal application to Rutgers-SHRP Admissions (not Rutgers-Newark) by May 1st immediately preceding the intended Fall Semester enrollment.

The Health Information Manager is a member of the health care team and is the professional responsible for management of health information systems consistent with medical, administrative, ethical and legal requirements. Health Information professionals collect, analyze and utilize data to provide information critical to the healthcare industry. A Registered Health Information Administrator (RHIA) collects many kinds of data from a variety of sources, monitors the integrity of the information, ensures appropriate access to health records and manages the analysis and use of this data. This professional is an essential connection between physicians, patients, payers and other in the healthcare industry.

Course requirements include General Biology, Anatomy, Physiology, Chemistry, Physics, Psychology and Statistics as well as undergraduate volunteer work or internship experience. The proposed option includes the courses and guidance to reach such expectations.

Each student majoring in Biology should consult with his/her departmental advisor to select the appropriate degree option, and major electives for his or her respective interests and goals. For information regarding College/ program mission and student learning outcomes please see <https://www.kean.edu/academics/college-natural-applied-and-health-sciences/cnahs-mission-and-slos>

Course Descriptions

The following core course descriptions are located from the Kean University 2019-2020 Course Catalog.

BIO 1000 Principles of Biology (4). The course introduces the student to the nature of living forms, their interdependencies, and their adjustments to their physical environment. The fundamentals of structure and function dealt with in such primary processes as respiration, digestion, circulation, excretion, control systems, reproduction, heredity and variation of biological form through time.

BIO 1200 Biology & Society (3). Explores the impact of biological discoveries and their applications on individuals and society. Includes ethical and practical ramifications. May not be used for major credits toward graduation by biology majors. Satisfies the GE disciplinary/interdisciplinary science requirement (3 hr. lec.).

BIO 1300 General Biology (4). An introduction to the fundamental concepts of biological organization, with emphasis on the molecular and cellular levels. Emphasis on scientific methods, the integration of structure and function at the cellular level, and on the underlying biochemistry. This course, in combination with BIO 1400, forms the foundation for Biology majors and for students following the Science Core. Therefore, student must pass both BIO 1300 and BIO 1400 to receive credit for this course. Students are not permitted to enroll in BIO 1300 and BIO 1400 in the same semester.

BIO 1400 General Biology (4). An introduction to the biology of organisms, including a survey of kingdoms, behavior, evolution, and ecology. This course, in combination with BIO 1300, forms the foundation for Biology majors and for students following the Science Core. Students are not permitted to enroll in BIO 1300 & BIO 1400 in the same semester (the course is not a General Education Lab course).

BIO 2305 Fundamentals of Microbiology (4). This course provides learning opportunities in the basic principles of medical microbiology and infectious disease. It covers mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal micro flora. The biology of bacterial, viral, fungal, and parasitic pathogens and the diseases they cause are covered. The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body. In a typical undergraduate setting, this course would fulfill requirements for students applying to professional health science programs such as medical school, nursing, physician assistant, occupational therapy, physical therapy, and doctorate of physical therapy (The course is not a General Education Lab course). This course is not intended for Biology majors. This course is not equivalent to Bio 3305.

BIO 2402 Human Physiology and Anatomy (4). A study of the physiology of body processes and related anatomical and histological structures. Topics include biochemical, cellular and histological units and the structures and functions of the body's integumentary, skeletal, muscular, nervous, endocrine, cardiovascular, lymphatic, respiratory, digestive, urinary and reproductive systems. Provides background for students in special education, health information management, recreation therapy and physical education.

BIO 2403 Human Anatomy & Physiology I (4). An integrated understanding of human anatomical structures and their functions. BIO 2403 is the study of the organization of the human body, introduction to basic chemistry, the cellular and tissue levels of organization, the integumentary system, skeletal system and articulations, muscular system and the nervous system. Lectures are synchronized with laboratory exercises and include clinical applications of such systems geared toward students interested in the allied health professions.

BIO 2404 Human Anatomy & Physiology II (4). BIO 2404 is a continuation of BIO 2403 and includes the study of the endocrine system, cardiovascular system, lymphatic system, respiratory system, urinary and reproductive system. Laboratories are synchronized with lecture materials and include models, microscopic slides, animal specimens. Participation in the lab involves individual hands-on exercise and team work/group discussion. Additional lab study time and group study is also important. Lectures are synchronized with laboratory exercises and include clinical applications of such systems geared toward students interested in the health professionals. THIS COURSE IS NOT FOR BIOLOGY MAJORS. CREDIT CANNOT BE GIVEN FOR BIO 2403 AND ANY OF THE FOLLOWING: BIO 2402 OR BIO 2409 OR BIO 3403.

BIO 2500 Principles of Botany (4). Introduction into Plant Science, covering basics of diversity and phylogeny of photosynthetic organisms and fungi, with the emphasis on anatomy, metabolism, reproduction and ecology of higher plants.

BIO 2650 Introduction to Marine Biology (4). Offered summers at N.J. Marine Sciences Consortium field stations. A field and laboratory oriented course covering the characteristics of marine plants and animals; instruction and experience in collecting and identifying examples of local marine flora and fauna. May not be applied toward the 32 credit major requirement in biology.

BIO 2900 Computer Applications in Biology (3). Introduction to biological applications of information technology. Students apply biology software, computer programs, and electronic communication techniques to selected topics in the biology core curriculum.

BIO 2910 Essentials of Bioinformatics (3). Introduction to the computational methods of bioinformatics as they pertain to genes and proteins. Includes the use of online protein and nucleic acid databases, handling of analytical software and biological modelling. Students are suggested to bring their own laptops.

BIO 3000 Marine Biology (4). The interrelations of marine plants and animals with their environment. Topics include: primary production, symbiosis, predation, energy flow, zonation and effects of salinity, temperature, light, dissolved oxygen, tides and wave action. One weekend field trip required. Equivalent given summers at N.J. Marine Sciences Consortium field stations.

BIO 3050 Field Biology Marine Systems (4). A field-based course in terrestrial systems that introduces students to a terrestrial environment and its varied organisms and habitats. Emphasis

will be on observation, species identification, taxonomy, field notes, sampling methods, observational and experimental study design, mapping, data analysis, and scientific writing.

BIO 3051 Field Biology: Terrestrial Systems (4). A field-based course in terrestrial systems that introduces students to a terrestrial environment and its varied organisms and habitats. Emphasis will be on observation, species identification, taxonomy, field notes, sampling methods, observational and experimental study design, mapping, data analysis, and scientific writing.

BIO 3060 Biology and Ecology of Birds (4). This course will emphasize the biological uniqueness of birds and the behavioral, physiological and ecological relationships of birds to their environment. Laboratories will emphasize field skills and the identification of New Jersey birds.

BIO 3100 Medical Terminology (3). Comprehensive method to the study of medical words that pertain to body systems, anatomy, physiology, pathophysiology, medical diagnosis and procedures. A specialized language that is used internationally by health care professionals for the purpose of communicating medical data in a precise and accurate manner. Provides an in-depth knowledge of medical words, word building, definitions and word use in all areas of medical science to aid in the basic understanding of health care pre professional courses.

BIO 3200 Biology of Food in Health and Disease (3). An introduction to the biology of food and its role in health and disease prevention, management and treatment, including a survey of basic food items, preparation techniques that affect nutrient quality and healthfulness and current research in nutritional sciences.

BIO 3260 Histology (4). A laboratory oriented course dealing with the microscopic and ultrastructural anatomy of mammalian tissues and organs, with emphasis on relating structures to functions.

BIO 3305 Principles of Microbiology (4). A study of microorganisms and their activities. Topics include microbial cell structure, metabolism, microbial genetics, taxonomy and phylogeny, methods of culture and identification, and their role in disease and immunity.

BIO 3315 Principles of Microbiology (3). A study of microorganisms and their activities. Topics include microbial cell structure, metabolism, microbial genetics, taxonomy and phylogeny, methods of culture and identification, and their role in disease and immunity. Both this course and the laboratory bio*3315L must be completed to satisfy the microbiology requirement. Requirement for BS Biology, Health Professions Option and BS Biology, Cell and Molecular Biology Option

BIO 3315L Principles of Microbiology Laboratory (1). This laboratory course introduces students to procedures for handling microbes, methods of identification of microbes (staining and biochemical tests), the importance of handwashing and disinfection, and testing for antibiotic susceptibility. Both this course and the lecture BIO*3315 must be completed to satisfy the

Microbiology requirement. Requirement for BS Biology, Health Professions Option and BS Biology, Cell and Molecular Biology Option

BIO 3317 Infectious Disease (2). An introduction to pathogens (viral, bacterial, parasitic and fungal), their biological properties, pathogenicity and mode of transmission.

BIO 3400 Zoology: Form and Function (4). The evolution of invertebrates and vertebrates using principles of comparative anatomy and physiology. Morphological and functional changes correlated with varied environments and adaptations that gave rise to a diversity of life forms.

BIO 3403 Anatomy and Physiology I (4). An integrated understanding of the structures (both gross and microscopic) and the functions of various body systems. Laboratories are synchronized with lecture materials and include exercises using prosected models and other specimens. Organization of the human body, introductory chemistry, cells, tissues, the integumentary system, skeletal systems and articulations, muscular system and the nervous.

BIO 3404 Anatomy and Physiology II (4). A BIO 3404 is a continuation of BIO 3403 and includes the study of the endocrine system, cardiovascular system, lymphatic system, respiratory system, urinary system and reproductive system. Credit cannot be given for both BIO 2402 or BIO 2409 and for BIO 3403-3404 or 3433-3434.

BIO 3405 Basic Gross Anatomy (4). An in-depth study of gross and functional anatomy utilizing skeletons and models that depict the skeletal, muscular, vascular and nervous systems. A general overview and regional study of the viscera. Open to students in the Athletic Training Program and other students by permission of the instructor.

BIO 3406 Neuroscience (4). Study of the excitable tissues beginning at the cellular level and leading to an integration of the morphological and physiological divisions of the nervous system.

BIO 3420 Parasitology (4). Introduction to animal parasites and parasitism, emphasis on morphology, distribution, life cycles and effects on host of protozoan, helminth and arthropod parasites.

BIO 3450 Biological Aspects of Aging (3). A study of the biology of aging from biochemical, cellular, and physiological viewpoints. Emphasis is placed on age-associated functional and structural changes of the organ systems.

BIO 3535 Field Botany (3). Principles of field identification of local flora with emphasis on use and construction of keys. Two all day Saturday field trips.

BIO 3614 Principles of Ecology (4). This course covers factors affecting the distribution and abundance of organisms. Fundamental ecological concepts are examined at the organismal, population, and ecosystem levels. Human impacts on the environment are discussed. Instructor permission may be sought if course prerequisite is not met. Required for BIO Bachelor of Arts majors and a BIO major elective

BIO 3709 Genetics (4). A study of the essential concepts, principles and applications of all branches of genetics, including transmission, molecular and population genetics. Discussion of recent developments in the field, focusing on genomics and new genetic techniques. Examinations of principles and applications of genetics by means of laboratory exercises. Credit not given for both BIO*3709 AND BIO*3704/3705. Required for biology majors

BIO 3820 Basic Tissue Culture (4). Fundamentals of animal and plant tissue culture. Laboratory exercises include methods of establishing and maintaining primary tissue cultures and the culture of established cell lines.

BIO 3835 Biostatistics (3). A survey of commonly applied statistical methods used in the life sciences with special emphasis placed on application of these methods to research questions. Application of commonly used statistical software to previously existing data will be used to expose students to: experimental design, hypothesis testing, t-tests, chi-square tests, analysis of variance, regression/correlation, and simple multivariate tests.

BIO 4105 Essentials of Biochemistry (4). Introduction into four major classes of biological macro molecules: proteins, carbohydrates, lipids and nucleic acids, as well as enzyme kinetics, bioenergetics and metabolic pathways. Laboratory activities include biochemical techniques such as UV/visible spectroscopy, chromatography, enzyme activity assays, as well as protein and DNA purification and analysis.

BIO 4115L Biochemistry Laboratory (1). This laboratory component of Biochemistry (BCHM 4115). Laboratory activities incorporate biochemical techniques including buffer preparation, amino acid titrations, UV/visible spectroscopy of biomolecules, enzyme activity assays, protein and DNA purification, and carbohydrate assays. 3-hour laboratory. The courses BCHM 4115 and BCHM 4115L, when taken together, are equivalent to BIO 4105, Essentials of Biochemistry. This course may not be taken if the student has already completed BIO 4105, Essentials of Biochemistry or CHEM 3583 Biochemical Techniques.

BIO 4225 Cell Physiology (4). Physiological approach to the study of eukaryotic cells with emphasis on current molecular, chemical and physical principles and methodology relating structure to cell function. Hands on laboratory experience in modern methods and technology used to examine gene expression, molecular transport, signal transduction and cell-cell interactions.

BIO 4310 Virology (4). Study of the isolation, propagation, and characteristics of viruses, and the techniques for achieving those goals. Consideration also given to the interaction of viruses with procaryotic and eucaryotic cells, the origin and evolution of viruses, and the emergence of new viruses.

BIO 4315 Immunology (4). A fundamental study of the innate and adaptive immune systems of animals. Consideration also given to immunologic responses of plants.

BIO 4316 Immunology (3). An introduction to the fundamental concepts of immunology with a focus on innate and adaptive immunity. Consideration is given to the role of the immune system

in cancer, autoimmune diseases, and inflammation. Both this course and the laboratory BIO*43161 must be completed to satisfy the immunology requirement. Required for BS Biology, Health Professions Option and for BS Biology, Cell & Molecular Option

BIO 4316L Immunology Laboratory (1). An introduction to immunological laboratory techniques. Consideration is given to immunological assays used in clinical environments and how they are used to diagnose diseases. Both this course and the lecture BIO*4316 must be completed to satisfy the immunology requirement. Required for BS Biology, Cell & Molecular Option. Otherwise, Biology Major Elective.

BIO 4325 Applied Microbiology (4). A study of the importance of microorganisms in food production and preservation, industry, pathogenesis and disease prevention, and public health. Type of course: Bio Major elective Revised as of: 12/06/17

BIO 4395,6,7,8 Cooperative Education in Biology (1-4). Cooperative Education in Biology is an off-campus laboratory experience in a field of biological sciences. Cooperative educational links partnerships between the University and employers. Students get a taste of real work in their field of study, which can help them deepen their commitment to their chosen career or redirect their career choice. Students may work full or part-time by arrangement with employer. The Cooperative Education in Biology course may be repeated for credit up to a total of four credits. TYPE OF COURSE: Major Elective for BS Biology Cell and Molecular Option, BS Biology Health Professional Option, and all other Biology majors. PREREQUISITES: Minimum of Junior status and 16 credits BIO plus permission of executive director.

BIO 4455 Developmental Biology (4). A study of developmental processes in animals combining descriptive, theoretical, and experimental approaches. Includes study of cell determination and pattern formation.

BIO 4615 Applied Ecology (4). Examination of environment problems, solutions and management dealt with by biologists in government and industry. Wildlife management, conservation biology and industrial ecology. Students must provide own transportation for some labs.

BIO 4700 Molecular Genetics (4). Molecular biology of the gene with an emphasis on current topics related to recombinant DNA, genetic engineering, molecular biology laboratory skills and molecular genetics. Laboratory activities include common methods and instrumentation used in molecular biology and recombinant DNA studies.

BIO 4704 Molecular Biology of Genes (3). Molecular biology of genetic inheritance and molecular evolutionary genetics, with an emphasis on recent advances. Topics include DNA and chromatin structure and function, regulation of gene expression and related functions, mutation, gene duplication, patterns of genetic divergence and genealogical reconstruction.

BIO 4835 Biostatistics (3). Basic statistical techniques useful in biological research including frequency distribution, statistical inference, and application of chi square, analysis of variance and regression.

BIO 4901 Honors Thesis in Biology I (3). HONORS THESIS IN BIOLOGY I-RESEARCH AND PRESENTATION. Qualified undergraduate biology majors will gain an appreciation of how biological knowledge is acquired by participating in an independent laboratory or field research project under the guidance of a faculty member to a depth not attainable through regular class work. This course and [BIO 4902](#) are taken as a chronological series ([BIO 4901](#) must precede [BIO 4902](#)).

BIO 4902 Honors Thesis in Biology II (3). HONORS THESIS IN BIOLOGY II-RESEARCH AND PRESENTATION. Qualified undergraduate biology majors will gain an appreciation of how biological knowledge is acquired by participating in an independent laboratory or field research project under the guidance of a faculty member, to a depth not attainable through regular class work. This course and [BIO 4901](#) are taken as a chronological series ([BIO 4901](#) must precede [BIO 4902](#)).

BIO 4911,2,3,4 Special Topics in Biology (1-4). An opportunity to study special topics in biology which are not the usual focus of coverage in regular Biology courses. Course offering and course topics to be announced by the Biology Program. TYPE OF COURSE: Elective for Biology majors PREREQUISITES: 20 credits in BIO or instructor permission

BIO 4961,2,3 Independent Research in Biology (1-3). A laboratory or field investigation of a biology research problem, performed independently by student, under the supervision of a faculty member. May be repeated for credit, up to a total of six credits; however, only four credits may be used to fulfill major elective requirement. TYPE OF COURSE: Elective for Biology majors PREREQUISITES: Seniors with 20 credits in BIO or Juniors on Dean's List with 16 credits BIO and permission of Biology executive director

BIO 4970 Seminar in Integrative Biology (3). Critical analysis of current topics in biology utilizing the primary literature and integrating concepts taught in the Biology core curriculum. Consideration given to social, ethical, philosophical and/or historical aspects of the life sciences. Format includes student presentations, reading-based class discussions, and library papers.

BCHM 4115 Biochemistry (3). A study of proteins, carbohydrates, lipids, and nucleic acids, and their functions in the cell. The course applies knowledge acquired from organic chemistry courses to biological systems. Biology majors must take Biochemistry I Laboratory (BCHM 4115L) as a co-requisite. The courses BCHM 4115 and BCHM 4115L, when taken together, are equivalent to BIO 4105, Essentials of Biochemistry. The course BCHM 4115, when taken alone, is equivalent to CHEM 3581. This course may not be taken if the student has already completed BIO 4105, Essentials of Biochemistry or Biochemistry, CHEM 3581.

BCHM 4115L Biochemistry Laboratory (1). This laboratory component of Biochemistry (BCHM 4115). Laboratory activities incorporate biochemical techniques including buffer preparation, amino acid titrations, UV/visible spectroscopy of biomolecules, enzyme activity assays, protein and DNA purification, and carbohydrate assays. 3-hour laboratory. The courses BCHM 4115 and BCHM 4115L, when taken together, are equivalent to BIO 4105, Essentials of

Biochemistry. This course may not be taken if the student has already completed BIO 4105, Essentials of Biochemistry or CHEM 3583 Biochemical Techniques.

Of these, the following have not run in the past three years:

BIO 1200 Biology & Society

BIO 2650 Introduction to Marine Biology

BIO 2900 Computer Applications in Biology

BIO 3000 Marine Biology

BIO 3050 Field Biology Marine Systems

BIO 3051 Field Biology: Terrestrial Systems

BIO 3535 Field Botany

BIO 4455 Developmental Biology

BIO 4704 Molecular Biology of Genes

BIO 4835 Biostatistics

BIO 4901 Honors Thesis in Biology I

BIO 4902 Honors Thesis in Biology II

Student Learning Outcomes (This is the 1st course in the major required for biology majors):

At completion of the course, students will demonstrate the ability to:

- A. Understand the complexity and common themes unifying biology, in particular apply the mechanisms of cellular processes, the cell theory, the adaptation and evolution of diverse organisms and understand correlations among structure, organization, and function of cells.
- B. Apply the process of scientific method. Understand biology is evidence based and grounded in the formal practices of observation, experimentation, and hypothesis testing. Apply quantitative reasoning and quantitative analysis and mathematical reasoning to interpret biological data, analyze results and refine conclusions. Understand the importance of a statistical sample, the meaning of statistical significance, and statistical treatment to different data sets.
- C. Understand how to collaborate effectively in cooperative laboratory and field-based experimental projects and know, observe and obey laboratory safety rules.
- D. Know that communication & collaboration of biological concepts & interpretations with scientists in other disciplines is of paramount importance, including but not limited to, math, physics and chemistry.
- E. Understand how to communicate clearly and explicitly, both orally and in writing, following conventional scientific formats. Apply proficiency in reading, understanding and critically evaluating scientific literature across major areas of biology.
- F. Understand the relationship between science and society: understand biology is conducted in a societal context and can be used to identify social and historical dimensions of biological practice.

Important University-Wide Dates for SPRING 2019 (Semester runs Tues Jan 22nd to Wed May 15th)

Mon Jan 21	Holiday/University Closed
Tues Jan 29	Last day to add a class Last day to drop a class with a 100 % Refund & no mark on transcript
Wed Jan 30	Mark of "W" on transcript begins for course withdrawals
Tues Feb 5	Last Day to Withdraw from Class with a 75 % Refund
Tues Feb 12	Last Day to Withdraw from Class with a 50 % Refund
Mon Feb 18	University Closed/No Classes
Mar 11 to Mar 17	SPRING BREAK NO CLASSES
Fri Apr 12	Last day to withdraw from a class with a grade of "W" on transcript (no refund)
Apr 19 to Apr 21	University Closed/No Classes
Tues May 7	Classes follow a FRIDAY SCHEDULE
Wed May 8	Classes follow a MONDAY SCHEDULE

University Policies and Information

Students are responsible to review and understand the *University Academic Integrity Policy* (available at the Center for Academic Success or at <http://www.kean.edu/admin/uploads/pdf/AcademicIntegrityPolicy.pdf>). Western society punishes plagiarism. Students are expected to ensure their writings and presentations abide by these policies.

Students should review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom: <http://www.kean.edu/KU/Code-of-Conduct>.

Students are strongly encouraged to register for the University's emergency notification system (<http://www.kean.edu/campusalert>) in order to be informed of campus emergencies, weather notices, and other announcements.

All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>; click on E-mail Account Request Form.

Americans with Disabilities Statement & Kean University Non-Discrimination Statement:

Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Students may contact the Office of Disability Services in Downs Hall Room 122 or call 908-737-4910 to discuss special needs.

Title IX of the Education Amendments of 1972 (Title IX) prohibit discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action Programs, Office of the Vice President for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at the following: <http://www.kean.edu/policies/sexual-misconduct-policy>.

SYLLABUS NOTICE FOR LABORATORY COURSES -- REPRODUCTIVE HAZARDS

Reproductive hazards are substances or agents that may affect the reproductive health of women or men or the ability of couples to have healthy children. Efforts have been made to eliminate the use of known reproductive hazards in our labs. However, the vast majority of laboratory chemicals have never been tested by the manufacturer or by any governmental agency. As a result, their effect on a developing fetus is unknown; female students must assume that each chemical used in this lab presents a hazard to an unborn child. If you are pregnant, become pregnant or are planning to become pregnant during the semester, you are strongly encouraged to speak privately with your instructor who will be able to provide written health and safety information about each chemical that will be used in the class. You are asked to review and discuss this information with your healthcare provider. After you have reviewed the information, you can choose to:

1. Continue your enrollment in the lab - You will be asked to sign a waiver and will be expected to follow a strict set of health and safety procedures while in the lab.
2. Withdraw from the lab - Your instructor will assist in creating plan to complete course at a later date.

Course Instructional Methods

This course is a 4 credit, lecture and laboratory course. Lecture content is reinforced with work in the lab.

ATTENDANCE

- By the letter of the *Student Attendance Policy*, attendance is expected every time a class meeting is held. Regular, on-time and productive participation in class may be given positive consideration in the semester grade.
- There are **NO MAKEUP LABS** and you are expected to arrive **ON TIME** to each lab.
- The department of biology approved the policy effective May 2016, in which if a general biology student **misses more than three labs unexcused, the student fails the entire four credit course.**

EXAMINATIONS

- Three in-class exams are scheduled and carry equal weight. While the exams will not be directly cumulative, biology is a subject in which content builds on itself.
- Should you not be able to take an exam during the scheduled time, with a valid, documented excuse (determined by the instructor), an alternate exam seating may be allowed albeit it perhaps with a different exam/different format. It is the responsibility of the student to contact the professor if an exam is missed and to provide documentation for consideration of a makeup exam.
- Exams will be a combination of multiple choice, short answer, and diagrams. You will be advised on the test to pick a specific number of problems from each section to answer. If you fail to follow the directions, the first sets of questions you answer will be graded.
- All cell phone and bags will be left in the front of the room. If you are caught cheating, you will automatically fail.

Mastering Biology Online Course Companion Website***Out-of-Class Homework Assignments + Adaptive Followups***

Using the Access Code you purchase for Mastering Biology, enroll yourself in the course using the course ID your instructor provides.

Course ID: MAASS03SP2019

These assignments are done through the textbook publisher's site that accompanies the course textbook. You do them online, outside of class. Due dates are listed with a 9pm deadline. There are 13 homework assignments on the lecture textbook chapters, for a total of 104 points as follows:

INSTRUCTORS MAY CHANGE DUE DATES ACCORDING!!!

- Batch #1 (due 2/27) tally of 33pts: Intro, 2pts + Ch2, 9pts + Ch3, 9pts + Ch5, 7pts + Ch6, 6pts
 - Batch #2 (due 4/3): tally of 33pts Ch7, 7pt + Ch8, 10pts + Ch9, 6pts + Ch10, 10pts
 - Batch #3 (due 5/15) tally of 38 pts: Ch12, 8pts + Ch13, 8pts + Ch16, 10pts + Ch17, 12pts
-
- Mastering Biology tracks how you do on the required homework questions and then depending on how you perform, gives you additional adaptive followup questions to address your trouble areas. If you ace the homework questions you test out of receiving adaptive followup questions but if the system gives you adaptive followup questions you must do them, otherwise if you do not answer them, you lose points. Adaptive followup is only available if you do the homework by the due date. So while you can do homeworks late albeit points penalty deductions, you will lose points for any adaptive followups the system would assign you.
 - Refer to Mastering Biology website calendar to see when each assignment is open for you and when it closes (ie. the due date). An assignment that is completed late is penalized 5% per day (but never reduced by more than 80%). Once you complete an assignment, you can't access it again until the due date has passed; but once the due date passes, you can access the assignment to use as a study tool.
 - Mastering Biology has a number of other student tools, activities and animations that will help boost your understanding and performance in this course. For example, in the "study area" on the site, there are practice test questions from the textbook publisher.
 - The Mastering Biology site is also where course announcements are posted and where course materials, especially the pdf files of the lecture Powerpoint slideshows, are posted.

LABORATORY WORK**LAB SHEETS.....The instructor-provided lab sheets accompany, but don't replace, the lab book**

Observations and answers from all lab sessions are to be recorded on the lab sheet handouts (found in the lab folder on Mastering biology) and given to the instructor before you leave lab. A lab may not cover every single procedure in the lab manual; lab sheets tell you which procedures you will perform & direct you to the lab manual. Although you work in a lab group, each student submits their own lab sheet. There are 12 labs so 12 lab sheets each valued at 10 points.

LABORATORY

You will NOT be able to makeup lab if you miss a lab or a significant portion of that lab (do NOT be late to lab). The first lab session of the semester will cover lab safety rules and regulations. Additionally, the department of biology approved the policy effective May 2016, in which *if a general biology student misses more than three labs unexcused, the student fails the entire four credit course.*

LAB REPORTS....Draft Report due 4/12.....Final Report due 5/3

You will submit a formal laboratory report on one lab exercise; first, you submit a draft, then post instructor feedback, you submit your final version of the lab report. Each student may select the lab exercise for which they will write their report from among Lab Exercises "Diffusion/Osmosis," "Physical Stress on Cell Membrane," or "Enzyme Rate." The format of the laboratory report and the rubric that will be used to assess and grade the lab reports are included in this syllabus.

While you may perform a lab with your lab partner in the lab, the written lab report is done individually. The writing in the lab report is to be the student's original work as plagiarism is not acceptable. Standard in-text citation by (Name, Year) method is required along with a works cited listing.

Go to Youtube.com and in search box enter LLorentzen Microlecture

You will see listed 2 videos created by Dr. Lorentzen of Kean's Biology Dept. to help you.

How to use Name/Year method of citation (32 seconds run time)

How to incorporate graphs as figures into your report (2:58 runtime)

DETERMINATION OF SEMESTER GRADE:

Deadlines for submission of assignments are firm and while (late assignments accepted, with point penalty deductions at discretion of instructor). A single letter grade is assigned (A/B/C/D/F as per 90/80/70/60/59 & below) based on the points accumulated divided by the maximum total points possible.

Mid-Term Progress information will be provided to students by the instructor via KeanWise. Please see the 2018-2019 Undergraduate or Graduate Catalog for more information.

There are 584 points for the semester as follows:

300 pts	3 Lecture Exams @100 points each
120 pts	12 Labs including Lab Sheets @10 points each
30 pts	Lab Report Draft (submit hard copy print out)
30 pts	Lab Report Final (submit along with graded draft)
104 pts	13 Homework Assignments online @ Mastering Biology

Your score in Mastering will display out of 206 points (104 pts Homework + 102 pts Adaptive Followup) but your instructor will adjust it for course grade calculation based on the 104 pts assigned value.

INSTRUCTOR MAY OPT DIFFERENT LAB REPORT DUE DATES!!!

Biology Lab Safety Rules (Modified from Kean University BIO 1000 Lab Rules, 6.23.17)

Lab Guidelines are designed to keep you safe as well as the instruments that you use in lab in working condition as you perform your lab exercises and experiments. Certain chemicals and equipment used in the bio lab have the potential to cause harm. Plain old common sense is the #1 rule to follow in the lab!

BE PREPARED

Before you enter the lab, you should be prepared and knowledgeable about what exercises you will perform in the lab. This means that you are to have read the assigned procedures in the lab manual ahead of coming into the lab. Make sure in reviewing the lab manual you take note anywhere in the procedure that alerts you to safety precautions that are needed.

BE NEAT

When working in the lab, ensure that you keep that area on your lab bench where you work free of clutter and organized. If you happen to spill something, ask the instructor for cleanup assistance. Have your personal belongings put away from your lab bench work area. Follow the instructions given for how to clean up your area after lab and where to dispose of trash. Do not put excess reagents back into stock bottles. **WASH YOUR HANDS PRIOR TO LEAVING THE LAB.**

BE CAREFUL AND BE CAUTIOUS WITH CHEMICALS, SLIDES & SPECIMENS

Handle items, especially sharp and those made of glass, carefully. Be aware of your surroundings as you work and work on task. Keep conversation with peers to a minimum and only relevant to the work at hand. The best way to help ensure safety when handling chemicals is to assume any chemical you handle is dangerous. Seek instructions from the instructor during lab for specific information on handling chemicals known to be dangerous. If any chemical comes in contact with your skin or eyes, *immediately* notify your instructor. Your instructor will notify you if/when additional precaution is needed including use of hand and/or eye protection. *You are to bring your own pair of eye goggles to each lab session; disposable lab gloves are available in lab for use.*

WEAR PROPER CLOTHING

Accidents in the lab do happen. Certain chemicals have the potential to damage fabric and clothing. Consider what you wear. Avoid open toed shoes/flip flops/sandals as such is not appropriate nor safe for wearing in the lab. Tie long hair back as this is a known danger when working in the lab.

LOCATE SAFETY EQUIPMENT

Be sure to locate all safety equipment in the lab in which you are working. This includes items such as fire extinguishers, first aid kit, broken glass receptacles, chemical waste containers, eye wash station, shower pull, and sink. If glass breaks in lab, immediately tell instructor. Also note where exits are located in case of an emergency.

BIOLOGY LAB DON'TS

DO NO eat or drink in the lab. DO NOT apply lotion and/or cosmetics or lip balm in lab. DO NOT taste any chemicals or substances you are working with. DO NOT use handle broken glass with bare hands. DO NOT pour chemicals down the sink unless instructed to do so. DO NOT operate equipment nor perform an experiment without permission. DO NOT leave heated materials unattended nor place flammable items near a heat source. DO NOT engage in childish antics such as horseplay or pranks.

Syllabus template and course schedule written by: General Biology I & II Coordinator:

Dr. Laura Lorentzen, L.Lorentz@kean.edu (Office in Main Campus Science Bldg C113, 908-737-3661)

Laboratory technician: Norberto Mapoy, nmapoy@kean.edu (Prep lab next to B113, 908-737-3576)

General Bio Lab Report Grading Rubric**STUDENT:** _____(1/15, 6/15, 6/18 Lorentzen modified J.K. Brown's 2011 *Biotechnology A Laboratory Skills Course* 1st ed. BIORAD, Hercules CA, p.372)

Objective	Novice (1)	Developing (2)	Proficient (3)
Title Page	Title Page missing or largely incomplete.	Title Page present but incomplete and/or title not descriptive and precise.	Stand-alone title page is complete and includes precise & descriptive title of work, author's name, names of lab partners, course name & date of submission.
Abstract	Abstract content poor.	Abstract presents information from only some portions of the report.	Abstract correctly represents a concise full summary of all parts of the report.
Introduction	Introduction does not sufficiently address both the experimental purpose/objective/hypothesis and the relevant background matter.	Introduction addresses only the purpose/objective/hypothesis of the work or else only the background information, but not both.	Introduction addresses the experimental purpose/objective(s), states hypothesis & defines the background information relevant to the subject matter.
Methods	Methods are incompletely or incorrectly described.	Methods are described in most experiments but another person may have trouble repeating the experiments as not enough detail provided.	Methods are described completely such that another person could easily repeat the experiment. Methods written in formal paragraph format using past verb tense.
Results	Data presentation is vastly incomplete as either only illustrations provided without written narrative or only written narrative provided without illustrations.	Data presentation of illustrations as well as written results narrative, but one or more are incomplete or not formatted correctly.	All appropriate illustrations (figures/tables) are presented and include illustration # and title/legend. Data obtained are presented in formal written narrative that <i>precedes</i> illustrations.
Discussion	No account of potential sources of error. No conclusion. Data analysis and interpretation of data lacking.	Analysis and interpretation of data that is not sufficiently thorough, and/or content of results and discussion are not correctly separated. Insufficient conclusion.	Data/results are analyzed in light of known findings and are interpreted in the context of either the stated hypothesis or experimental purpose/objective. Sources of potential error are discussed. Sufficient conclusion.
Literature Cited & Originality	No attribution to any other work is provided, and/or the writing is plagiarized.	Terminal Reference listed but either incomplete format and/or missing/incorrect format for in-text citation in the narrative.	Correct format used for both in-text citation in the narrative (introduction, methods) as well as Terminal Reference list.
Presentation of Report	More than one of the items listed to the right for proficient level not met.	One of the items listed to the right for proficient level not met.	Double spaced, reasonable page margins, page #s, font size, section subheaders, neat/orderly professional appearance.
Grammar & Writing Style	Significant portion of report has grammar/spelling/punctuation and/or typographical issues. Poor writing style.	Some grammar/spelling/punctuation and/or typographical issues. Writing style not polished.	Few to none issues related to grammar/spelling/punctuation and typographical issues. Style & tone of writing is at appropriate level.
Submission Deadline	Lab report submitted very late.	Lab report submitted late.	Lab report submitted by the stated deadline.

Score earned on DRAFT lab report: _____ out of 30 points possible

SCORE EARNED ON FINAL LAB REPORT: _____ out of 30 points possible

NOTE THAT WHEN SUBMITTING FINAL LAB REPORT, YOU MUST ALSO SUBMIT THE GRADED DRAFT LAB REPORT + GRADED RUBRICS FOR DRAFT REPORT. OTHERWISE, POINTS WILL BE DEDUCTED.

Style Guide for Writing a Formal Biology Lab Report

(From many sources SP14 by Dr. Lorentzen, Kean University, revised summer 2014, summer 2015, summer 2017, summer 2018)

Overview of How to Format the Lab Report

Lab reports are expected to be typed on a computer, printed out, either stapled or paper clipped together and submitted to your instructor. Use double-spacing 11 or 12 point font for the document's narrative, while single spacing in illustrations is fine. Margin settings should be standard settings (1 or 1 ½ inch). Multipage documents need page numbers. All illustrations must have a figure # (this includes both tables and graphs); tables also must have a title and other figures such as graphs must have both a title and a figure legend. Graphs are to be done on the computer but maybe submitted hand drawn if done so on graph paper. Proper grammar mechanics and spelling is expected along with paragraph organization for the written narrative.

Scientific writing is to be clear and concise as it is distinctly different from creative prose writing. Word choice is to be exact. You may write "I/we" rather than using third person (ie. "the researcher did")...whichever you opt to you be consistent in use throughout the document. However, if you write such that every other sentence is "we did this...we did that..." you distract the reader from the work done so instead rearrange sentence structure where possible. While some scientists will say you have to use third person narrative, over the last decade or so, more and more scientists and professional journals encourage the use of I/we as I do. Note that numbers should be written as numerals when the number is greater than 10 or when associated with a unit of measurement. Never start a sentence with a number unless the number (no matter how large) is spelled out. It is best to use PAST TENSE OF THE VERB when writing lab reports.

Components of the Lab Report

COVER PAGE provides a descriptive TITLE, your name, lab partner's names, course name/number including section # and date of submission.

ABSTRACT is a single paragraph that is a concise but specific summary of each section of the lab report. While the abstract appears before the introduction in terms of placement in the report, it is common practice to actually write the abstract last once the rest of the report is done.

INTRODUCTION section provides relevant background information to understand what the lab report contains. You must in-text cite the source of the background information. It also must include a specific PURPOSE STATEMENT (or objective or research question) of the work done and your HYPOTHESIS. For example, you may wish to investigate how the production of carbon dioxide by yeast is affected by nutrient source. You would formulate your Research Hypothesis Statement as "IF....., THEN....." whereby your hypothesis follows the "if" & the "then" is followed by a possible testable possibility. Ex.: If yeast are selective to their nutrient source, then yeast fed sugar will have different carbon dioxide production than yeast fed protein.

METHODS section is a formal narrative written in paragraph format that presents how the experiments were done such that a person of science could be reasonably expected to repeat them. You write how you did what you did, and you also include how you collected/analyzed the data obtained. It is ok to say "I/we"....write in past tense....in-text cite the lab manual procedure.

RESULTS section is where you report the data obtained in an unbiased manner. You may include illustrations of data. However, you still need formal narrative written in paragraph format in which you tell what your data is while referring to any given numbered figures. For example, a sentence within a paragraph of your results section might be as follows: Figure 1 shows the production of carbon dioxide decreased after five minutes.

DISCUSSION section is where you interpret the data....what does the data obtained mean/imply? Does the data support your hypothesis or not? Explain. If relevant, how do your results compare with the expected results? What might be considered sources of potential error or what problems occurred while conducting the work? The lab manual may pose discussion questions on which you can reflect. Do not simply put answers to such questions in your lab report discussion section. Instead, use any discussion questions as a guide on a way to incorporate material into your formal written discussion narrative. The discussion must end with a brief and concise **CONCLUSION** that should be in synch with the stated purpose and/or hypothesis stated in the lab report. The conclusion should state the major finding(s) of the work, but it is NOT to be a summary of the entire work.

LITERATURE CITED section is the full reference listing of all sources that appear as in-text citation anywhere in the document. At a minimum, you should in your methods section in-text cite the lab manual used for the methods. Other sections in which citation maybe relevant is the introduction and discussion. All work contained in the lab report is to be the original writing of the student author. Paraphrases should be in-text cited and direct quotes contained within quotation marks.

The Name/Year Method for in-text citation is expected.

If writing a sentence in the introduction & you need to cite source for a fact, it would look like:

The gene we describe in this report is identical to the one first isolated in 1989 (Smith, 1991).

Or you are reporting a statistic and you paraphrase the source that you need to cite:

The incidence rate for cancer in 2010 in NY was higher than that of NJ (CDC, 2010).

Examples of in-text citation just given.

Have their full reference listings in the Literature Cited section as below:

CDC (2010) Centers for Disease Control & Prevention Website. Cancer prevention and control, cancer rates by state, incidence rates by state. [updated 24 Oct 2013] Accessed 13 June 2013 Available from: <http://www.cdc.gov/cancer/dcpc/data/state.htm>

Smith, J. (1991) The pretend gene as a candidate for the cause of pretend disease. *Journal of Biology*. 47:113-117.

In the Name/Year system, references appear in alphabetical order in the Literature Cited Section of the lab report.

Go to Youtube.com and in search box enter LLorentzen Microlecture

You will see listed 2 videos by Dr. Lorentzen to help with how to use Name/Year method of citation (32 seconds run time) & how to incorporate graphs as figures into your report (2:58 runtime).

SPRING 2019 BIO 1300 Section XX GENERAL BIOLOGY I COURSE SCHEDULE (subject to change, ver.10.28.18)

Week Starting Monday	LECTURE (# is Chapter in Textbook) Fall Semester runs Jan 22nd thru May 15th Lecture is DAY & TIME & PLACE	LABORATORY (See Lab Manual for Lab Title/Procedures Listed) NOTE: Where needed, lab time maybe used as lecture time Lab is DAY/TIME in Bruce Hall B-124b
Jan 21	Syllabus & Course Expectations + Demo course Mastering Biology site	No BIO 1300 Lab first week
Jan 28	Ch. 1 Themes in Biology Finish Ch. 1, Start Ch. 2 Chemistry	Lab #1: Lab Safety & Orientation/Expectations + Termite Catch the Scent (handout)
Feb 4	Finish Ch. 2 Ch. 3 Water	Lab #2: Measurements in Biology: The Metric System and Data Analysis (Procedures 2.1 thru 2.6)
Feb 11	Ch. 4 Carbon Ch. 5 Carbohydrates & Lipids	Lab #3: Microscope: Basic Skills of Light Microscopy (Proc. 3.1 to 3.5; for Proc. 3.3 do alternate protocol)
Feb 18	Mon Feb 18 th is a HOLIDAY Ch.5 Proteins Ch. 6 The Cell	Lab #4: Spectrophotometry: ID Solutes & Determine Concentration (Proc.8.1, 8.2, 8.3)
Feb 25	Finish Ch. 6 The Cell Mastering Bio Batch #1 due 2/27 by 9pm Exam #1 (Ch. 1 thru 6)	Lab #5: The Cell: Structure & Function (Proc. 4.1 thru 4.5 + 4.9 & 4.10) in Proc. 4.1, omit step 5; in Proc. 4.4, omit step 1; in Proc. 4.5 omit steps 8 & 9
Mar 4	Ch. 7 Membrane	Lab #6: Diffusion & Osmosis (Proc. 9.2, 9.4, 9.5, 9.7, 9.8; start w/Proc 9.4, do others while waiting; for Proc. 9.4 use 20% sucrose in beaker holding Bag A) *For lab report do only Proc. 9.4 & 9.5; Discuss lab report expectations
Mar 11	*****SPRING BREAK*****	*****SPRING BREAK*****
Mar 18	Ch.8 Metabolism/ATP & Enzymes Ch. 9 Cellular Respiration	Lab # 7: Cell Membranes: Physical Stress Proc 10.1 *For lab report do Proc 10.1
Mar 25	Continue Ch. 9	Lab #8: Enzymes: Factors affecting Rate of Activity--Temperature (Proc. 11.1 do quantitative & qualitative analysis) *For lab report do Proc. 11.1
Apr 1	Ch. 10 Photosynthesis MasteringBioBat:h#2 due 4/3 by 9pm	Lab #9: Respiration: Anaerobic fermentation of Organic Molecules in Yeast (Proc. 12.1, use fermentation tubes, incubate @ 45 degrees C)
Apr 8	Exam #2 (Ch. 7 thru 10) Ch. 5 (Nucleic Acids: DNA & RNA)	Lab #10: Photosynthesis: Pigment Separation by TLC & CO ₂ Uptake (start w/Proc. 13.4, then do 13.1; in Proc. 13.1 omit step 4) Draft Report Due
Apr 15	Ch. 12 Mitosis & Cell Cycle Start Ch. 13 Meiosis Fri April 19 is a HOLIDAY	NO BIO 1300 LABS THIS WEEK
Apr 22	Ch. 13 Meiosis Ch. 16 DNA Replication	Lab # 11: Mitosis: Replication of Eukaryotic Cells (Proc. 14.3 [steps 1 – 5] & Proc. 14.4 [steps 1 – 4]) & Meiosis: Reduction Division (Proc. 15.2)
Apr 29	Finish Ch. 16 DNA Replication Ch. 17 Transcription	Lab #12 LAST LAB DNA Isolation (handout) + SIR II course evaluations Final Report Due
May 6	Continue Ch. 17 Translation Tues MAY 7 is a Friday Schedule Wed MAY 8 is a Monday Schedule	NO BIO 1300 LABS THIS WEEK
May 13	Finish Ch. 17 Mastering Bio Batch #3 due 5/15 by 9pm Exam#3 (Ch.5DNA/RNA, 12/13,16/17)	NO BIO 1300 LABS THIS WEEK

*MasteringBio Homeworks+Adaptive Followups due by 9pm (late submissions allowed albeit w/points deduction)



GENERAL BIOLOGY II BIO 1400 Section 01 4 Credits/Semester Hours SPRING 2019

Prerequisite: BIO 1300 (General Biology I)
The following chapters, covered in the General Biology I textbook, are essential prerequisite knowledge prior to starting BIO1400: Ch. 1 (Themes); Ch. 13 (Meiosis); and Ch. 16 (DNA Replication).

Corequisite: CHEM 1083 (General Chemistry I)

Instructor: Laura Lorentzen, Ph.D. ("Dr. L") **Email:** L.Lorentz@kean.edu
Office: Main Campus Science Bldg. C-113 **Office Phone:** 908-737-3661
Biology Dept. Main Office 908-737-3650

Office Hours: Mon 7:45 to 10:45am
Tues 7:45 to 9:15am + 10:55am to 12:25pm
Wed 7:45 to 10:45am
Thurs 7:45 to 9:15am
Fri 7:45 to 9:15am

You are also encouraged to email me as I can often answer your questions through email.

CLASS PERIODS: LECTURE TUES & FRI 12:30PM TO 1:45PM SCIENCE BLDG C-218
LAB MON 12:30PM – 3:10PM IN BRUCE HALL B-124b

COURSE DESCRIPTION:

An introduction to the biology of organisms, including a survey of kingdoms, behavior, evolution, and ecology. This course, in combination with BIO 1300, forms the foundation for Biology majors and for students following the Science Core. Students are not permitted to enroll in BIO 1300 & BIO 1400 in the same semester (the course is not a General Education Lab course).

COURSE MATERIALS:

Mastering Biology is the online learning website for the course where students access course lecture slideshows, related materials, and where students access and complete all required course homeworks. Students are required to purchase the access code to Mastering Biology. Having a hard copy of the lecture textbook vs. the eText is the decision of the student. If a used textbook is purchased, you will still need to purchase the access code. The access code, once purchased, is good for your use in BOTH BIO 1300 & BIO 1400 courses (these 2 courses are required 1st year coursework in biology major).

LECTURE: Urry et al. (2016) *Campbell Biology*, 11th Ed., plus MasteringBiology Pearson NY
Bound book with Mastering Biology (with etext): ISBN 9780134082318
Three hole punched book with Mastering Biology (with etext): ISBN 9780134454665
Mastering access code with etext: ISBN 9780134446523
Direct from publisher, may opt to purchase only the Mastering Bio access (without etext)

LAB MANUAL: The lab manual is required. It is published by McGrawHill as a custom create manual entitled "Gen Bio I & II Lab Manual" (Copyright 2016, 2nd Ed. ISBN: 9781308812274) & is available in the Kean Bookstore. The customized create versions contain selected exercises from: Vodopich DS & Moore R (2014) *Biology Laboratory Manual* 11th Edition. McGraw-Hill NY.

LAB: Students are to purchase laboratory safety eye goggles and bring to each lab.

Student Learning Outcomes (This is the 2nd course in the major required for biology majors).

At completion of the course, students will demonstrate the ability to:

- A. Understand how to apply the scientific method and collaborate effectively in cooperative laboratory and field-based experimental projects and know, observe and obey lab safety rules.
- B. Understand the basic principles of genetics and be able to solve genetics problems concerning patterns of inheritance.
- C. Apply the fundamental concepts of evolution toward an explanation of the underlying unity of biological diversity, while understanding the hierarchical organization of biological systems and the dynamic interactions among different levels.
- D. Apply knowledge of form, function and process to arrive at a comprehensive understanding of the diversity of biological life forms.
- E. Know the adaptations by which different organisms meet the basic functions and challenges of life during gas exchange, reproduction (focus on human sexual reproduction), development/embryology, locomotion, nutrition metabolism, excretion, thermoregulation and homeostasis.
- F. Understand how to effectively find, organize, and use resources from the literature and the lab and present data and results in oral, visual and written communication.
- G. Understand key issues of controversy or uncertainty in current biological study and the historical context of biological thought in order to appreciate science as an ongoing, human process.

Important University-Wide Dates for SPRING 2019 (Semester runs Tues Jan 22nd to Wed May 15th)

Mon Jan 21	Holiday/University Closed
Tues Jan 29	Last day to add a class
	Last day to drop a class with a 100 % Refund & no mark on transcript
Wed Jan 30	Mark of "W" on transcript begins for course withdrawals
Tues Feb 5	Last Day to Withdraw from Class with a 75 % Refund
Tues Feb 12	Last Day to Withdraw from Class with a 50 % Refund
Mon Feb 18	University Closed/No Classes
Mar 11 to Mar 17	SPRING BREAK NO CLASSES
Fri Apr 12	Last day to withdraw from a class with a grade of "W" on transcript (no refund)
Apr 19 to Apr 21	University Closed/No Classes
Tues May 7	Classes follow a FRIDAY SCHEDULE
Wed May 8	Classes follow a MONDAY SCHEDULE

University Policies and Information

Students are responsible to review and understand the *University Academic Integrity Policy* (available at the Center for Academic Success or at <http://www.kean.edu/admin/uploads/pdf/AcademicIntegrityPolicy.pdf>). Western society punishes plagiarism. Students are expected to ensure their writings and presentations abide by these policies.

Students should review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom: <http://www.kean.edu/KU/Code-of-Conduct>.

Students are strongly encouraged to register for the University's emergency notification system (<http://www.kean.edu/campusalert>) in order to be informed of campus emergencies, weather notices, and other announcements.

All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>; click on E-mail Account Request Form.

Americans with Disabilities Statement & Kean University Non-Discrimination Statement:

Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Students may contact the Office of Disability Services in Downs Hall Room 122 or call 908-737-4910 to discuss special needs.

Title IX of the Education Amendments of 1972 (Title IX) prohibit discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action Programs, Office of the Vice President for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at the following: <http://www.kean.edu/policies/sexual-misconduct-policy>.

SYLLABUS NOTICE FOR LABORATORY COURSES -- REPRODUCTIVE HAZARDS

Reproductive hazards are substances or agents that may affect the reproductive health of women or men or the ability of couples to have healthy children. Efforts have been made to eliminate the use of known reproductive hazards in our labs. However, the vast majority of laboratory chemicals have never been tested by the manufacturer or by any governmental agency. As a result, their effect on a developing fetus is unknown; female students must assume that each chemical used in this lab presents a hazard to an unborn child. If you are pregnant, become pregnant or are planning to become pregnant during the semester, you are strongly encouraged to speak privately with your instructor who will be able to provide written health and safety information about each chemical that will be used in the class. You are asked to review and discuss this information with your healthcare provider. After you have reviewed the information, you can choose to:

1. Continue your enrollment in the lab - You will be asked to sign a waiver and will be expected to follow a strict set of health and safety procedures while in the lab.
2. Withdraw from the lab - Your instructor will assist in creating plan to complete course at a later date.

Course Instructional Methods

This course is a 4 credit, lecture and laboratory course.

Lecture content is reinforced with experimentation, observation and specimen dissection in lab.

ATTENDANCE

- By the letter of the *Student Attendance Policy*, attendance is expected every time a class meeting is held. Regular, on-time and productive participation in class may be given positive consideration in the semester grade.
- There are **NO MAKEUP LABS** and you are expected to arrive **ON TIME** to each lab.
- Department of biology approved the policy effective May 2016, in which if a general biology student **misses more than three labs unexcused, the student fails the entire four credit course.**

Mastering Biology Online Course Companion Website
Out-of-Class Homework Assignments + Adaptive Followups

Using the Access Code you purchase for Mastering Biology, enroll yourself in the course.

Course ID: BIO1400LORENTZENSP19

- These assignments are done through the textbook publisher's site that accompanies the course textbook. You do them online, outside of class. Due dates are listed with a 9pm deadline. There are 13 homework assignments on the lecture textbook chapters for a total of 124 points:
 - Batch#1 (38pts due 10/14): Intro, 2pts +Ch14, 7pts +Ch15, 8pts +Ch24, 10pts +Ch25, 11pts
 - Batch#2 (45pts due 11/14): Ch27, 10pts +Ch28, 12pts +Ch29, 12pts +Ch30, 11pts
 - Batch#3 (41pts due 12/19): Ch32, 9pts +Ch33, 12pts +Ch40, 11pts +Ch47, 9pts
- Even though we lecture and test on Chapters 26, 31, 34 & 48, there are no assigned homeworks on Mastering on such.
- Mastering Biology tracks how you do on the required homework questions and then depending on how you perform, gives you additional adaptive followup questions to address your trouble areas. If you ace the homework questions you test out of receiving adaptive followup questions but if the system gives you adaptive followup questions you must do them, otherwise if you do not answer them, you lose points. Adaptive followup is only available if you do the homework by the due date. So while you can do homeworks late albeit points penalty deductions, you will lose points for any adaptive followups the system would assign you.
- Refer to the Mastering Biology website calendar to see when each assignment is open for you and when it closes (ie. the due date). An assignment that is completed late is penalized 5% per day (but never reduced by more than 80%). Once you complete an assignment, you can't access it again until the due date has passed; but once the due date passes, you can access the assignment to use as a study tool.
- Mastering Biology has a number of other student tools, activities and animations that will help boost your understanding and performance in this course. For example, in the "study area" on the site, there are practice test questions from the textbook publisher.
- The Mastering Biology site is also where course announcements are posted and where course materials, especially the pdf files of the lecture Powerpoint slideshows, are posted.

EXAMINATIONS

- You will have a midterm and a final lab practicum on lab materials.
- Three in-class exams are scheduled and carry equal weight. While the exams will not be directly cumulative, biology is a subject in which content builds on itself. Exams are: based on lecture slideshow content (lab topics parallel lecture but lab is not directly tested on lecture exams); are both multiple choice and short answer questions; and are timed (1 hour 15min). You are allowed to bring one, handwritten 3x5inch index card with notes to the exam that you must show instructor & submit with your exam. No watches nor electronics are allowed during the exam nor leaving for the restroom. Bring a #2 pencil. Instructor will keep track of time during the exam for you.
- Should you not be able to take an exam during the scheduled time, with a valid, documented excuse (determined by the instructor), an alternate exam seating may be allowed albeit it perhaps with a different exam/different format. It is the responsibility of the student to contact the professor if an exam is missed and to provide documentation for consideration of a makeup exam.

LABORATORY WORK

LAB SHEETS....The instructor-provided lab sheets accompany, but don't replace, the lab book

Observations and answers from all lab sessions are to be recorded on the lab sheet handouts (found in the lab folder on Mastering biology) and given to the instructor before you leave lab. Note that the lab sheet *doesn't* replace the lab manual, it is a guide for using the lab manual. A lab may not cover every single procedure in the lab manual; lab sheets tell you which procedures you will perform & direct you to the lab manual. Although you work in a lab group, each student submits their own lab sheet. There are 11 labs (not counting the 2 lab practical days) so 11 lab sheets total, each valued at 10 points.

LABORATORY & LAB PRACTICALS

You will NOT be able to makeup lab if you miss a lab or a significant portion of that lab (do **NOT** be late to lab). The first lab session of the semester will cover lab safety rules and regulations.

Additionally, the department of biology approved the policy effective May 2016, in which ***if a general biology student misses more than three labs unexcused, the student fails the entire four credit course.***

- Students working in lab groups perform the following preserved specimen dissections: angiosperm flowering plant & seeds; earthworm, mussel, starfish, crawfish, and fetal pig.
- There are two **lab practicals**, each is a closed-book, timed exam during which you go station-to-station to ID item shown/answer question posed; lab practicals cover the specimens, slides, and material/content performed during lab sessions.

DETERMINATION OF SEMESTER GRADE

Deadlines for submission of assignments are firm (late assignments accepted, with point penalty deductions at discretion of instructor). Keanwise shows acceptable undergraduate letter grades that have plus/minus designation. A single letter grade is assigned (A/B/C/D/F 90/80/70/60/59 & below) based on the points accumulated divided by the maximum total points possible.

Mid-Term Progress information will be provided to students by the instructor via KeanWise. Please see the 2018-2019 Undergraduate Catalog for more information.

There are 594 points for the semester as follows:

50% of Course.....3 Exams @100 points each, total of 300 points

20% of Course.....11 Lab Sessions @10 points each, total 110 points

10% of Course.....2 Lab Practical Exams (Midterm & Final) each worth 30 points, total 60 points

20% of Course.....13 homework assignments online @ Mastering Biology, total of 124 points

Your score in Mastering will display out of 246 points (124pts Homework + 122 pts Adaptive Followup) but your instructor will adjust it for course grade calculation based on the 124 pts assigned value.

Biology Lab Safety Rules (Modified from Kean University BIO 1000 Lab Rules, 6.23.17)

Lab Guidelines are designed to keep you safe as well as the instruments that you use in lab in working condition as you perform your lab exercises and experiments. Certain chemicals and equipment used in the bio lab have the potential to cause harm. Plain old common sense is the #1 rule to follow in the lab!

BE PREPARED

Before you enter the lab, you should be prepared and knowledgeable about what exercises you will perform in the lab. This means that you are to have read the assigned procedures in the lab manual ahead of coming into the lab. Make sure in reviewing the lab manual you take note anywhere in the procedure that alerts you to safety precautions that are needed.

BE NEAT

When working in the lab, ensure that you keep that area on your lab bench where you work free of clutter and organized. If you happen to spill something, ask the instructor for cleanup assistance. Have your personal belongings put away from your lab bench work area. Follow the instructions given for how to clean up your area after lab and where to dispose of trash. Do not put excess reagents back into stock bottles. **WASH YOUR HANDS PRIOR TO LEAVING THE LAB.**

BE CAREFUL AND BE CAUTIOUS WITH CHEMICALS, SLIDES & SPECIMENS

Handle items, especially sharp and those made of glass, carefully. Be aware of your surroundings as you work and work on task. Keep conversation with peers to a minimum and only relevant to the work at hand. The best way to help ensure safety when handling chemicals is to assume any chemical you handle is dangerous. Seek instructions from the instructor during lab for specific information on handling chemicals known to be dangerous. If any chemical comes in contact with your skin or eyes, *immediately* notify your instructor. Your instructor will notify you if/when additional precaution is needed including use of hand and/or eye protection. *You are to bring your own pair of eye goggles to each lab session; disposable lab gloves are available in lab for use.*

WEAR PROPER CLOTHING

Accidents in the lab do happen. Certain chemicals have the potential to damage fabric and clothing. Consider what you wear. Avoid open toed shoes/flip flops/sandals as such is not appropriate nor safe for wearing in the lab. Tie long hair back as this is a known danger when working in the lab.

LOCATE SAFETY EQUIPMENT

Be sure to locate all safety equipment in the lab in which you are working. This includes items such as fire extinguishers, first aid kit, broken glass receptacles, chemical waste containers, eye wash station, shower pull, and sink. If glass breaks in lab, immediately tell instructor. Also note where exits are located in case of an emergency.

BIOLOGY LAB DON'TS

DO NOT eat or drink in the lab. DO NOT apply lotion and/or cosmetics or lip balm in lab. DO NOT taste any chemicals or substances you are working with. DO NOT use handle broken glass with bare hands. DO NOT pour chemicals down the sink unless instructed to do so. DO NOT operate equipment nor perform an experiment without permission. DO NOT leave heated materials unattended nor place flammable items near a heat source. DO NOT engage in childish antics such as horseplay or pranks.

Syllabus template and course schedule written by: General Biology I & II Coordinator:

Dr. Laura Lorentzen, L.Lorentz@kean.edu (Office in Main Campus Science Bldg C113, 908-737-3661)

Laboratory technician: Jennifer Ray Yaturo (email rayj@kean.edu phone 908-737-3627)

SPRING 2019 BIO 1400-01 GENERAL BIOLOGY II COURSE SCHEDULE (subject to change, ver.12.25.18)

LECTURE TUES & FRI 12:30PM TO 1:45PM SCIENCE BLDG C-218
 LAB MON 12:30PM TO 3:10PM BRUCE HALL B-124b

Week Starting Monday	LECTURE (# is Chapter in Textbook) Semester runs Jan 22 to May 15	LABORATORY (See Lab Manual for Lab Title/Procedures Listed) NOTE: Where needed, lab time maybe used as lecture time
1	T 1/22 Syllabus + Demo Mastering Biology Site F 1/25 Ch. 14 Mendel & the Gene	NO LAB 1st WEEK OF SEMESTER
2	T 1/29 Ch. 14 F 2/1 Ch. 14	M 1/28 Lab #1: Lab Safety/Orientation (syllabus/handouts) & Process of Science Handout
3	T 2/5 Ch.15 Chromosomal Inheritance F 2/8 Ch. 15	M 2/4 Lab #2: BioRad Handout Cheek Cell DNA Extraction (handout) & Genetics of Corn video + Finish Lab#1
4	T 2/12 Ch. 24 Origin of Species F 2/15 Ch. 24 & Ch. 25 History of Life on Earth	M 2/11 Lab #3: Genetics: Principles of Mendel (Proc. 17.1, 17.5, 17.6 & 17.7) + Genetics word problems + Skin Color video
5	T 2/19 Ch. 25 F 2/22 Ch. 25	M 2/18 UNIVERSITY HOLIDAY/NO LAB
6	T 2/26 Ch. 26 Phylogeny & Tree of Life F 3/1 Ch. 26	M 2/25 Lab #4: Genetics problems recitation continued & Wards lab handout on blood typing
7	MasteringBio Batch#1 due 9pm Sun 3/3 T 3/5 Exam #1 (Ch. 14, 15, 24, 25 & 26) F 3/8 Ch. 27 Prokaryotes: Bacteria & Archae	M 3/4 Lab #5: Prokaryotes: Bacteria, Gram Stain & Inoculation (Proc. 24.1, 24.2, 24.3, 24.6, 24.8) + Origin of Birds video
*****	SPRING BREAK WEEK OF MARCH 1st	SPRING BREAK WEEK OF MARCH 1st *****
8	T 3/19 Continue Ch. 27 F 3/22 Ch. 28 Prokists	M 3/18 Midterm Lab Practical Covers content of Labs #1 thru #5
9	T 3/26 Ch. 29 Plant Diversity F 3/29 Ch. 29 + Ch. 30 Seed Plants	M 3/25 Lab #6: Prokists: Algae (Procedures 25.1, 25.3, 25.4, 25.5, 25.7 thru 25.10) + Protozoa/Slime Molds (Proc. 26.1, 26.3 thru 26.7) & view bacteria plates
10	T 4/2 Ch. 30 Seed Plants F 4/5 Ch. 31 Fungi	M 4/1 Lab #7: Plants (Proc. 30.2, 30.3, 30.4, 31.1 [step 6, use Fig. 31.6], 31.6, 32.1, 32.3) & Fungi (Proc. 27.6[omit steps 3 & 4], 27.7, 27.8, 27.9) + Dissection Safety Rules
11	MasteringBio Batch#2 due 9pm Sun 4/7 T 4/9 Exam #2 (Ch. 27, 28, 29, 30 & 31) F 4/12 Ch. 32 Animal Diversity	M 4/8 Lab #8: Mollusca & Annelida (Proc.38.1, 38.2, 38.4 thru 38.6 & Table 38.2) + TED Talk Video on Climate Change
12	T 4/16 Ch. 32 + Ch. 33 Invertebrates F 4/19 UNIVERSITY CLOSED	M 4/15 Lab #9: Arthropoda (Proc. 39.1 [steps 1-4] thru 39.2) & Echinoderm (Proc. 40.1 & 40.2)
13	T 4/23 Ch.33+34 Origin/Evolution of Vertebrates F 4/26 Ch. 34 + 47 Animal Development	M 4/22 Lab #10: Animal Embryology/Development (slides & mounts starfish, frog & chick) & Slides of vertebrate animal tissues (muscle, connective, nervous & epithelial) & Origin of Animal Multicellularity video (stop vide at runtime 18:23)
14	T 4/30 Ch.47+ Ch. 40 Animal Form & Function F 5/3 Ch. 40	M 4/29 Lab #11: Appendix 1 Fetal Pig Dissection (specimen, video, lab manual & handout) + SIR II course evaluation
15	T 5/7 IS A FRIDAY so Ch. 48 Neurons/Signaling F 5/10 Catchup/Study Day	M 5/6 Final Lab Practical Covers content of Labs #6 thru #11
16	MasteringBio Batch#3 due 9pm Sun 5/12 T 5/14 Exam #3 (Ch. 32, 33, 34, 40, 47, 48)	M 5/13 NO LAB

*MasteringBio Homeworks+Adaptive Followups due by 9pm (late submissions allowed albeit w/points deduction):
 Homeworks Intro, Ch14&15,24&25 due Mar 3rd; Homeworks Ch 27-30 due Apr 7th; Homeworks Ch 32&33,40&47 due May 12th



**COURSE SYLLABUS
BIO 2500 01 - PRINCIPLES OF BOTANY
SPRING 2019**

I. COURSE INFORMATION:

Instructor Name: Dr. Christopher Zambell

Office: SCIENCE BUILDING, C-126

Office Hours:

Mon. 1 PM – 5 PM, Tue. 3:30 PM – 5 PM, Wed. 9:15 AM – 10:45 AM & 1 PM – 5 PM, Fri. 9:30 AM – 10:30 AM

Phone: 908-737-3577

Kean Email: zambellc@kean.edu

Meeting Times / Location:

Lecture: Mon. & Thurs., 11:00 AM - 12:15 AM (BRUCE HALL, B-109)

Lab: Tues., 9:30 PM - 12:15 PM (SCIENCE BUILDING, C-156)

Term: Jan. 22, 2019 - May 15, 2019

Course Description: Lecture and Lab. Introduction into Plant Science, covering basics of diversity and phylogeny of photosynthetic organisms and fungi, with the emphasis on anatomy, metabolism, reproduction, and biotechnology of higher plants.

Pre-Requisites: BIO 1300 (General Biology I) or BIO 2200 (Cell Biology)

Course Objectives:

After successful completion of the course, students will:

A. Continue to develop abilities necessary to do scientific inquiry and understandings about scientific inquiry:

- Identify questions and concepts that guide scientific investigations.
- Interpret scientific data and theories presented in science publications.
- Formulate testable hypothesis, design experiments to test them to create new knowledge.
- Use techniques of various scientific disciplines to find solutions to problems of personal relevance.
- Evaluate data and their graphical representation.
- Critically assess experimental results and draw conclusions based on the data.
- Communicate and defend the results of their research both orally and in a written form in the style of a research article.
- Effectively work in team with the others.

B. Summarize the modern understanding of phylogeny and diversity of photosynthetic organisms via:

- Relating evolution and diversity of photosynthetic protists, higher plants and fungi to the modern evolutionary synthesis
- Classifying major photosynthetic organisms with respect to their phylogeny

C. Understand the structure and function of higher plants via:

- Explaining functional and adaptive significance of plant morphology and anatomy at cellular, tissue and organ level
- Arranging basic physiological plant processes such as photosynthesis, respiration, transpiration, growth, and development into a complete picture of plant metabolism.
- Explaining how plants are propagated via traditional breeding and biotechnology.

D. Summarize the role of plants in society via:

- Evaluating roles photosynthetic organisms and fungi play in human's health, energy, climate and society from biological and ethical perspectives
- Evaluating the role of genetically modified plants in nature and society
- Debating different traditional and biotechnological methods in plant production

II. INSTRUCTIONAL METHODS

Lecture, reading, lab activities, lab reports, student presentations, exams, mastering homework.

III. TEXTBOOKS AND MATERIALS

A. Software: Microsoft Excel, is free for students at Kean University: <https://products.office.com/en-us/student>. Students should download excel, rather than just using the online version. The online version is missing some functionality in manipulating graphs. Downloading is free.

B. Text: Urry et al. (2016) Campbell Biology, 11th Ed., with MasteringBiology (online access to the MasteringBiology homework is **mandatory!**) This is the same book you used for BIO1300-1400!! If you do not have this book or access to MasteringBiology, your options are:

1. Three-hole punched book (paper version) with Mastering Biology (and with e-text): ISBN 9780134454665
2. MasteringBiology with Pearson eText (this is the electronic version only), access card: ISBN 9780134472942
3. Alternatively, you can go to www.masteringbiology.com, register for our course (see the course ID below) and pay for the online homework only. This is the cheapest option and recommended only to the students who have severe financial problems.

C. Lab manual: Laboratory manual is custom made for Kean University and will be distributed during the first class. Small fee will be charged to cover printing charges.

D. Online Resources (mandatory!):

Blackboard: Blackboard is an online resource which will be used in this class. Blackboard contains your grades and lecture slides (please, allow me some time to upload the lectures; this is a courtesy and not a substitute to your in-class notes). Make sure you have your valid e-mail connected to the Blackboard to receive the announcements. Lab reports will be uploaded to the Blackboard.

MasteringBiology (10% of lecture grade; 7% of the total grade): You must register at MasteringBiology in order to complete your homework (mandatory). It includes the e-text, so if you do not want to purchase a paper version of the textbook, this online platform should be enough. You may be able to use the same account with Pearson you used for your BIO1300 course, so no need to buy a new Access Card. Only if you have not purchased the Pearson book/access to Mastering, or your access has expired, you need to buy it.

CourseID: To Be Determined

IV. TOPICS AND ASSIGNMENTS / SCHEDULE:

Lab Schedule:

Week	Date	Lab topic	Homework (due 11:59 PM) To be announced
1	1/22	Lab 1 – Systematics and Phylogeny	
2	1/29	Lab 2 – Photosynthetic Bacteria and Protists	Message Board: Intro
3	2/5	Lab 3 – Mosses and Ferns	Write-up: Intro Message Board: Methods
4	2/12	Lab 4 – Gymnosperms & Angiosperms Life Cycle	Write-up: Methods Message Board: Results
5	2/19	Lab 5 - Angiosperm Flowers & Angiosperms Fruit	Write-up: Results Message Board: Discussion
6	2/26	Lab 6 – Fungi	Write-up: Discussion
7	3/5	Lab 7 – Cells and Tissues of Vascular Plants	
8	3/12	NO CLASS --- WEEK OF SPRING BREAK	
9	3/19	Lab 8 – Vascular Plant Organs: Stems, Roots, Leaves,	
10	3/26	**** PRACTICAL EXAM (25% Lab Grade) *****	
11	4/2	Lab 10 – Photosynthesis	
12	4/9	Lab 11 – Plant Hormones Experiment Part I	Write-up: Photosynthesis
13	4/16	Lab 12 – Plant Hormones Experiment Part II	
14	4/23	Lab 13 – Antibiotic Activity of Spices	Write-up: Plant Hormones
15	4/30	Ecology – Field Trip	Write-up: Spices (tentative)

LABORATORY RULES AND SAFETY GUIDELINES:

DO NOT EAT, CHEW GUM OR DRINK IN THE LABORATORY; Before returning the microscopes to the microscope cabinet, please show it to the instructor for inspection; Notify your instructor immediately if you are pregnant or have medical conditions that need special laboratory precautions. If you are allergic to certain substances (chemicals, animal and plant products etc.), make sure you consult your physician and take appropriate medicine before the class; Wear disposable gloves when working with chemicals; Familiarize yourself with emergency exits, fire extinguishers and blanket, first aid kit, eyewash station, chemical shower, biohazard container, and broken glass container; Immediately notify your instructor of all spills, accidents, or damaged equipment; Properly dispose of waste materials and chemicals as directed by your instructor; Wash your hands with soap and water before leaving the laboratory; Follow any other specific safety measures given by your instructor.

Lecture Schedule (subject to change):

Week	Date	Topic	Campbell Biology, 11 ^o Required chapters
PHOTOSYNTHETIC ORGANISMS AND FUNGI			
1	1/24 (Th)	Introduction to Botany	
2	1/28 (M)	Systematics; Evolutionary Concepts	Ch. 26
2	1/31 (Th)	Systematics finish and class exercises	Ch. 26
3	2/4 (M)	Prokaryotes: Cyanobacteria Protists: Plant-like Protists (algae) & Fungus-like Protists (oomycetes & slime molds)	Ch. 27 (cyanobacteria insert), Ch. 28
3	2/7 (Th)	Land Plants Group 1: Bryophytes, the non-vascular seedless plants	Ch. 29
4	2/11 (M)	Land Plants Group 2: Ferns and Fern Allies, the vascular seedless plants	Ch. 29 (continued) + supplementary material (see PowerPoint)
4	2/14 (Th)	Finish Ferns & Allies; Review	
5	2/18 (M)	PRESIDENTS DAY	
5	2/21 (Th)	***** EXAM 1 *****	Exam: Systematics (Ch. 26), Cyanobacteria (Ch. 27-insert), Photosynthetic Protists (Ch. 28), Land Plants 1 (Bryophytes, Ch. 29) and Land Plants 2 (Ferns and Fern Allies, Ch. 29); All PPT slides also covered.
6	2/25 (M)	Land Plants Group 3: Gymnosperms	Ch. 30
6	2/28 (Th)	Land Plants Group 4: Angiosperms	Ch. 30 (continued), 38.1 (angiosperm double fertilization, flowers and fruits) + supplementary material
7	3/4 (M)	Angiosperms continued;	"
7	3/7 (Th)	Land plant evolutionary & geological history; Wrap up all land plant groups.	"
8	3/11 (M)	Fungi	Ch. 31
8	3/14 (Th)	Review	
9	3/18 (M)	***** EXAM 2 *****	Exam covers: Ch.30 (Gymnosperms and Angiosperms), 31 (Fungi), 38.1 (Angiosperm reproduction, flowers, fruits); all PPT slides
ANATOMY, METABOLISM, PROPOGATION AND ECOLOGY OF HIGHER PLANTS			
9	3/21 (Th)	Plant molecules and cells	Ch. 6 (cell), Ch. 35 (tissues) + supplementary material
10	3/25 (M)	Plant cell types, tissues and tissue systems	Ch. 35 + supplementary
10	3/28 (Th)	Plant Organs: Roots, Shoots and Leaves	Ch. 35 + supplementary

11	4/1 (M)	Growth and Meristems	Ch. 35 + supplementary
11	4/4 (Th)	Photosynthesis	
12	4/8 (M)	Photosynthesis (cont.)	Ch. 10
12	4/11 (Th)	Finish / review / or new topics	
13	4/15 (M)	***** *****	EXAM 3 Exam covers: Ch. 6, 35, 10 and lecture materials
13	4/18 (Th)	Resource acquisition and transport	Ch. 36
14	4/22 (M)	Resource acquisition and transport (cont.)	Ch. 39
14	4/25 (Th)	Plant response to signals	Ch. 37
15	4/29 (M)	Plant propagation and biotechnology	Ch. 38.2-38.3
15	5/2 (Th)	Biotechnology II (exercise)	Ch. 52
16	5/6 (M)	Soil and Plant Nutrition	
17	5/8 (W)	Review Wednesday is Monday schedule	36, 37, 38.2-38.3, 39, 52 and lecture materials
18	5/13 (M)	***** *****	EXAM 4 / FINAL EXAM

Due dates for Mastering:

Mastering Batch 1 [Intro, Ch. 26, 27/28, 29] due **TBD**

Mastering Batch 2 [Ch. 30, 31], due **TBD**

Mastering Batch 3 [35,10] due **TBD**.

Mastering Batch 4 [36, 37, 38 (biotech portion), 39] due **TBD**.

Important Dates in the University Academic Calendar, SPRING 2019Withdrawal Dates:

January 29 (Tue.) – last day to withdraw with 100% refund

February 5 (Tue.) – last day to withdraw with 75% refund

February 12 (Tue.) – last day to withdraw with 50% refund

April 12 (Fri.) – last day to withdraw with a grade of "W" (no refund)

Holidays (University Closed):

February 18 (Mon.) – PRESIDENTS' DAY

March 11 (Mon.) – March 17 (Sun.) – SPRING RECESS

Apr. 19 (Fri.) – Apr. 21 (Sun.) – EASTER RECESS (does not affect our class)

End of Semester:

Tues., May 7 – Friday schedule (no Tuesday classes meet)

Wed., May 8 – Monday schedule (no Wednesday classes meet)

Thurs., May 9 – Wednesday, May 15 – FINALS WEEK

Wed., May 15 – Term Ends

No reading day this semester!

V. ASSESSMENT:

Mid-Term Progress information will be provided to students by the instructor via KeanWise. Please see the 2018-2019 Undergraduate or Graduate Catalog for more information.

Grade Breakdown

Lecture – 70% of final grade

	% of lecture	% of final grade (rounded)
Exam 1	21.25	14.9
Exam 2	21.25	14.9
Exam 3	21.25	14.9
Exam 4	21.25	14.9
Attendance	5	3.5
Homework	10	7

Lab – 30% of final grade

Lab Work*	25	7.5
Lab Exam	25	7.5
Full Lab Reports	25	7.5
Short Report / Discussion / Message-Board	25	7.5

*Lab work is lab attendance, being on time, cleaning your bench, participating in lab discussions, maintaining the microscopes, maintaining a lab notebook, showing me in-class work, and then signing out after completing lab activities.

Percent (cut-off)	93%	90%	88%	83%	80%	76%	70%	60%	<60%
Grade	A	A-	B+	B	B-	C+	C	D	F

VI. POLICIES

Class Policies

Attendance: Students who are sick must email me the night before or first thing in the morning, and later provide a doctor's note if they wish to receive attendance credit. Make sure all missed classes for which you have a valid excuse are recorded via email so that I can track them better.

Missed Exams: DO NOT MISS AN EXAM WITHOUT AN IMMEDIATE EXPLANATION VIA EMAIL THE SAME DAY AND LATER DOCUMENTATION OR YOU WILL RECEIVE A ZERO ON THAT EXAM. Students wishing to reschedule/skip an exam date due to illness must absolutely provide proof of illness absence via a doctor's note. For students lacking insurance, the university health center can provide a note if you are sick.

Extra Credit and Make-up: No extra credit assignments will be assigned to individual students. No make-up work or extra credit may be requested after the final exam.

Important University Policies and Information

Students are responsible to review and understand the *University Academic Integrity Policy* (available at the Center for Academic Success or at <http://www.kean.edu/admin/uploads/pdf/AcademicIntegrityPolicy.pdf>)

Students should review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom: <http://www.kean.edu/KU/Code-of-Conduct>.

Students are strongly encouraged to register for the University's emergency notification system (<http://www.kean.edu/campusalert>) in order to be informed of campus emergencies, weather notices, and other announcements. Kean Ocean students would sign up via the following link: <https://ocean.sendwordnow.com/LicensePage.aspx>

All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>; click on E-mail Account Request Form.

Americans with Disabilities Statement & Non-Discrimination Statement:

Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Students may contact the Office of Disability Services in Downs Hall Room 122 or call 908-737-4910 to discuss special needs.

Title IX

Title IX of the Education Amendments of 1972 (Title IX) prohibit discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action Programs, Office of the Vice President for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at the following: <http://www.kean.edu/policies/sexual-misconduct-policy>.

KU Non-Discrimination Policy:

Kean University is an affirmative action, equal opportunity institution.



I. GENERAL COURSE INFORMATION:

Course Title: Zoology: Form and Function

Course # & Section: Biology 3400, Section 01 02

Semester: SPRING 2019

Course Meeting Days/Times: Lecture: Tuesdays & Thursdays from 2:00 PM – 3:15 PM
 Lab: Section 01 Wednesday 9:30AM – 12:15PM
 Section 02 Wednesday 12:30AM – 3:15PM
 **OPEN LAB – TBA via e-mail. Dates will also be posted on Black Board

Course Meeting Location: Lecture: Hennings Hall, Room HH-113
 Lab: Science Building, Room C-145

Instructor: Dr. Roxie A. James
Email: rjames@kean.edu
Office Location: Main Campus Science Bldg, C-112
Office Phone: 908-737-3662
Biology Dept.: 908-737-3650
(Main Office)

Office Hours: MON: 09:00-10:30 AM; 02:00 AM – 03:00PM
 TUES: 10:00 AM – 01:30PM
 WED: 03:30PM -05:00PM
 THUR: 09:00AM-01:30PM

*The best way to contact me is via e-mail. I encourage you to send me an email or attend my office hours if you encounter any course related questions. I am here to help.

Course Description: The evolution of invertebrates and vertebrates using principles of comparative anatomy and physiology. Morphological and functional changes correlated with varied environments and adaptations that gave rise to a diversity of life forms.

Prerequisites: BIO 1400, CHEM 1084, & GE 2024. Students without prerequisite(s) must withdraw from the class.

Course Learning Objectives:

- This course is designed to examine the history of Kingdom Animalia encompassing the study of both

invertebrate and vertebrate structures; the domain of comparative anatomy. On a broader scope, however, the course entails the study of functional changes undergone by Animalia- changes correlated with varied environments and modes of life found in the course of their long evolutionary history.

- The first half of the class introduces protozoa and common invertebrate phyla using many living and preserved specimen. Coverage of the vertebrates is selective beginning with Fishes and Tetrapod surveys and then an in-depth examination of vertebrate systems using comparative anatomy of the dogfish shark, bullfrog, and rat. Each Laboratory exercise begins with an overview of the topic or animal group. Taxonomy will be summarized at the class level and dissection will include both structure and function of organ systems.
- SLO – 01. Acquire the knowledge of fundamental concepts and principles to characterize living organisms and biological functions. (KU 1, 2, 4)
- SLO-03. Develop skills in critical thinking, scientific reasoning, and problem solving. (KU 1, 2, 4) SLO-04. Develop the ability to apply biological principles to understand current issues. (KU 1, 2, 3, 4)
- SLO-05. Develop the ability to effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication (KU 1, 2, 4)
- SLO-06. Develop an awareness of careers and professions available in the biological sciences. (KU 2, 3, 4)
SLO #7 Acquire adequate preparation to enter health professional programs and/or the work force in related fields (KU 2, 3, 4)

II. INSTRUCTIONAL METHODS:

Methods: This course is taught using a variety of instructional approaches including lectures, laboratory exercises, group laboratory dissections, laboratory practical's, written exams/quizzes, critical thinking exercises, and online homework assignments. The course includes an online learning platform. (Homework is completed via McGraw Hill Connect).

Course Materials:

LECTURE: Integrated Principles of Zoology 17th ed. Hickman *et al.* McGraw Hill Pub. NY, 2017

INCLUDES TEXT + CONNECT ACCESS CODE ISBN: 9781260089851

STANDALONE CONNECT ACCESS CODE ISBN: 9781259665035

LAB MANUAL: Exploring Zoology A Laboratory Guide, 2nd ed. Smith & Schenk Morton Pub. Englewood, CO 80110

ISBN: 9781617311567

LAB: Students are to purchase a pair of lab safety eye goggles to bring to each lab. Wearing a laboratory coat is highly recommended during lab. Students should wear gloves during laboratory dissections and while performing lab exercises.

GOGGLES, THE LABORATORY MANUAL AND THE CONNECT ACCESS CODE ARE MANDATORY COMPONENTS OF THE COURSE.

Topics and Assignments:

Review the tentative course schedule below. A weekly outline of the material that we cover in lecture and lab is clearly outlined below. This chart also contains important exam dates and other pertinent due dates.

SPRING 2019 ZOOLOGY: FORM AND FUNCTION COURSE SCHEDULE
(Syllabus and Schedule subject to change, ver.1.5.19)

Week (#) Of	LECTURE (# is Chapter in Textbook) <i>NOTE: Spring 2018 runs Jan 22nd thru May 15th</i>	LABORATORY (See Lab Manual for Lab Title Listed (# is Chapter in Lab Manual) <i>NOTE: Where needed, lab time may be used as lecture time</i>
(1) Jan 21	NO CLASS (1/21) Syllabus & Course Expectations (1/22) CH 10: Start Intro to Taxonomy & Phylogeny	Lab 1: Protozoa/Porifera (Lab BK 6-7) (1/23)
(2) Jan 28	Ch 10: Finish Taxonomy & Phylogeny Ch11: Unicellular Eukaryotes	Lab 2: Cnidaria (Lab BK 8) (1/30)
(3) Feb 4	Ch 12: Sponges: Phylum Porifera Ch 13: Start Radiate Animals	Lab 3: Platyhelminthes/Pseudocoelomates (Lab BK 9-10) (2/6)
(4) Feb 11	Ch 13: Finish Radiate Animals Ch.14: Acoelomate Animals	Lab 4: Mollusca/Annelida (Lab BK 11-12) (2/13)
(5) Feb 18	Ch. 15/18: Pseudocoelomates	EXAM I (2/20) Topics include: Protozoa, Porifera, Cnidaria, Platyhelminthes, Pseudocoelomates. MOLLUSCA AND ANNELIDA ARE NOT ON EXAM I. THEY WILL BE TESTED ON EXAM 2! Refer to Black Board
(6) Feb 25	Ch. 16 Mollusks Ch. 17 Segmented Worms	Lab 5: Arthropods (Lab BK 13) (2/27)
(7) Mar 4	Ch. 19/20/21: Arthropoda Ch 22: Echinodermata	Lab 6: Echinoderms (Lab BK 14) (3/6)
(8) Mar 11	SPRING BREAK –NO CLASSES ☐ SPRING BREAK DATES: 3/11- 3/17	SPRING BREAK-NO LAB ☐

(9) Mar 18	Hemichordates & Ch 23: Chordates Ch 23: Chordates continued	EXAM II (3/20) Topics Include: Mollusks, Annelids, Arthropods, Echinoderms Refer to Black Board
(10) Mar 25	Ch 23: Chordates continued Ch 24: Start Fishes	Lab 7: Hemichordates/Chordata/Jawless Fish (Lab BK 15-16) (3/27)
(11) Apr 1	Ch 24: Fishes Ch 24: Finish Fishes	Lab 8A: Cartilaginous Fishes (Lab BK 17) Lab 8B: Ray-Finned Fishes (Lab BK 18) (4/3)
(12) Apr 8	Ch. 25 Early Tetrapods & Modern Amphibians Ch. 25 Finish Early Tetrapods & Modern Amphibians	Lab 9: Amphibians (Lab BK 19) Lab 10: Reptiles (Lab BK 20) (4/10) **Last Day to withdraw from Course with "W" on transcript**
(13) Apr 15	Ch 26: Amniote Origins & Non-Avian Reptiles Ch 26: Amniote Origins & Non-Avian Reptiles	Lab 11: Birds (Lab BK 21) (4/17)
(14) Apr 22	Ch. 27 Birds Ch. 28 Mammals	Lab 12: Mammals (Lab BK 22-3 Rats) (4/24)
(15) Apr 29	Ch. 28 Mammals cont.	Review/Catch Up (5/1)
(16) May 6	Review **TUES, MAY 7th ** VERY IMPORTANT** University follows a FRIDAY SCHEDULE *University follows a Monday Schedule on Weds, (5/8) *	Topics Include: Hemichordates, Chordates, Jawless Fishes, Cartilaginous Fishes, Bony Fishes, Tetrapods, Amphibians, Amniotes (Birds, Reptiles, & Mammals). Refer to Black Board
(17) May 13	WEEK OF 5/13 does not impact Bio 3400, Sect 01.02. FINAL EXAM WEEK 5/9-5/19	WED, 5/15 – FINAL EXAM (EXAM 3)

- *Self-Quiz Schedule is as follows: On Tuesdays & Thursdays for review and attendance.*
- **Note: A "Catch up day" is a day in which we will proceed with the remaining lecture or lab material. We will continue with the lecture or lab material if we are behind the indicated schedule above.*
- *Do not be intimidated by the course syllabus. Our course will be both informative and fun! Manage your time appropriately and remain vigilant throughout the semester!*
- *Group Lab Report due one week after lab exercise is completed. If you are absent for a lab, you will need to make that lab up during open lab hours. If you do not make up the lab you will receive a grade of zero (0).*

Important University-Wide Dates for SPRING 2019 (Semester runs Tues Jan 22nd to Wed May 15th)

Mon Jan 21	Holiday/ University Closed
Tues Jan 29	Last day to add a class Last day to drop a class with a 100 % Refund & no mark on transcript
Wed Jan 30	Mark of "W" on transcript begins for course withdrawals
Tues Feb 5	Last Day to Withdraw from Class with a 75 % Refund
Tues Feb 12	Last Day to Withdraw from Class with a 50 % Refund
Mon Feb 18	University Closed/No Classes
Mar 11 to Mar 17	SPRING BREAK NO CLASSES ☐
Fri Apr 12	Last day to withdraw from a class with a grade of "W" on transcript (no refund)
Apr 19 to Apr 21	University Closed/No Classes
Tues May 7	Classes follow a FRIDAY SCHEDULE **
Wed May 8	Classes follow a MONDAY SCHEDULE*

III. ASSESSMENT:**IMPORTANT COURSE INFORMATION:****EXAMINATIONS & QUIZZES:**

- Three in class laboratory exams are scheduled as listed in the course outline. The exams are worth 20% of your grade (See below). Each exam will consist of open-ended questions. (Approximately 70-100 questions per exam at the discretion of the instructor. This information will be discussed prior to the exams). Laboratory Material will be tested along with lecture material. Should you not be able to take an exam during the scheduled time, with a valid, documented excuse (determined by the instructor), an alternate exam seating may be allowed albeit it perhaps with a different exam/different format.
- Cellular Phones will be collected during your exams and watches or smart devices are strictly prohibited during your tests. You must remove watches and electronic devices prior to the exam otherwise you will receive a grade of ZERO for the test. You will also receive an academic integrity charge if you are using a cellular phone, smart watch or other "cheating aides" and/or electronic devices during an exam.
- **REGARDING EXAM DAYS AND TESTING:** All book bags, purses, water bottles, other items, etc. must be placed in the front of the classroom prior to the exam. You will only use a pen or pencil for the test. You must take care of personal business prior to exams. **I will not allow you to be excused from the test room during an exam. Once you decide to leave the room during an exam, you must submit your exam paper for final grading. Try to take care of personal business (use of restroom, eating breakfast, etc.) prior to examinations and class.**
- **NO ONE IS ALLOWED TO KEEP COPIES OF THE EXAM PAPERS. TAKING PHOTOS OF EXAMS ARE ALSO STRICTLY PROHIBITED. FAILING TO COMPLY WITH THESE POLICIES WILL RESULT IN A TEST GRADE OF ZERO AND ACADEMIC INTEGRITY CHARGE.**

LECTURE AND LABORATORY SESSIONS: A lab may or may not cover all procedures listed in the lab manual. You need to be present in lab and perform the work & any worksheets asked of you to earn the points for class attendance. Observations and/or answers to questions from all lab procedures are to be recorded directly in your lab manual, lab handouts, or else in a separate lab notebook, and must be shown to the instructor before you leave the lab each week. The lab practical is a closed-book, timed exam during which you go station-to-station to ID items shown/answer question posed; it covers the specimens, slides, and material/content performed during lab & lecture sessions. **Your laboratory manual and safety goggles must be brought to every lab class. Failing to do so will result in point reduction from your laboratory and lecture participation grade. If you do not clean up your work area, participation points will also be deducted from your grade.**

- **HOMEWORK ASSIGNMENTS:** Homework assignments are to be completed on the McGraw Hill Connect learning site by the appropriate due date. All due dates are indicated within the syllabus schedule. Please note that late homework submissions are subject to a 25% late penalty per day late. Homework assignments submitted four days after the due date will not be accepted. (Four days after the due date = 100% point reduction). To sign up for CONNECT (our online homework/learning platform), please click the following link:
<http://connect.mheducation.com/class/bio3400sect01sp19jam.es>
<http://connect.mheducation.com/class/bio3400sect02sp19jam.es>
 - o **Two documents containing instructions on how to register with the connect learning platform have been e-mailed to you. This information is also included on Black Board. Please register for Connect and begin completing the homework assignments as**

possible. The homework is worth 10% of your course grade. The assignments can be difficult to manage if you are completing them close to the due date.

REMEMBER: PACE YOURSELF AND MANAGE YOUR TIME IN AN EFFICIENT MANNER!

ATTENDANCE: By the letter of the *Student Attendance Policy*, attendance is expected every time a class meeting is held (both lecture and lab). **ATTENDANCE IS MANDATORY FOR BOTH LECTURE AND LABORATORY CLASSES.** Class participation in both lecture and lab is strongly encouraged. Regular, on-time and productive participation in class may be given positive consideration in the semester grade. **There are no makeup lecture classes and you are expected to arrive ON TIME to each lab.**

Additional open lab review is RECOMMENDED outside of class time (The open lab schedule will be posted on the door of Room C-145)

DETERMINATION OF YOUR SEMESTER GRADE

YOUR FINAL GRADE BASED IS ON THE AVERAGE OF:

Attendance.....10%
 Lab Exam I20%
 Lab Exam II20%
 Lab Exam III.....20%
 Lab grades.....20%
 Homework (via Connect).....10%

Grading Scale

A =93-100	B = 83-85	C = 70-75
A- =90-92	B- = 80-82	D = 60-69
B+ =86-89	C+ = 76-79	F = 59 and below

Mid-Term Progress information will be provided to students by the instructor via Kean Wise. Please see the 2018-2019 Undergraduate or Graduate Catalog for more information.

IV. UNIVERSITY POLICIES AND IMPORTANT INFORMATION:

All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>

Students are strongly encouraged to register for the University's emergency notification system (www.mir3.com/kean) in order to be informed of campus emergencies, weather notices, etc.

Students are responsible to review and understand the *University Academic Integrity Policy*, available at the Center for Academic Success or at <http://www.kean.edu/sites/default/files/u8/AcademicIntegrityPolicy.pdf>. Western society punishes plagiarism. Students are expected to ensure their writings and presentations abide by these policies.

Students are encouraged to download the application (Smartphone App) for the Campus Alert System, which is compatible with iPhone/Android electronic devices. This allows you to contact the campus police, apply for a safety escort for transport to and from campus locations. The following link provides additional information on this service for students. <http://www.kean.edu/ealerts>

Inappropriate behavior and conduct will not be tolerated within our classroom. We must respect one another and behave in an appropriate, professional manner. Students should also review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom: <http://www.kean.edu/KU/Code-of-Conduct>

Cell Phone and Electronic Device Use: It is vital that we are distraction free during instructional time as well as during experimental time. Please arrive on time, turn off iPods, remove headphones and silence cell phones during lecture and lab. Cell phones are not allowed to be on your desk during class and exams/quizzes. Talking/texting on your cellular phone during a quiz/exam will result in a quiz/exam grade of ZERO. If you are communicating via facetime/video chat, or are talking on a cellular phone during laboratory or lecture class, you will be asked to leave class. (Points will be deducted from your participation grade if you are asked to leave class due to inappropriate behavior). Please take care of personal business before (not during) class, and plan to stay for the entire period. If you have an unusual situation requiring cell phone use, please speak with me prior to class.

Americans with Disabilities Statement & Non-Discrimination Statement: Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Students may contact Kean Disability Office in Downs Hall Rm 122 to discuss special needs, phone 908-737-4910.

KU Non-Discriminatory Policy: Kean is an affirmative action, equal opportunity institution. It is the policy of Kean Administration that there will be no discrimination or harassment on the basis of age, disability, gender, marital status, national origin, race, religion, sexual orientation, or veteran status in any educational programs, activities or employment. Persons having questions about equal opportunity and non-discrimination, please contact Human Resources for referral to the appropriate personnel, 908-737-70430.

SYLLABUS NOTICE FOR LABORATORY COURSES -- REPRODUCTIVE HAZARDS

Reproductive hazards are substances or agents that may affect the reproductive health of women or men or the ability of couples to have healthy children. Efforts have been made to eliminate the use of known reproductive hazards in our labs. However, the vast majority of laboratory chemicals have never been tested by the manufacturer or by any governmental agency. As a result, their effect on a developing fetus is unknown; female students must assume that each chemical used in this lab presents a hazard to an unborn child. **If you are pregnant, become pregnant or are planning to become pregnant during the semester, you are strongly encouraged to speak privately with your instructor who will be able to provide written health and safety information about each chemical that will be used in the class.** You are asked to review and discuss this information with your healthcare provider. After you have reviewed the information, you can choose to:

1. Continue your enrollment in the lab - You will be asked to sign a waiver and will be expected to follow a strict set of health and safety procedures while in the lab.
2. Withdraw from the lab - Your instructor will assist you in creating a plan to complete the course at a later date

Title IX

Title IX of the Education Amendments of 1972 (Title IX) prohibit discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action Programs, Office of the Vice President for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at the following: <http://www.kean.edu/policies/sexual-misconduct-policy>.

Biology Lab Safety Rules (Modified from Kean University BIO 1000 Lab Rules, 12.12.15)

Lab Guidelines are designed to keep you safe as well as the instruments that you use in lab in working condition as you perform your lab exercises and experiments. Certain chemicals and equipment used in the bio lab have the potential to cause harm. Plain old common sense is the #1 rule to follow in the lab!

BE PREPARED

Before you enter the lab, you should be prepared and knowledgeable about what exercises you will perform in the lab. This means that you are to have read the assigned procedures in the lab manual ahead of coming into the lab. Make sure in reviewing the lab manual you take note of anywhere in the procedure that alerts you to specific safety precautions that are needed.

BE NEAT

When working in the lab, ensure that you keep that area on your lab bench where you work free of clutter and organized. If you happen to spill something, ask the instructor for cleanup assistance. Have your personal belongings put away from your lab bench work area. Follow the instructions given for how to clean up your area after lab. WASH YOUR HANDS PRIOR TO LEAVING THE LAB.

BE CAREFUL AND BE CAUTIOUS WITH CHEMICALS, SLIDES & SPECIMENS

Handle items, especially sharp and those made of glass, careful. Be aware of your surroundings as you work and work on task. Keep conversation with peers to a minimum and only relevant to the work at hand. The best way to help ensure safety when handling chemicals is to assume any chemical you handle is dangerous. Seek instructions from the instructor during lab for specific information on handling chemicals known to be dangerous. If any chemical comes in contact with your skin or eyes, *immediately* notify your instructor. Your instructor will notify you if/when additional precaution is needed including use of hand and/or eye protection. *You are to bring your own pair of eye goggles to each lab session; disposable lab gloves are available in lab for use.*

WEAR PROPER CLOTHING

Accidents in the lab do happen. Certain chemical have the potential to damage fabric and clothing. Consider what you wear. Avoid open toed shoes/flip flops/sandals as such is not appropriate nor safe for wearing in the lab. Tie long hair back as this is a known danger when working in the lab.

LOCATE SAFETY EQUIPMENT

Be sure to locate all safety equipment in the lab in which you are working. This includes items such as fire extinguishers, first aid kit, broken glass receptacles, chemical waste containers, eye wash station, shower pull, and sink. Also note where exits are located in case of an emergency.

BIOLOGY LAB DON'TS

DO NOT eat or drink in the lab. DO NOT taste any chemicals or substances you are working with. DO NOT use handle broken glass with bare hands. DO NOT pour chemicals down the sink unless instructed to do so. DO NOT operate equipment nor perform an experiment without permission. DO NOT leave heated materials unattended nor place flammable items near a heat source. DO NOT engage in childish antics such as horseplay or pranks.

Below is a tentative schedule for the course. Please refer to your syllabus on a weekly basis to help you prepare for upcoming assignments. Be sure to report to BOTH lecture and lab courses on time. A lab may not cover every single procedure in the lab manual; I will tell you which procedures you will follow during the lab.

Some of our laboratory experiments are shorter in length than others. When our laboratory assignments are short, we may proceed with the lecture material when necessary (if a class is missed due to a holiday or inclement weather). This will allow us more time to complete the material and review for our exams and quizzes. Plan to be in our lecture and laboratory sessions for the entire time frame.

Syllabus template obtained from Spring 2018 Kean University Syllabus Guidelines. Information contained within the Syllabus was extracted from the Bio 3400 syllabus template written by Dr. Roxie James (1/2017) and the Bio 1400 course syllabus written by Dr. Laura Lorenzen (9/2017). Syllabus & course schedule modified by Professor Kerrylynn Konecny (ver.1.3.19) Dissection safety rules & questionnaire by Professor Kerrylynn Konecny (ver 1.4.19)

After reviewing the syllabus, please complete the forms on pages 11-12

Laboratory Dissection Care & Safety Rules**I. GENERAL GUIDELINES:**

- ***Treat all organisms and specimens with respect and care. We are obtaining knowledge through dissection.*** The specimens are for educational learning use only. All specimens and specimen parts are to remain in the lab within the dissecting pans.
- Secure gloves, and any other personal safety protective apparel or equipment stated by the instructor.
- Alert instructor ASAP if you have any allergies to preservatives and or latex.
- Clear off your lab station and follow the appropriate lab procedures when asked to do so. Do not perform your own unguided experiments.
- Obtain a dissecting pad and necessary equipment (scalpel, pins, dissecting needle, forceps, etc.). Always keep your instruments organized and clean to improve your safety
- Properly mount dissection specimens to the dissecting pan or tray. Do not dissect a specimen while holding it.
- Handle scalpels, razor blades, and other sharp instruments with care. Cut away from the body and other students. Do not use excessive force when working with sharp instruments.
- Exercise caution when getting up from your lab station. Be aware of your surroundings and conscious of others.
- If any accidents occur, you must notify your instructor IMMEDIATELY.

II. SCALPEL SAFETY

- Hold a scalpel as you would a pencil. Cut with a downward motion but never cut very hard/forceful to make a cut (If extreme pressure is required, you have a dull scalpel or will require a different instrument).
- Watch the placement of your specimen holding hand. NEVER cut toward your holding hand or your classmates' hands.
- One person will dissect the specimen at a time to avoid any accidents.
- Scalpels are not appropriate for bone or tissue cartilage work.

III. APPROPRIATE DISPOSAL AND CLEAN UP MECHANISMS

- Dispose of your specimen in the appropriate waste container. Do not throw "regular garbage" in this container. This is a container for dissected specimens ONLY.
- Clean and dry all dissecting pads and instruments.
- Place all instruments back into the appropriate container.
- Clean off your lab station with soap and water.
- Thoroughly wash your hands after completing your dissection and cleaning up your work area.

Please complete the following acknowledgement and questionnaire after we discuss the course syllabus. Submit the documents at the end of class. (Complete both pages, front and back).

Bio 3400 01.02 (circle)

Laboratory Contract

I, _____ have read the lab safety guidelines prior to performing any dissections in my Biology 3400 Laboratory course. I was provided with a copy of these laboratory guidelines and I will adhere to the appropriate lab protocol/ safety procedures. I understand that I will be asked to leave the class if I violate any of the safety rules.

Print Your Name: _____

Sign Your Name: _____

Date: _____

Biology 3400: Zoology Form and Function

Syllabus Contract

I, _____ have read both the lecture and laboratory syllabi for the Biology 3400 Course. I was provided with a copy of the Lecture Syllabus and Laboratory Syllabus and I will adhere to the appropriate course rules and lab protocol/ safety procedures. I understand that I will be asked to leave the class if I violate any of the rules, particularly the lab safety protocol.

(Print Name)

(Signature)

(Date)

Turn Over →

NAME: _____

Biology 3400

General Questionnaire: Please select your answer

1. What is your ultimate career goal?

Medical (Dentist, Physician, Veterinarian, Physical Therapist, Occupational Therapist, Physician Assistant,
Nurse, Pharmacist)

Research

Education

Other _____

Undecided

2. Are you a Biology Major? YES NO
3. Are you a transfer student? YES NO
4. Are you a visiting student? YES NO
5. Have you taken a Zoology course in the past? YES NO



Principles of Ecology | Spring 2019 Syllabus

Course Title: Principles of Ecology

Course Number and Section: BIO 3614 Section 03

Semester: Spring 2019

Lecture Meeting Days/Times: Tuesday – 4:30-7:15pm

Lab Meeting Days/Times: Thursday – 4:30-7:15pm

Lecture Meeting Location: 107 Hennings

Lab Meeting Location: 110 Bruce Hall

Instructor Name: Mr. Sergio Capozzi

Office Location: Biology – 124 Science Building – C-155 (mailbox)

Office Hours: NA (contact me by email or after class if you would like to set up a time to meet)

Phone: (908) 737-3650 (Biology Office)

Kean Email: scapozzi@kean.edu

The best way to contact me between class/lab is by email.

Course Description: This course provides an introduction to ecology as a scientific discipline, focusing on foundations and applications of ecology. Basic ecology is examined at the organism, population, community, and ecosystem levels. The course also covers factors affecting the distribution and abundance of organisms. Human impacts on the environment are examined, as are methods used to conserve and restore species and ecosystems. Using tools discussed in class and lab, by the end of this course you will be able to define key ecological terms (see below), understand species interactions in biological communities, and understand the relationships of these communities to environmental factors.

Pre-requisite/program: BIO 1300 or permission of instructor/Biology Department.

Course Objectives: Upon the completion of this course, students will be able to:

1. Understand the complex nature of local ecosystems.
2. Recognize the abiotic factors that impact plant and animal distribution and adaptation.
3. Describe community succession and structure, as well as how species interactions (competition, predations, etc.) impact species distribution and ecosystem diversity.
4. Use life tables and sampling techniques to estimate population abundance and growth.
5. Understand the threat to global biodiversity and articulate restoration and conservation techniques to maintain species and ecosystem diversity.
6. Use statistical techniques to scientifically evaluate ecological data.
7. Conduct experiments and write manuscript style scientific reports.
8. Present research findings through PowerPoint or poster presentations.
9. Use various ecological sampling techniques in appropriate environments.

Instructional Methods

Methods: This course is taught using a variety of instructional approaches including lecture, class discussions, labs, small group projects, and electronic discussion (Blackboard).

Textbook & Materials: All course materials will be posted on Blackboard. This includes PPT lecture notes, readings, lab packets, exam reviews, assignments, and other materials, as well as schedule information. All assignment, lab, and exam scores will also be posted in Blackboard. Make sure to check Blackboard regularly for class announcements.

This course does not have a textbook. However, much of the material we will cover in lecture is based information found in introductory ecology textbooks, including:

- *Krohne, D.T. (2018). Ecology: Evolution, Application, Integration. 2nd ed. Oxford University Press.*
- *Molles, M. C, Jr. (2015). Ecology: concepts and applications. McGraw-Hill Publishers, New York, NY.*
- *Ricklefs, R. and R. Relyea. (2014). Ecology: The Economy of Nature, 7th ed. W.H. Freeman and Company.*
- *Smith T.M and R.L. Smith. (2014). Elements of Ecology. 9th ed. Pearson.*

These textbooks are not required, but optional for those of you who would like to use a textbook as a reference/study guide. While there is no required textbook, there will be (almost) weekly readings (or videos), which I will post on Blackboard.

Labs: In general, there will be a laboratory exercise each week of class. All lab work will be completed the day of the lab (i.e., labs are generally not take home assignments).

Several of the labs will be completed in groups. A portion of these labs may be conducted outside. We will work outside in all types of weather. **BE PREPARED.** This is a field-intensive class. It may snow/rain this semester, and it will get cold. **If a lab is scheduled, we may be going outside. You are expected to come to lab dressed appropriately for the weather.**

The remaining labs will be completed using online simulations (provided by SimBio). You will need to bring your personal computer with SimUText (if needed, I will also reserve a computer lab for students without personal computers; note: SimUText cannot be downloaded to the computer lab computers at this time).

The labs/assignments provided by SimBio cost \$42 (total for access to eight labs). Each student must sign up and download the SimUText labs (one copy cannot be shared among multiple students; you each need a personal login). The labs should be downloaded to your personal computer (downloads to a tablet are not supported at this time). Once the labs are downloaded, they will be available offline; however, an internet connection is required to complete the labs and log question responses.

Please follow the instructions below to subscribe to SimUText (I will also provide the link via Blackboard). To avoid possible problems, do not wait until the last minute.

It is important that you review the information below *before* you subscribe to the SimUText. **To avoid possible problems, do not wait until the last minute.**

- CHECK YOUR TECH! Visit <https://simutext.zendesk.com/hc/en-us/categories/200170134-Check-Your-Tech> to confirm that the SimUText application will work on your computer, and/or to explore your options if there is a problem.
- When you are ready to subscribe and download installers, follow this link to initiate the process: <https://www.simutext.com/student/register.html#/key/UJwk-4PTq-TzUC-PTz7-BfFC>
- After you have completed the subscription process, if you need to download the SimUText application installers again, you will be able to access them by logging into the [SimUText Student Portal](https://www.simutext.com/student) (<https://www.simutext.com/student>).

Should you encounter problems, you may need your course-specific Access Key. It is: **UJwk-4PTq-TzUC-PTz7-BfFC**

Problems or questions? Visit [SimUText Support](http://simbio.com/support/simutext) (<http://simbio.com/support/simutext>)

If you plan to install/run the SimUText labs on a USB drive, please see the "SimUText for USB/Flash Drives" at the following link: <https://simutext.zendesk.com/hc/en-us/categories/200170144-Downloading-and-Installing-SimUText>.

Problems or questions? Visit SimBio Support to search the Knowledge Base and view Video Tutorials. OR, submit a support request at: <http://simbio.com/support/simutext>.

You may work on the SimUText labs with a partner, but each student must turn in/complete each individual lab. Most of the simulation-based labs include a two-part assignment (worth a total of 20 points per lab): a workbook (generally worth 10 points) and online graded questions (worth 10 points). Both must be completed for full credit on the lab.

Topics and Assignments (Tentative Lecture and Lab Schedule)

Date	Lecture	Lab
Jan 22	Introduction to Ecology	
Jan 24		Scientific Method and Ecological Observations
Jan 29	Terrestrial Biomes	
Jan 31		Collection of Ecological Data – Part I
Feb 5	Aquatic Ecology	
Feb 7		Collection of Ecological Data – Part II
Feb 12	Nutrient Cycling Exam 1 Review	
Feb 14		Collection of Ecological Data – Part III
Feb 19	EXAM 1	
Feb 21		Sampling Exercise
Feb 26	Ecophysiology: Temperature and Water	
Feb 28		Data, Descriptive Statistics, and Graphing – Part 1
Mar 5	Energy and Trophic Relations	
Mar 7		Top-Down Control (SimBio)
Mar 12	SPRING BREAK	
Mar 14	No Lecture or Lab	
Mar 19	Population Ecology – Part I	
Mar 21		Keystone Predator (SimBio)
Mar 26	Population Ecology – Part II	
Mar 28		Isle Royale (SimBio)

Date	Lecture	Lab
Apr 2	Ecological Interactions Exam 2 Review	
Apr 4		Niche Wars (SimBio)
Apr 9	EXAM 2	
Apr 11		Intermediate Disturbance Hypothesis (SimBio)
Apr 16	Succession Biodiversity	
Apr 18		Patchy Prairies (SimBio)
Apr 23	Island Biogeography + Metapopulations	
Apr 25		Island Biogeography Lab
Apr 30	Restoration and Conservation Ecology	
May 2		Global Climate Change Final Exam Review
May 7	NO CLASS	
May 14	FINALEXAM	

Important Dates

For important dates, please consult the Academic Calendar via the following link:

<https://www.kean.edu/offices/registrar-office/academic-calendar>

Assessment: Your final grade in the class will be based on:

- 3 Exams – 100 points each (final is NOT cumulative)
- 12 labs – 20 points each
- 3-5 assignments (10-20 points each)

There are about 600 total points for all exams, labs, and assignments. This point total may increase, but will not be less than 600. All exam, lab, and assignment scores will be posted on Blackboard.

****I do not offer extra credit.****

Your grade may be positively OR negatively influenced by class attendance and participation, but just showing up does not guarantee a higher grade. Regular and productive participation in lecture and lab will be considered (positively!) during grade determinations at the completion of the course.

Exams will be based on information covered in in class and lab, as well as readings and assignments. All three exams will be multiple-choice (no short-answer or essays) and will be completed on Scantron forms. As with any class at Kean University, there is no tolerance for cheating. If I suspect you are cheating on an exam, I will call you out and you will receive a zero (at a minimum, per the Student Code of Conduct – see below). So, don't cheat.

You are expected to be present for all exams. If you must miss an exam, you must notify me in advance (in person, or by phone, or email) and have a serious excuse (illness, family emergency, car accident, court appearance, etc.) to be excused from taking the exam on the scheduled date. If you miss an exam for an excused reason AND can provide proof of the incident that caused you to miss an exam, you will be allowed to take a make-up exam during College Hour. You will have only one opportunity to make up an excused missed exam in the week following your absence! If you miss the final exam for an excused reason, you will receive an "Incomplete" grade.

I will assign final grades as follows:

94%	A
90%	A-
87%	B+
83%	B
80%	B-
75%	C+
70%	C
60%	D
< 60%	F

There are no A+, C-, D+ or D- grades in the Kean letter grading system.

Please note:

1. I only use letter grades for your final class grade. I will score all exams, labs, and assignments (from which you may calculate a letter grade if you wish).
2. I don't offer extra credit.
3. I do not drop the lowest grade within any set of tests or assignments.
4. Grades are not on a "curve."
5. And again, I don't offer extra credit.

Mid-Term Progress As required, I will provide mid-term progress grades via KeanWise. Please see the 2018-2019 Undergraduate Catalog for more information.

Policies

All students are expected to attend class and lab on a regular basis. Cellphone and laptop use during class are not prohibited, but highly discouraged. Many of the labs will require the use of your personal laptop.

Important University Policies and Information

Students are responsible to review and understand the *University Academic Integrity Policy* available via the following link: <https://www.kean.edu/academic-integrity>

Instructors must indicate on the syllabus and/or individual assignment if the use of Kean University academic support services (Tutoring and/or Writing Center) is permitted for take home assignments/exams.

Students should review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom:

<https://www.kean.edu/offices/community-standards-and-student-conduct/student-code-conduct>

Students are strongly encouraged to register for the University's emergency notification system (<http://www.kean.edu/campusalert>) in order to be informed of campus emergencies, weather notices, and other announcements. Kean Ocean students would sign up via the following link: <https://ocean.sendwordnow.com/LicensePage.aspx>

All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <https://www.kean.edu/offices/computer-and-information-services/ocis-forms> click on E-mail Account Request Form.

Americans with Disabilities Statement & Non-Discrimination Statement:

Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Students may contact the Office of Disability Services in Downs Hall Room 122 or call 908-737-4910 to discuss special needs.

Title IX

Title IX of the Education Amendments of 1972 (Title IX) prohibit discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action

Programs, Office of the Vice President for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at the following: <https://www.kean.edu/offices/policies/sexual-misconduct-policy>

Kean University Non-Discrimination Policy:

Kean University is an affirmative action, equal opportunity institution.

Biology 3709 -- GENETICS**SPRING 2019, SECTION 1**

INSTRUCTOR: Professor Sara Maass-Meyer
OFFICE: Science Bldg. C-134
PHONE: (908) 737-3672
E-MAIL: maasss@kean.edu
OFFICE HOURS: Tuesday 8:00am-9:15am, 12:30pm-1:45pm
Wednesday 9:15am-1:45pm
Thursday 10:30am-1:45pm, 3:30pm-4:15pm
Friday 7:00am-8:00am

TEXTBOOK: *Genetics: A Conceptual Approach*, 6th edition (Pierce, 2017)
Older editions of the textbook are acceptable.
Supplemental lab materials (posted on Blackboard)

LAST DAY TO WITHDRAW: April 12, 2019 Please see the website below for other important dates.

<http://www.kean.edu/offices/registrar/academic-calendar>

COURSE OBJECTIVES

"A study of the essential concepts, principles and applications of all branches of genetics, including transmission, molecular and population genetics. Discussion of recent developments in the field, focusing on genomics and new genetic techniques. Examinations of principles and applications of genetics by means of laboratory exercises."

Through lecture and laboratory exercises, this course aims to familiarize you with the basic concepts of transmission, molecular and population genetics as well as their applications in daily life. **Note that this course is designed for junior and senior biology majors and minors**, not for freshmen, sophomores, or non-biology majors. As such, you are expected to have an understanding of basic concepts in biology, chemistry and mathematics covered in all prerequisite courses, including but not limited to: cell structure and function, enzymes and their function, chemical bonds and their properties, probability and simple mathematical calculations. The course will draw upon these concepts throughout the semester.

LECTURE FORMAT, LECTURE ATTENDANCE, ASSIGNMENTS ON SAPLING LEARNING & GOOGLE DOCS

This Genetics course will be supplemented with Blackboard, an online course management system, and Sapling Learning, an online learning and assessment tool. Your registration for this course will allow you access to the course material on Blackboard, which is linked to the course site on Sapling Learning.

You will find the following information on Blackboard:

- a. Course syllabus in PDF.

- b. Lab exercises in PDF.
- c. A set of PowerPoint slides for each textbook chapter. You should download and/or print out the slides (in black-and-white, or in color) and bring them to lecture with you. For printing, the format of 4 slides per page is recommended.

During each lecture, the instructor will use the PowerPoint slides as a guide, and additional information will be discussed. The lectures will be interactive, with the instructor frequently calling upon individual students. Lecture attendance will be taken daily. The purposes of taking attendance are to encourage you to attend lecture regularly and to help the instructor to get to know you by name. Consistent attendance (no more than 1 unexcused lecture absence) will earn you 10 points toward your final grade.

LAB SCHEDULE, SUMMARIES & ATTENDANCE

A total of 12 labs are scheduled. The labs focus on transmission and molecular genetics using bacteria, fruit flies, plants, and humans as model genetic organisms. Most labs are expected to take under 2 hours. Each of the 12 labs that you successfully complete will earn you 5 points toward your final grade.

You will also submit two 100- to 200-word lab summaries, which you will write up by hand at the end of two different labs chosen by you. The summaries will be corrected but not graded. You will lose 2.5 points for each lab summary not turned in by the end of the semester.

The objectives, introduction to the lab activity and lab procedure are provided in the laboratory manual, which is available on Blackboard. You are expected to scan each lab in advance and become familiar with the expectations of the lab. The labs are interactive, with the instructor frequently calling on individuals to answer questions. You are also expected to answer questions and record observations during lab when applicable.

EXAMS

There will be two in-class, 75-minute, all multiple-choice exams as listed in the tentative course outline. The exam dates will not be changed unless class is canceled due to an emergency, in which case the exam will be given during the next class meeting. You are encouraged to sign up for Kean Emergency Alert System to receive notifications regarding emergency closings.

Exams are 100 points each, consisting of 100 multiple-choice questions. Each exam will cover both lecture and lab material, and will be non-comprehensive. The vast majority of exam questions will be taken directly from Sapling Learning questions that you should have already worked on. You will earn 5 bonus points for each exam if you take the exam during the scheduled class period.

Should you not be able to take an exam during the scheduled time, with a valid, documented excuse, you can arrange with the instructor to take the exam at another time, usually within 24 hours of the missed exam. Otherwise (that is, in the absence of valid, documented excuse), to avoid a significant lowering of your grade, a comprehensive make-up exam must be taken at the end of the semester. **There will not be bonus points on late or make-up exams.**

MIDTERM PROGRESS

Information will be provided via KeanWise. Please see the 2017-2018 Undergraduate or Graduate Catalog for more information.

TENTATIVE COURSE OUTLINE (SUBJECT TO CHANGE)

<u>DATE</u>	<u>TEXTBOOK CHAPTER & LECTURE TOPICS</u>	<u>LAB TOPICS</u>
Jan 22, 24	Syllabus; Chap. 1 (Introduction to Genetics)	#1: No Lab
Jan 29, 31	Chap. 10 (DNA: The Chemical Nature of the Gene)	#2: <i>Drosophila</i> culture/ mutants
Feb 5, 7	Chap. 12 (DNA Replication and Recombination)	#3: <i>Drosophila</i> F1 Generation
Feb 12, 14	Chap. 19 (Molecular genetic analysis & biotechnology)	#4: Chromatography of <i>Drosophila</i> eye pigments
Feb 19, 21	Chap. 13 (Transcription) Chap. 14 (RNA Molecules and RNA Processing)	#5: <i>Drosophila</i> F2 Generation
Feb 26, 28	Chap. 15 (The Genetic Code and Translation)	#6: Human Barr Body
Mar 5, 7	Exam I Q&A Review Exam I	#7: <i>Bacterial Transformation</i>
Mar 11-15	Spring Break	#8: Spring Break
Mar 19, 21	Chap. 2 (Chromosomes & Cellular Reproduction)	#9: <i>Transformation Cont'd</i> <i>Pipetting</i>
Mar 26, 28	Chap. 3 (Basic Principles of Heredity)	#10: Bioinformatics
Apr 2, 4	Chap. 4 (Sex Determination & Sex-Linked Characteristics)	#11: Isolate human DNA & set up PCR reaction for <i>Alu</i> insertion analysis
Apr 9, 11	Chap. 5 (Extensions & Modifications of Basic Principles)	#12: Gel electrophoresis to analyze <i>Alu</i> insertion
Apr 16, 18	Chap. 6 (Pedigree Analysis, Applications, and Genetic Testing)	#13: No Lab
Apr 23, 25	Chap. 23 (Cancer Genetics)	#14: Redo <i>Alu</i> PCR if no Result
Apr 30, May 2	Chap. 25 (Population Genetics)	#15: Redo Gel for <i>Alu</i> insertion
May 7, 9	Follow Friday Schedule (No Tues Class) Review	#16: No Lab
May 14	Exam II	

Note: In the unlikely event that Exam II cannot be held on May 14 (for example, due to an emergency closing), your grade for exam II will be assigned as equal to your grade for Exam I.

DETERMINATION OF YOUR COURSE GRADE

You are expected to strictly adhere to the *Kean University Academic Integrity Policy* (available upon request). To minimize the possibility of cheating, the use of electronic devices (except calculators) is prohibited during exams, and each bathroom trip you take during an exam, regardless of your excuse, will lead to a 3-point deduction from your total points earned for that exam. If you are caught cheating during an exam, your grade for that exam will be 0. Note that this will likely result in your failing the course.

Seating may be randomly assigned for exams. You will be asked to leave your belongings, including cell phones, at the front of the classroom prior to taking exams.

Exam I	up to 100 points	<u>Final Grade (points)</u>	
Exam II	up to 100 points	400 and above	A
Taking exams on time	up to 10 points	380 and above	A-
Lecture attendance	0 or 10 points	360 and above	B+
Lab attendance	up to 60 points (2 summaries required)	330 and above	B
<u>Sampling Learning</u>	<u>up to 150 points</u>	300 and above	B-
Total	up to 430 points	270 and above	C+
		240 and above	C
		210 and above	D
		Below 210	F

(END OF SYLLABUS)

**COURSE SYLLABUS****BIO 4970 Section 01****SPRING 2019****SEMINAR IN INTEGRATIVE BIOLOGY aka "Bio Senior Seminar"****Course Meets Tuesdays & Thursdays from 9:30am to 10:45am in Bruce Hall B-119**

Instructor: Laura Lorentzen, Ph.D. (Dr. "L") Email: LLorentz@kean.edu

Office: Main Campus Science Bldg. C-113

Office Phone: 908-737-3661 (908-737-3650 Biology Dept. Main Office)

Office Hours: Mon 7:45 to 10:45am
 Tues 7:45 to 9:15am + 10:55am to 12:25pm
 Wed 7:45 to 10:45am
 Thurs 7:45 to 9:15am
 Fri 7:45 to 9:15am

You are also encouraged to email me as I can often answer your questions through email.

This three credit course is required for Biology Majors (General Education Capstone Course)

Prerequisites: Senior Declared Status and 20 credits in biology.
 Students without prerequisite(s) must withdraw from the class.

Course Description: Critical analysis of current topics in biology using the primary literature and integrating concepts taught in the Biology Core curriculum. Consideration will be given to social, ethical, legal, political, philosophical and/or historical aspects of the life sciences. Format includes formal student oral and written presentations, reading-based class discussions, and library papers.

Student Learning Outcomes for the Program (major) aligned with the course objectives:

Upon completion of this course, students will be able to:

- A. Find, read and interpret primary scientific literature while investigating in depth a current topic in biology (scientific method of inquiry). SLO-02, SLO-5
- B. Assess research critically in terms of experimental design and statistical significance (scientific method of inquiry). SLO-02, SLO-05
- C. Present a clear and comprehensive oral presentation based on scientific evidence from a specific biological topic. SLO-02, SLO-03, SLO-04, SLO-05, SLO-7
- D. Create a written document based on scientific evidence from a specific biological topic. SLO-02, SLO-03, SLO-04, SLO-05
- E. Defend or counter logically a position proposed in a discussion of a biological subject that is the subject of a case study. SLO-02, SLO-03, SLO-04, SLO-05, SLO-7
- F. Assemble a bibliography on a scientific subject, using library resources (scientific method of inquiry). SLO-02, SLO-05

Course Objectives: At the completion of the course students will demonstrate, at the level of a senior undergraduate, the following abilities in the listed areas:

1. Scientific Reasoning Skills

- a. Demonstrates an understanding of the development and application of scientific theories.
- b. Critically evaluates research presented in the primary literature.
- c. Demonstrates an understanding of quantitative representations of data using tables, graphs, statistical tests and error analysis.

2. Communication Skills

- a. Communicates scientific findings effectively by means of oral and written presentation, making use of technology (e.g., PowerPoint) as appropriate.
- b. Effectively communicates critical analysis of published scientific studies and conclusions.
- c. Engages in scientific discourse with useful and well-reasoned insights; listens, reflects and provides constructive feedback on presentations.

3. Interpersonal Skills relevant for career growth and development

- a. Interacts cooperatively and constructively in pairs, small groups and the classroom.
- b. Demonstrates independence of thought in decision-making and implements these decisions effectively.

Instructional Methods

The capstone experience is intended for students who have completed most of the requirements for graduation from Kean University. It is expected that students will have developed the appropriate study skills, content knowledge and conceptual understanding of biology in order to approach seminar-style discussion with a fair degree of sophistication. A variety of instructional methods may be employed to ensure that motivated students achieve the goals of the capstone experience. It is also recognized, however, that the unique challenges of the capstone experience may prove to be especially difficult for some students. The instructors of capstone courses in Biology need to be particularly cognizant of these challenges and sensitive to the warning signs of the student who, *while demonstrating appropriate effort*, struggles inordinately with the challenges presented by the experience. Appropriate intervention will be implemented.

A. Methods of Instruction

1. Lecture and class discussion.
2. Computer-assisted instruction, if appropriate.
3. Student presentations and subsequent discussion/debate.
4. Audiovisual/electronic instruction.

B. Learning Support Services and Interventions to be Incorporated

1. Regular interaction of individuals and groups with the instructor.
2. Additional meetings, as necessary, to assist struggling students.
3. Library: Information literacy skills & Career Services: Resume writing and e-portfolio development

C. Technology Support for Topics in the Curriculum

1. Format: Lectures by instructor and discussions led by students will take place during scheduled class meetings, and will incorporate appropriate technology. Outside of class time, students will research their scientific topics, write their papers, and prepare their oral presentations, using technology as appropriate.
2. Nature and frequency of use: As needed, students will use library resources including electronic databases available over the internet, as well as electronic and print journals.
3. Hardware and software required: For in-class presentations, students are required to use computer projection ("smart classroom") equipment. For preparation of course deliverables, a student may use the University computer labs.

Important University-Wide Dates for SPRING 2019 (Semester runs Tues Jan 22nd to Wed May 15th)

Mon Jan 21	Holiday/University Closed
Tues Jan 29	Last day to add a class Last day to drop a class with a 100 % Refund & no mark on transcript
Wed Jan 30	Mark of "W" on transcript begins for course withdrawals
Fri Feb 1	Deadline to file graduation application for May or August 2019 graduation
Tues Feb 5	Last Day to Withdraw from Class with a 75 % Refund
Tues Feb 12	Last Day to Withdraw from Class with a 50 % Refund
Mon Feb 18	University Closed/No Classes
Mar 11 to Mar 17	SPRING BREAK NO CLASSES
Fri Apr 12	Last day to withdraw from a class with a grade of "W" on transcript (no refund)
Apr 19 to Apr 21	University Closed/No Classes
T Apr 23 & W Apr 24	Kean Research Days, Annual Event
April 26	Deadline to file for early evaluation of graduation application for Jan 2020
Tues May 7	Classes follow a FRIDAY SCHEDULE
Wed May 8	Classes follow a MONDAY SCHEDULE
Thurs May 23	Undergraduate Commencement

University Policies and Information

- All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>
- Students are strongly encouraged to register for the University's emergency notification system (www.mir3.com/kean) in order to be informed of campus emergencies, weather notices, etc.
- Students are responsible to review and understand the *University Academic Integrity Policy*, available at the Center for Academic Success or <http://www.kean.edu/sites/default/files/u8/AcademicIntegrityPolicy.pdf>
- Western society punishes plagiarism. Students are expected to ensure their writings and presentations abide by these policies.
- Students should also review the *Student Code of Conduct*, as it discusses expectations of appropriate conduct in the classroom: <http://www.kean.edu/KU/Code-of-Conduct>

Americans with Disabilities Statement Kean University is an affirmative action, equal opportunity institution. Students with documented disabilities who may need special instructional accommodations or who may need special arrangements in the event of an evacuation should notify the instructor as soon as possible, no later than the second week of the term. Contact Kean Disability Office in Downs Hall Rm 122, phone 908-737-4910.

Non-Discrimination Statement Kean is an affirmative action, equal opportunity institution. It is the policy of Kean Administration that there will be no discrimination or harassment on the basis of age, disability, gender, marital status, national origin, race, religion, sexual orientation, or veteran status in any educational programs, activities or employment. Persons having questions about equal opportunity and non-discrimination, please contact Human Resources for referral to the appropriate personnel.

Title IX of the Education Amendments of 1972 Title IX prohibits discrimination on the basis of sex in education programs or activities. Sexual harassment in any form will not be tolerated at Kean University. Sexual harassment by students should be reported to the Office of Affirmative Action Programs, Office of the Vice Present for Student Affairs or the Office of Community Standards and Student Conduct immediately. Information about the University's Sexual Misconduct Policy may be found at <http://www.kean.edu/policies/sexual-misconduct-policy>

COURSE GRADE DETERMINATION

Mid-Term Progress information will be provided to students by the instructor via KeanWise. Please see the 2018-2019 Undergraduate Catalog for more information.

Deadlines for submission of assignments are firm (late assignments accepted, with point penalty deductions at discretion of instructor). Keanwise shows acceptable undergraduate letter grades that have plus/minus designation. A single letter grade is assigned (A/B/C/D/F 90/80/70/60/below60) based on the points accumulated divided by the **maximum total points of 300 points possible**.

76 points	CDA Eportfolio (Final Written Grant Proposal [60pts] + other assembled items [16pts])
20 points	5 Minute Madness Talk w/Critique of a Primary Literature Article for Critical Thinking
50 points	Oral Presentation of Grant Proposal Major Project
14 points	Mock Interview (10pts) + Draft Resume (4pts)
10 points	Lynda.com course completion
20 points	Progress Report I (Title Page, Intro with Literature Review & Works Cited for Grant Proposal)
30 points	Progress Report II (Complete draft of all sections of grant proposal)
40 points	On-Time and Full Session Class Attendance
40 points	Active & Relevant Class Participation (includes small scale homeworks ie. article summaries, writing exercises, video and discussion Q&A, LEARN online module library assignment)

Attendance and Participation in This Course

This is a seminar, which means active participation required, rather than passive/studious observer. Attendance and participation are crucial to the proper functioning of a seminar. Your written comments and spoken comments in class will contribute as part of your grade. *You are both expected to add relevant comments and ask pertinent questions during class discussion and at the conclusion of fellow student oral presentations.* Unexcused absences will result in a lower class participation grade. Excused absences, determined by the instructor, require documentation. Likewise, when the course requires the student to make and keep an appointment with the instructor, on-time & prepared attendance is a must. It is the student's responsibility to obtain class materials when a class is missed (often times, such material is on the course Google site).

Course Materials

- While there is no required textbook to purchase, the HIGHLY RECOMMENDED book is Student Handbook for Writing in Biology, 5th edition, by Karin Knisely, MacMillan/Sinauer Assoc. ISBN: 9781319121815
- You will need a current Kean Student Kean University library privileges as you are expected to acquire primary literature on your own related to your major project. In particular, you will need to log into your **Kean Blackboard** account to access and complete the online learning module LEARN: Library Essentials for Access and Research Navigation. Wikipedia is not an acceptable citation source for the purposes of this course.
- All students must have a valid Kean email account. For those who do not already have one, forms are available on-line at <http://www.kean.edu/offices/ocis/forms>
- You will need access to Kean Google Sites where you will create and maintain your Eportfolio. Certain course materials available to enrolled students at course **Kean Google Site** named "Senior Seminar with DrL" accessible via <https://sites.google.com/a/kean.edu/senior-seminar-with-dr/> In addition, you are to enroll in the class site at **Turnitin.com** (see Course Site section).

Course Site for Submission of Electronic Documents

For submission of assigned course deliverables, you do so by uploading your electronic file via Turnitin.com. The class site at Turnitin.com is "Senior Seminar SP19". This site is where you submit a majority of your assignments for grading. Once graded, you are able to see the instructor's comments, your score, etc. It is strongly advised you make use of Kean's Google drive to backup your assignments as you work on them.

Each student must go to the site <http://www.turnitin.com> and in the top right hand corner of the homepage, click on "Create new account." This will open the create user profile window and if you are a returning turnitin.com user, enter your email and password. If you are new to turnitin.com, then select "student" on the create user profile window. You will need to enter the Senior Seminar SP19 course using the **Class ID** which is **20028980** and the **Class Enrollment Password Key** which is **Lorentzen**

COURSE DELIVERABLES

LEARN course module thru your Kean Blackboard Account due prior to Jan 31 class @ Library

LEARN stands for Library Essentials for Access and Research Navigation. This self-paced online course has 4 units followed by a quiz that once completed, gives you a certificate of completion.

Lynda.com

LyndaCampus provides 24/7 access to thousands of up-to-date business, creative and technology skills training videos designed for desktop and mobile learning. Completion notification of any ONE course you select to do must be shown to Dr. Lorentzen by May 7th to receive course assignment credit. Completion should also be noted on final version of resume where relevant.

Mock Interview

In-person interview at prescheduled time during which course instructor is the interviewer and you are the interviewee. The interview relates to your plans post college. The interview is conducted in the instructor's office in C113 (Main campus, Science Bldg). You should come dressed and ready for the interview on-time.

Major Project THE GRANT PROPOSAL.... Written Document & Oral Presentation

This is an original scientific research grant proposal in physiology. The written proposal will be used to assess research skills, written communication progress, critical thinking, and willingness to consider alternative explanations. Start with a literature review to identify what is known vs. unknown on your topic of interest in physiology, then formulate a research question. Design experiment(s) to test your hypothesis. Include a budget, then conclude your proposal and finish with works cited. Itemized listing of each section for your proposal is found in "Evaluation Criteria for Major Project Written Grant Proposal" of this syllabus.

The written proposal's first draft (containing title page, introduction with literature review and hypothesis, and works cited sections) is called **Progress Report I** and is assessed as follows: 10% for Title Page + 35% for Introduction with Hypothesis + Rationale + 35% for Literature Review with In-Text Citation & Works Cited + 10% Grammar & Writing Mechanics + 10% for On-time submission of assignment.

The written proposal's second draft is called **Progress Report II** and is to be a complete draft of all sections of the proposal. The **Final Version** of the written grant proposal is due at semester's end and is a component of your Eportfolio assignment. Progress Report II and Final Version of grant proposal are held to the evaluation criteria shown in this syllabus and are graded according to the rubric in this syllabus.

The project proposal's **Oral Presentation** will employ Powerpoint and be used to assess ability to synthesize information, evaluate competing hypotheses, and lead effective class discussion. The student audience will be assessed for questions and/or comments. You will evaluate your classmates according to the oral presentation rubric (see syllabus). Each student will have 15 minutes time allotted for their oral presentation. Email your slideshow to LLorentz@kean.edu no later than 6am on the day you are scheduled to present.

5 Minute Madness Critique Presentations

5 Minute Madness is when you give a 5 minute presentation with Powerpoint on a topic central to your major project grant proposal (eg. select a pertinent original [not a review paper] research primary literature article). All slideshows must be emailed to me by 6am on the day of your scheduled presentation. You must stick to the strict 5min time limit. You must not just summarize the article, but also provide a critique of the paper (information will be provided in class).

Career Development & Advancement (CDA) Eportfolio

The CDA Eportfolio is a way of demonstrating to your prospective employer (or grad school admissions) the type of work you have done over your academic career, and how it relates to your coursework. You will create your Eportfolio as a Google site. It must include the following:

- Cover Letter for your ideal job application, graduate school, or other post baccalaureate activity
- Final version of your Resume
- Post interview Thank You letter
- 5 Minute Madness slideshow
- Final Version of your Major Project Grant Proposal
- Slideshow from your Oral Presentation of your Major Project Grant Proposal
- Reflection Essay on 2 of the movies/videos we view in-class this semester
- MiniEssay on Kean Research Days held in April (attend an oral presentation and summarize it)

Note that if your method of uploading documents to your Eportfolio is via your Google docs, then you will need to share your Google docs with me in order for me to view your uploaded submissions.

In class we will discuss additional "extra" items for inclusion in the CDA Eportfolio. Note the rubric below indicates that part of the grade is based on overall *presentation appearance & organization* of the Eportfolio.

GRADING RUBRIC FOR CDA Eportfolio

CDA Eportfolio Assessment Rubric (Based on [Pierette Pheeny](#), in *The Science Teacher*, October 1998)

Points	Required Items	Concepts	Reflection/Critique	Overall Presentation
4	All required items are included, with a significant number of additions. [at least 3 extra items]	Items clearly demonstrate that the desired learning outcomes for the term have been achieved. The student has gained a significant understanding of the concepts and applications.	Reflections illustrate the ability to effectively critique work, and to suggest constructive practical alternatives.	Items are clearly introduced, well organized, and creatively displayed, showing connection between items. Ex: Specific name/title for portfolio & table of contents
3	All required items are included, with a few additions. [1 or 2 extra items]	Items clearly demonstrate most of the desired learning outcomes for the term. The student has gained a general understanding of the concepts and applications.	Reflections illustrate the ability to critique work, and to suggest constructive practical alternatives.	Items are introduced and well organized, showing connection between items.
2	All required items are included.	Items demonstrate some of the desired learning outcomes for the term. The student has gained some understanding of the concepts and attempts to apply them.	Reflections illustrate an attempt to critique work, and to suggest alternatives.	Items are introduced and somewhat organized, showing some connection between items.
1	A significant number of required items are missing.	Items do not demonstrate basic learning outcomes for the term. The student has limited understanding of the concepts.	Reflections illustrate a minimal ability to critique work.	Items are not introduced and lack organization.
0	No work submitted			

Grading Rubric for Oral Presentation of Major Project Grant Proposal Source: F. Fitch, Communication Dept., Kean University, modified by L. Lorentzen, Biology/Kean 1/10/16

Item [Scale: 1 = poor; 2 = fair; 3 = ok; 4 = good; 5 = excellent]	Rating	Comments
ANALYSIS OF TOPIC (Purpose Clearly Conveyed)		
SUPPORTING MATERIAL SOURCES (Cited credible sources)		
SUPPORTING MATERIAL PREPARATION (Appropriate Visual Aids)		
ORGANIZATION (Content flow: transitions, introduction & conclusion)		
STYLE (grammar, diction)		
AUDIENCE ENGAGEMENT (eye contact, poise)		
BODY MOVEMENT (posture, gestures, facial expression)		
VOICE QUALITY (volume, tone, articulation)		
FLUENCY (freedom from notes, pacing, avoiding vocal fillers)		
IMPACT (appropriate use of time, speech accomplishes its purpose)		
TALLY		Your Score out of 50 points possible

Grading Rubric for the 5 Minute Madness Presentation

*Note: conclusion must include future direction of work (ie. what's likely next in this field of research)

Item [Scale: 1 = poor; 2 = fair; 3 = ok; 4 = good; 5 = excellent]
ANALYSIS OF TOPIC (Purpose Clearly Conveyed via Summary of Article)
MATERIAL CRITIQUE (Critique of the Primary Literature Article that was Presented)
SUPPORTING MATERIAL PREPARATION (Appropriate Visual Aids including Reference Citations)
ORGANIZATION (Content Flow: Transitions, Introduction & Conclusion)
STYLE (Grammar, Diction)
AUDIENCE ENGAGEMENT (Eye Contact, Poise)
BODY MOVEMENT (Posture, Gestures, Facial Expression)
VOICE QUALITY (Volume, Tone, Articulation)
FLUENCY (Freedom from Notes, Pacing, Avoiding Vocal Fillers)
IMPACT (Appropriate Use of Time, Speech Accomplishes its Purpose)
TALLY OUT OF 20 POINTS POSSIBLE

The Literature Review...an Essential Component of the Introduction of Your Grant Proposal

A scientific literature review is conducted of the primary literature on a given topic. For the purposes of this course, you select a topic in physiology. It is an account of what's published on the topic in scholarly journals, books, and other credible sources. A literature review is a main component of the introduction section of a grant proposal, a dissertation, thesis, journal manuscript, etc. The purpose is to clearly and concisely convey to the reader what the present knowledge on the topic is in the primary literature, ie. synthesize results into a summary of what is known and what is not known. Specifically, what is now known on the topic, what is under investigation/actively being researched on the topic, and if/where/what any controversy or competing theories or hypotheses on the topic and formulate questions for further research.

It is of paramount importance that the primary literature findings be incorporated into the literature review via **in-text citation** at point of use in your writing. This demonstrates that you the author have conducted a thorough literature review and it guides the reader to the work of others who are researching in the field of study. The literature review is not simply a book report of what has been published. Rather, the literature review is based around and guided by your research objective, your research problem or hypothesis. Hence, in doing your literature review, you need to demonstrate the skill of critical appraisal, the ability to apply principles of analysis to identify unbiased and valid studies. The other main skill that a literature review demonstrates is that of information seeking. Ask yourself the following questions:

- Has the search been wide enough to ensure all relevant material is found?
- Narrow enough to exclude irrelevant material?
- Is the number of sources appropriate for the length and scope of your writing?

How to Cite References

In-text citation is how you acknowledge, at the point of use, the source that you are paraphrasing or quoting. In-text citation methods for this course must be the **Name/Year Method** (also known as CSE Citation, for The Council of Science Editors).

The location placement of the in-text citation should be at the point in the sentence to which it applies. All in-text citations are then listed in full in the **Works Cited** section at the end of your document.

For the Name/Year method of In-Text Citation, the following formats within the body of the paper as you write are used:

- Holldobler and Wilson (1990) state that...
- In their paper, Holldobler and Wilson (1990) state that...
- Monaco et al. (1998) conclude that
- Our notion of how beetles interact socially was explained (Halffter 1997).

For the Name/Year method, the Works Cited full listing of the references used in your document would appear as follows. Note the references appear in alphabetical order.

Halffter, G (1997) Subsocial behavior in Scarabeinae beetles. Pp. 237-259 in: *Social Behavior in Insects and Arachnids* (JC Choe and BJ Crespi, eds.) Cambridge, UK: Cambridge University Press.

Holldobler, B and EO Wilson (1990) *The Ants*. Cambridge, MA: Harvard University Press.

Monaco, EL, DW Tallamy and RK Johnson (1998) Chemical mediation of egg dumping in the lace bug. *Animal Behavior* **56**:1491-1495.

For more information visit: <https://writing.colostate.edu/guides/guide.cfm?guideid=12>

CONTENT DESCRIPTION for BIO 4970 Major Project Written Grant Proposal

Documents must be typed, double-spaced, with one inch margins and have page numbers.

Cover Page

The title should be a descriptive but precise statement of what you intend to investigate.

Title Page should have: project title, student's name & contact information, submission date and course information.

Abstract Single paragraph that is a summary of all sections of the grant proposal

Table of Contents Include Section Subheaders & Page Numbers

Introduction

Proposals should concern intended original research. Ask a question such as "Why does....?" Or "What causes?" or "Why are there?" Does the introduction give evidence that the student has researched the published scientific literature on the topic to be investigated? Does the introduction provide a logical flow of thought for the formation of a hypothesis? Does the student acknowledge and use appropriate reference citations in the introduction?

Hypothesis

Proposed projects need to have a hypothesis and the appropriately designed experiments to test that hypothesis. Is the hypothesis clearly stated and relevant to the problem described?

Methods

- A. **Experimental procedure:** Has the student described a workable procedure that is likely to generate data appropriate to the hypothesis and problem? Are a sufficient number of replicates for the experiment planned and/or is sample size appropriate?
- B. **Experimental (dependent vs. independent) variables, controls, treatment/experimental groups:** Has the student successfully identified the variables that need to be considered in the project? Are the control procedures adequate for the variables indicated?
- C. **Data collection:** Are the sampling techniques and amount of data to be collected appropriate for the hypothesis and problem? Has the student considered an appropriate means of data analysis?
- D. **Safety/ethical considerations:** Has the student identified potential hazards in this type of research and in handling the materials/research subjects to be used? Has the student indicated that adequate safety procedures will be followed? If research animals or humans are the research subjects, what training and precautions will be employed?

Budget

Is the budget reasonable for the experiment? If you will purchase items, name the item make/model, the vendor and their city/state; if you will use/work in the lab of another scientist to perform some of the work, name that person and/or institutional affiliation).

Conclusion A separate paragraph following the budget that is the final push to state the importance of funding the proposed project.

Literature Cited

Use standard scientific style of documentation to format the reference citations (Name/Year Method; the works cited list matches the in-text citations used throughout the body of the document). See: http://writing.colostate.edu/guides/researchsources/documentation/cbe_citation/index.cfm

NOTE EACH PROGRESS REPORT & FINAL PROPOSAL MUST BE UPLOADED TO THE COURSE SITE AT TURNITIN.COM; FINAL PROPOSAL ALSO GOES IN YOUR CDA EPORTFOLIO

GRADING RUBRIC
PROGRESS REPORT II & FINAL VERSION of the Grant Proposal

By D.J. Eder, Ph.D. (after Angelo & Cross) modified 4/2013 & 1/2014 by Lorentzen (Copyright @2011; deden@sium.edu)

(1) Meets assignment requirements Including double spacing, 1 inch margins, 12 point font, page #s	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(2) Exercises academic Integrity (is free of plagiarism)	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(3) Meets requirements of Table of Contents & Cover page	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(4) Succinct abstract summarizes whole grant proposal application	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(5) Introduction presents research statement/hypothesis & synthesizes discerning published literature	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(6) Methods section tests hypothesis & is clearly & appropriately described	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(7) Provides adequate budget with justification and cost	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(8) Presents a succinct & relevant conclusion	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(9) Is focused, well organized, and unified	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(10) Uses direct language that is appropriate for the audience	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(11) Is free of errors in grammar, punctuation, word choice, spelling, and mechanical format	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
(12) Name/Year method of in-text Citation + Literature Cited Section	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR
OVERALL EVALUATION	EXCELLENT	VERY GOOD	ADEQUATE	WEAK	POOR

ADDITIONAL COMMENTS:

Note: While the above rubrics are used for evaluation and grading of the student written Progress Report II and Final Version of the Major Project Grant Proposal, Kean's General Education Program (for assessment purposes) requires the final version be assessed by use of the rubrics found on the next two pages, notably the transdisciplinarity general education rubric, the writing rubric, and the rubric for communication literacy.

GENERAL EDUCATION RUBRIC FOR PROGRAM ASSESSMENT OF MAJOR PROJECT

Kean University General Education Rubric

**Student Learning Outcome:
Transdisciplinarity**

Transdisciplinarity Rubric Draft

	Capstone 4	Milestones 3	Milestones 2	Benchmark 1
Curiosity	Shows great interest in exploring new topics. Explores a topic in depth, yielding a rich awareness and/or little known information. Shows interest in connecting to topics of interest raised by the original topic.	Shows regular interest in new topics. Explores a topic in depth, yielding insights and/or new information.	Shows interest in exploring new topics. Explores a topic in some depth, providing occasional insights.	Shows some interest in new topics. Explores a topic at surface level.
Integration of Prior Learning	Makes references to previous learning and applies new knowledge and skills creatively in new contexts.	Makes references to previous learning and applies that knowledge and those skills to new context.	Makes references to previous learning and extends that knowledge and those skills to new context.	Makes references to previous learning without generating to new context.
Connections to Discipline	Draws conclusions by synthesizing examples, facts, or theories from more than one field of study or perspective.	Connects examples, facts, or theories from more than one field of study or perspective and analyzes their relationships.	Connects examples, facts, or theories from more than one field of study or perspective.	Identifies examples, facts, or theories from more than one field of study or perspective.
Applying Methods and Knowledge	Adapts and applies knowledge or methods gained in one context to new contexts and synthesizes new findings in creative ways.	Adapts and applies knowledge or methods gained in one context to new contexts and analyzes new findings.	Applies knowledge or methods gained in one context in a new context for the purpose of identifying new areas of investigation.	Applies knowledge or methods gained in one context in a new context.
Embracing Contradictions	Integrates alternate, divergent, or contradictory perspectives of ideas in a novel or innovative way.	Incorporates alternate, divergent, or contradictory perspectives or ideas in an exploratory way.	Includes alternate, divergent, or contradictory perspectives or ideas in a descriptive way.	Acknowledges alternate, divergent, or contradictory perspectives or ideas.
Taking Risks	Actively seeks out untested directions and thinks independently and critically about new concepts.	Develops independent ideas and shares to share them in class and in assignments. Explores paths that are not tested for success.	Develops some independent ideas but adheres closely to provided information.	Stays strictly within guidelines and remembers what has been taught.

Draft date: September 2015

Kean University, www.kean.edu 1000 Morris Avenue, Union NJ 07083 for more information, please contact General Education at 908-737-0330

Writing Rubric

Student Name: _____ Score : _____
 Kean ID: _____
 Course and Section: _____ Instructor's name:

Criteria	5	4	3	2	1	0	Total
Genre/Audience							
Focus							
Development							
Organization							
Grammar/Mechanics							
Revision							

GENERAL EDUCATION RUBRIC FOR PROGRAM ASSESSMENT OF MAJOR PROJECT

SPEAKER EVALUATION FORM

Name of Speaker _____

Section _____

Student ID _____

Speech (1 or 2) _____

Key: 1=Unacceptable 2=Fair 3=OK/acceptable 4=good/above average 5=Excellent

Rating	Item	✓ = Positive, Effective 0 = Needs Work		Comments
CONTENT				
	Analysis of Topic (Critical Thinking)	<input type="checkbox"/> Clear purpose <input type="checkbox"/> Clear central idea <input type="checkbox"/> Multiple perspectives represented	<input type="checkbox"/> Relevant topic <input type="checkbox"/> Aware of possible objections to claims	
	Supporting Material	<input type="checkbox"/> Credible sources <input type="checkbox"/> Cited sources	<input type="checkbox"/> Varied sources <input type="checkbox"/> Sufficient sources <input type="checkbox"/> Appropriate visual aid	
	Organization	<input type="checkbox"/> Introduction <input type="checkbox"/> Main points clear	<input type="checkbox"/> Transitions <input type="checkbox"/> Conclusion	
	Style	<input type="checkbox"/> Defined terms <input type="checkbox"/> Used metaphors, analogies	<input type="checkbox"/> Grammar <input type="checkbox"/> Avoids clichés, jargon <input type="checkbox"/> Precise vocabulary	

DELIVERY				
	Engagement	<input type="checkbox"/> Audience awareness <input type="checkbox"/> Eye contact	<input type="checkbox"/> Poise <input type="checkbox"/> Manages anxiety	
	Body Movement	<input type="checkbox"/> Posture <input type="checkbox"/> Gestures	<input type="checkbox"/> Facial expression <input type="checkbox"/> Use of space	
	Voice Quality	<input type="checkbox"/> Volume <input type="checkbox"/> Variety in tone	<input type="checkbox"/> Extemporaneous <input type="checkbox"/> Articulation <input type="checkbox"/> Vocal control	
	Fluency	<input type="checkbox"/> Freedom from notes <input type="checkbox"/> Avoids vocal fillers	<input type="checkbox"/> Effective pace <input type="checkbox"/> Effective use of Pauses	
PREPARATION				
	Outline	<input type="checkbox"/> Structure	<input type="checkbox"/> Bibliography <input type="checkbox"/> Annotation	
IMPACT				
	OVERALL IMPACT	<input type="checkbox"/> Speaker is credible <input type="checkbox"/> Appropriate use of time	<input type="checkbox"/> Speech is memorable <input type="checkbox"/> Speech accomplishes purpose	
	FINAL GRADE			

SPRING 2019 BIO 4970-01 Seminar Integrative Biology COURSE SCHEDULE (updated 1.8.19)

→ Class meets weekly on Tuesdays & Thursdays 9:30to 10:45am in Bruce Hall B-119, unless noted

Week #	CONTENT/ASSIGNMENTS...Schedule subject to change when needed by instructor
#1	Tues Jan 22: Course Introduction; Assign CRISPR article for 1 page summary & upload to Turnitin.com for homework Thurs Jan 24: Project Ideas for Research Grant Proposal; Demo Turnitin.com & Grademark & Blackboard Library LEARN
#2	Tues Jan 29: Literature Review, Research Objective, How Reviewers Evaluate Proposals; CRISPR Article Summary Due Thurs Jan 31: Class meets in Library Classroom L115 with research librarian → Come with your LEARN completion certificate as this Blackboard assignment is to be done before this class! (see Textbook Chapters 1 – 3)
#3	Tues Feb 5: Sign up for Mock Interviews, Career Development: Scientific Job Search, Resume (Template/Examples), Cover Letter & Interview; Sign up for your chosen grant proposal major project topic Thurs Feb 7: Scientific Writing Guidelines & Exercises; Expectations for 5 Minute Madness Talks & Sign up for these dates (see Textbook Chapter 5 & Appendix 1)
#4	Tues Feb 12 & Thurs Feb 14: Draft Resume DUE Feb 12th submit as hard copy Citation Format; Originality & Scientific Integrity (see Textbook Chapters 3 & 4); This week sign up for grant proposal oral presentations & have your 5 Minute Madness research article approved
#5	Tues Feb 19 & Thurs Feb 21: Class as a whole does not meet, as we have by appointment, Individual Mock Interviews during class time or else by appointment during Dr. L's office hours this week; ALL INTERVIEWS @ Dr. L's Office C-113
#6	Tues Feb 26: Watch & discuss IBioseminar on Designing Effective Scientific Presentations (42min) Thurs Feb 28: Scientific Oral Presentations w/ Illustrations/Presentation of Data (Textbook Chapter 8 + Appendix 2 & 3)
#7	Tues Mar 5 No Class Meeting as Progress Report I DUE (Title Page, Introduction with Hypothesis & Literature Review + Literature Cited Section) Thurs Mar 7: Grant proposal methods design, data handling, budget & conclusion (Textbook Chapter 4); If you wish, you may bring draft slides for 5 Minute Madness Talks for cursory viewing/input (optional)
*****	WEEK OF MARCH 12th is SPRING BREAK ***** Good time to complete Lynda online course (deadline to complete is May 7 th) + work on Progress Report II (due Apr 18 th)
#8	Tues Mar 19: 5 Minute Madness Student Talks Thurs Mar 21: 5 Minute Madness Student Talks
#9	Tues Mar 26: Documentary 2010 "Naturally Obsessed: Making the Scientist" (60min) viewing/discussion Thurs Mar 28: Lecture on Your CDA Eportfolios + HHMI Video "Coevolution of Lactose Genes and Culture" (15min) viewing/discussion + Sign up for next week's methods review meetings
#10	Tues Apr 2 & Thurs Apr 4: This week, full class doesn't meet, but you MUST either come to the classroom B-119 during class time to show Dr. L your grant proposal's methods section draft & review your progress OR this week, come to Dr. L's office during her office hours & do so to receive participation credit
#11	Tues Apr 9: Lecture on Science Literacy + HHMI The Double Helix Video (17min) viewing/discussion Thurs Apr 11: HHMI 2007 Holiday Lecture "AIDS Outbreak to Epidemic Video" (58min) viewing/discussion
#12	Tues Apr 16: View/discuss 2018 (14min) Climate Change TED Talk by Chemical engineer Jennifer Wilcox on Synthetic Forests to Capture Carbon; 2017 Climate Change, Biology & Systems Thinking Video by Rooney (27min); 2016 TED Talk by Al Gore The Case for Optimism on Climate Change (25min) Thurs Apr 18: No Class Meeting as Progress Report II DUE (draft of all sections of grant proposal)
#13	Tues Apr 23: No Class Meeting as you are to attend an oral presentation/talk at Kean Research Day Thurs Apr 25: Full class doesn't meet, but you MUST either come to the classroom B-119 during class time to show Dr. L your draft slideshow OR this week, come to Dr. L's office during her office hours & do so to receive participation credit
#14	Tues Apr 30: Student Grant Proposal Oral Presentations Thurs May 2: Student Grant Proposal Oral Presentations
#15	Tues May 7: No Class Meeting as FRIDAY SCHEDULE + Proof of Lynda.com course completion DUE Thurs May 9: SIR II Course Evaluations + Student Grant Proposal Oral Presentations
#16	Tues May 14: Student Grant Proposal Oral Presentations + Deadline for Eportfolio @ Google Site including Final Project Grant Proposal (final grant proposal goes in Eportfolio plus grant proposal must be uploaded to Turnitin.com)

Textbook is not required, but highly recommended as a resource (Chapter # from textbook given where relevant to class)

4. OUTCOME ASSESSMENT PLAN

The B.A. degree in Biology has six (6) core courses as part of the requirements for the major. These six core courses provide a sound backbone of the discipline with regard to the research and theoretical aspects of Biology as well as the various areas of study within these fields. As such, these core courses are the primary vehicle for assessing the knowledge of our students. Beyond the core courses, students take at least two other elective courses. The faculty center assessment on the core knowledge of Biology within the six core courses.

Each core course has assessment tools such as exams, research and reflective writing assignments, portfolio work, and group work products as part of the evaluation process and the program has used results of assessment for making improvements to program practices aimed at increasing student learning. In addition, an evaluation of comprehensive exam results and national credentialing results demonstrates that students have areas of weakness that need to be reinforced.

Student Learning Outcome Assessment Methods

A series of direct measures have been established for each of the seven Student Learning Outcomes (SLOs) of the B.A. in Biology degree program. The SLOs are described, and the results follow.

SLO #1. Acquire Knowledge of fundamental principles (diversity of living organisms/biological fundamentals/evolutionary biology) (KU 1, 2, 4) (GE K1, S5, V1)

Direct Measure:

1. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
2. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.
3. **Laboratory Practical: BIO 1400 General Biology II.** Faculty-developed laboratory practical exam scored by instructor for each student.

SLO #2. Acquire the laboratory and field skills to gather and analyze data related to biological questions (KU 1, 2, 4) (GE K1, S3, S4, S5, V2)

Direct Measure:

1. **Written Laboratory Reports: BIO 1300 General Biology I.** Faculty developed writing rubric scored by instructor for each student.

SLO #3. Develop skills in critical thinking, scientific reasoning, and problem solving (KU 1, 2, 4) (GE K2, S1, S3, S4, S5, V1)

Direct Measure:

1. **Written Laboratory Reports: BIO 1300 General Biology I.** Faculty developed writing rubric scored by instructor for each student.
2. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
3. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.

SLO #4. Develop the ability to apply biological principles to understand current issues (KU 1, 2, 3, 4) (GE K1, S3, S4, S5, V1, V3)

Direct Measure:

1. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
2. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.

SLO #5. Develop the ability to effectively find, organize, and use resources from the literature and present results in oral, visual, and written communication (KU 1, 2, 4) (GE K1, S1, S2, S3, S4, S5, V1)

Direct Measure:

1. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
2. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.
3. **Laboratory Practical: BIO 1400 General Biology II.** Faculty-developed laboratory practical exam scored by instructor for each student.
4. **Written Laboratory Reports: BIO 1300 General Biology I.** Faculty developed writing rubric scored by instructor for each student.

SLO #6. Develop an awareness of careers and professions available in the biological sciences (KU 2, 3, 4) (GE S4, S5, V4, V5)

Direct Measure:

1. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
2. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.
- 3.

SLO #7. Acquire adequate preparation to enter health professional programs and/or the work force in related fields (KU 2, 3, 4) (GE K1, K4, S5, V4, V5).

Direct Measures:

1. **Final Paper: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed writing rubric scored by instructor for each student.
2. **Final Presentation: BIO 4970, Seminar in Integrative Biology (Capstone).** GE-developed presentation rubric scored by instructor for each student.

Student Learning Outcomes Data

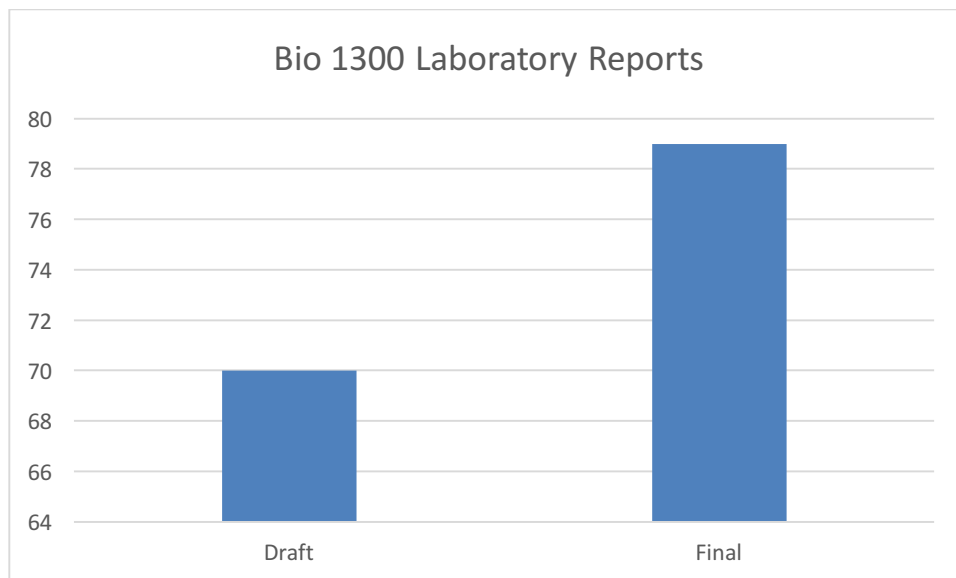
Table 1. Mastery List of Student Learning Outcomes

Required CORE Courses	Knowledge SLO1	Lab/Field Skills - SLO2	Critical Thinking, Scientific Reasoning, Problem Solving -SLO3	Current Issues SLO4	Oral, Visual Written Communication SLO5	Career Awareness SLO6	Preparation to Enter Health Professions (Post Grad) Programs SLO7
Bio 1300: General Biology I		X	X		X		
Bio 1400: General Biology II	X				X		
Bio 4970, Seminar in Integrative Biology	X		X	X	X	X	X

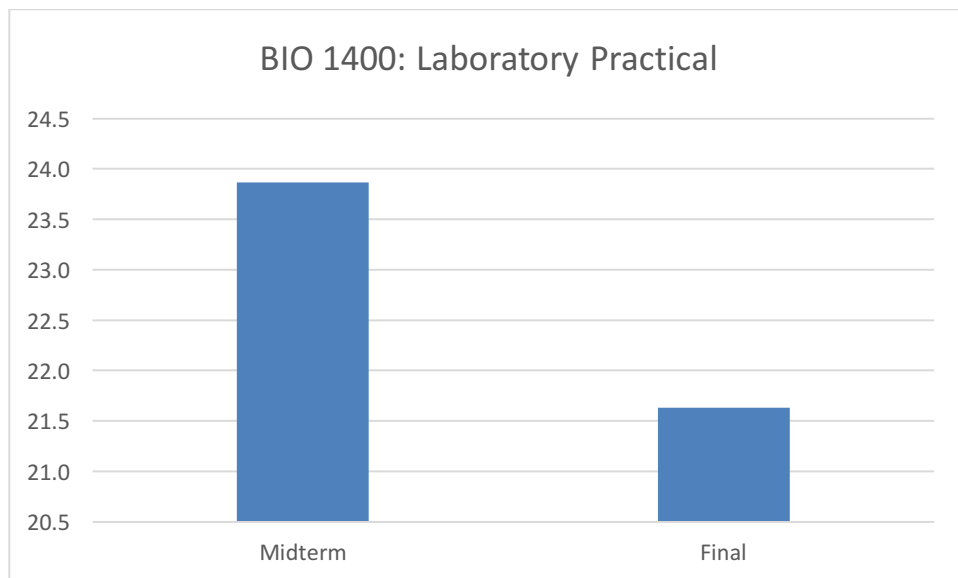
Assessment Results

Written Laboratory Reports (SLO #2, 3, 5)

Lab reports are considered an integral part of the scientific process. They help to develop skills needed for structuring experiments and communicating results of the scientific method. Three of the seven SLOs (# 2, 3 and 5) are measured with the Lab Report Rubric adopted by Dr. Lorentzen of the Kean Biology faculty. This instrument is used to assess required lab work in BIO 1300. In BIO 1300, two lab reports (draft and final) are worth 60 points of the final grade. The table feature draft and final report scores for BIO 1300. The percentage of improvements between the draft and final report was a 9% gain. Effective lab report writing is a critical industry standard for Kean students to master before graduation. The Lab Report Rubric, adopted by Dr. Lorentzen of the Biology Program, enables freshmen students to gain this skill while preparing for academic careers. Continued use of the rubric will enable faculty to identify and emphasize material in which students are weak and to better prepare them for their upper level classes.

**Laboratory Practical Exam (SLO #1, 5)**

BIO 1400 introduces students to fundamental concepts of Biological organizations relative to the molecule and cellular levels. The laboratory practical identifies the learning that has occurred during the semester course. Scores declined over time when comparing the midterm (79.6%) and final (72.1%) laboratory practical for BIO 1400 students. The differences between the midterm and the final is expected due to the final having more material compared to the midterm. Instructors can help to increase this difference by spending more time explaining difficult concepts and providing review material. BIO 1400 is a part of a two semester introduction to Biology for majors. The material covered in this class is expanded on in other courses, such as BIO 3709 Genetics and BIO 3315 Microbiology. Students are able to review and expand upon information learned in BIO 1400 in the upper level classes. For example, the Gram stain is taught in both BIO 1400 and BIO 3315; which would allow for topics that are troublesome for students to learn to be reinforced.



BIO 4970 Capstone Assessment

Final Report (SLO #1, 3, 4, 5, 6, 7) and Final Presentations (SLO #1, 3, 4, 5, 6, 7)

Biology Capstone students participate in the writing of and presenting a culminating paper based their research interests. The General Education Evaluation forms are used by faculty to evaluate the outcomes of this experience based on a standardized format. The data from these rubrics (tables below) demonstrate that the students are showing mastery (4-5) of the different aspects of the writing and presentations. Over the course of the semester, the students get practice presenting and faculty continue to request that draft presentations be submitted ahead of time for review. The additional writing and presentation experience is benefitting the students and faculty may want to pursue creating additional opportunities for writing and presentations for the students, i.e. adding more opportunities for students to participate and present research projects.

Writing		uses Kean University Written Communication Rubric				
	Genre/Audience	Focus	Development	Organization	Grammar/Mechanics	Revision
mean	4.1	4.2	4.0	4.0	4.1	3.8
median	5	4	4	4	5	4
mode	5	5	4	5	5	5

Speech	uses Kean University Speaker Evaluation Form
---------------	--

	Analysis of Topic	Supporting Material	Organization	Style	Engagement	Body Movement	Voice Quality	Fluency	Outline	Overall Impact
mean	4.6	4.5	4.6	4.6	4.4	4.5	4.5	4.4	4.7	4.5
median	5	5	5	5	5	5	5	5	5	5
mode	5	5	5	5	5	5	5	5	5	5

Employer Results

Employer results are not available.

Internship List

The biology program is currently seeking to expand internship opportunities. Current options include L'oreal and co-operative education experiences that place students in a variety of laboratory, field and other settings related to the biology major.

5. RUBRICS, OTHER TOOLS, AND FINAL EXAMS

Laboratory Report Writing Rubric (Dr. Laura Lorentzen)

STUDENT: _____

(1/2015 Lorentzen modified J.K. Brown's 2011 *Biotechnology A Laboratory Skills Course* 1st ed. BIORAD, Hercules CA, p.372)

Objective	Novice (1)	Developing (2)	Proficient (3)
Title Page	Title Page missing or largely incomplete.	Title Page present but incomplete and/or title not descriptive and precise.	Stand-alone title page is complete and includes precise & descriptive title of work, author's name, names of lab partners, course name & date of submission.
Abstract	Abstract only summarizes the introduction of the report.	Abstract presents information from only some portions of the report.	Abstract represents a concise full summary of all parts of the report.
Introduction	Introduction does not sufficiently address both the experimental purpose/objective/hypothesis and the relevant background matter.	Introduction addresses only the purpose/objective/hypothesis of the work or else only the background information, but not both.	Introduction addresses the experimental purpose/objective(s)/hypothesis & defines the background information relevant to the subject matter.
Methods	Methods are incompletely described.	Methods are described in most experiments but another person may have trouble repeating the experiments as not enough detail provided.	Methods are described completely such that another person could easily repeat the experiment.
Results	Data presentation is vastly incomplete as either only illustrations provided without written narrative or only written narrative provided without illustrations.	Data presentation of illustrations as well as written results narrative, but one or more are incomplete or not formatted correctly.	All appropriate illustrations (figures/tables) are presented and include Illustration # and title/legend. Data obtained are presented in formal written narrative that precedes illustrations.
Discussion	No account of potential sources of error. No conclusion. Data analysis and interpretation of data lacking.	Analysis and interpretation of data that is not sufficiently thorough, and/or content of results and discussion are not correctly separated. Insufficient conclusion.	Data/results are analyzed in light of known findings and are interpreted in the context of either the stated hypothesis or experimental purpose/objective. Sources of potential error are discussed. Sufficient conclusion.
Literature Cited & Originality	No attribution to any other work is provided, and/or the writing is plagiarized.	Terminal Reference listed but either incomplete format and/or missing/incorrect format for in-text citation in the narrative.	Correct format used for both in-text citation in the narrative (introduction, methods) as well as Terminal Reference list.
Presentation of Report	More than one of the items listed to the right for proficient level not met.	One of the items listed to the right for proficient level not met.	Double spaced, reasonable page margins, page #s, section subheaders, neat/orderly professional appearance.
Grammar	Significant portion of report has grammar/spelling/punctuation and/or typographical issues.	Some grammar/spelling/punctuation and/or typographical issues.	Few to none issues related to grammar/spelling/punctuation and typographical issues. Style & tone of writing is at appropriate level.
Submission Deadline	Lab report submitted very late.	Lab report submitted late.	Lab report submitted by the stated deadline.

Score earned on DRAFT lab report: _____ out of 30 points possible

SCORE EARNED ON FINAL LAB REPORT: _____ out of 30 points possible

NOTE THAT WHEN SUBMITTING FINAL LAB REPORT, YOU MUST ALSO SUBMIT THE GRADED DRAFT LAB REPORT + GRADED RUBRICS FOR DRAFT REPORT. OTHERWISE, POINTS WILL BE DEDUCTED.

SPEAKER EVALUATION FORM

Name of Speaker _____ Section _____
 Student ID _____ Speech (1 or 2) _____

Key: 1=Unacceptable 2=Fair 3=OK/acceptable 4=good/above average 5=Excellent

Rating	Item	✓ = Positive, Effective 0 = Needs Work		Comments
CONTENT				
	Analysis of Topic (Critical Thinking)	<input type="checkbox"/> Clear purpose <input type="checkbox"/> Clear central idea <input type="checkbox"/> Multiple perspectives represented	<input type="checkbox"/> Relevant topic <input type="checkbox"/> Aware of possible objections to claims	
	Supporting Material	<input type="checkbox"/> Credible sources <input type="checkbox"/> Cited sources	<input type="checkbox"/> Varied sources <input type="checkbox"/> Sufficient sources <input type="checkbox"/> Appropriate visual aid	
	Organization	<input type="checkbox"/> Introduction <input type="checkbox"/> Main points clear	<input type="checkbox"/> Transitions <input type="checkbox"/> Conclusion	
	Style	<input type="checkbox"/> Defined terms <input type="checkbox"/> Used metaphors, analogies	<input type="checkbox"/> Grammar <input type="checkbox"/> Avoids clichés, jargon <input type="checkbox"/> Precise vocabulary	
DELIVERY				
	Engagement	<input type="checkbox"/> Audience awareness <input type="checkbox"/> Eye contact	<input type="checkbox"/> Poise <input type="checkbox"/> Manages anxiety	
	Body Movement	<input type="checkbox"/> Posture <input type="checkbox"/> Gestures	<input type="checkbox"/> Facial expression <input type="checkbox"/> Use of space	
	Voice Quality	<input type="checkbox"/> Volume <input type="checkbox"/> Variety in tone	<input type="checkbox"/> Extemporaneous <input type="checkbox"/> Articulation <input type="checkbox"/> Vocal control	
	Fluency	<input type="checkbox"/> Freedom from notes <input type="checkbox"/> Avoids vocal fillers	<input type="checkbox"/> Effective pace <input type="checkbox"/> Effective use of Pauses	
PREPARATION				
	Outline	<input type="checkbox"/> Structure	<input type="checkbox"/> Bibliography <input type="checkbox"/> Annotation	
IMPACT				
	OVERALL IMPACT	<input type="checkbox"/> Speaker is credible <input type="checkbox"/> Appropriate use of time	<input type="checkbox"/> Speech is memorable <input type="checkbox"/> Speech accomplishes purpose	
	FINAL GRADE			

Revised 2013

WRITING RUBRIC

Writing Rubric

Student Name: _____

Score : _____

Kean ID: _____

Course and Section: _____ Instructor's name: _____

Criteria	5	4	3	2	1	0	Total
Genre/Audience							
Focus							
Development							
Organization							
Grammar/Mechanics							
Revision							

Descriptors for Rubric: Condensed

	5	4	3	2	1	0
Genre/Audience	Uses conventions in skillful way	Uses conventions in somewhat skillful way	Uses conventions in formulaic way	Does not follow conventions consistently	Fails to follow most or any conventions	Not applicable
Focus	Explicit, nuanced, complex stance	Explicit and nuanced, but not complex, stance	Stance defined in general terms	Vague stance	No clear stance	Not applicable
Development	All ideas developed with specific, relevant information.	Most ideas developed with specific, relevant information. Reader raises few questions	Ideas not developed consistently. Supported with vague generalization or inappropriate examples	Most ideas not developed or supported with inappropriate examples.	Ideas stated, not developed	Not applicable
Organization	Structure imparts feeling of wholeness and skill	Structure imparts a feeling of wholeness but not skill	Structure breaks down in some places, though solid overall	Structure feels rough or unclear	Structure clear or confusing	Not applicable
Grammar/mechanics	Few or no errors exist; those present have no effect on reading	Errors obvious but not distracting	Errors begin to interfere with reading	Several distracting errors or multiple patterns of error	Numerous errors make understanding text difficult or impossible	Not applicable
Revision	Almost all revisions make draft stronger	Most revisions make draft stronger	Some revisions strengthen, but some weaken draft	Few revisions, with little effect on quality	Very few revisions; may make final worse	No evidence of revision

Descriptors for Rubric

This document contains an expanded explanation of the criteria making up the baseline and portfolio evaluation rubrics for College Composition (revised Summer 2011). Each criterion is briefly defined and linked to common terms used for it in composition textbooks. Characteristics of each level in a criterion are also included.

Genre/Audience: The writing demonstrates an understanding of the conventions of the genres they are writing as well as for academic writing in general. See p. 44 for the conventions of the required genres.

Terms related to this criterion: conventions, community of readers, discourse community, genre, style, tone

- Score of 5: the writer follows all or almost all of the conventions for the genre and academic writing in general. In addition, the writer demonstrates a skillful ability to manipulate those conventions in ways that make their work stand out while still fulfilling the reader's expectations.
- Score of 4: the writer follows most, if not all, of the conventions for the genre and academic writing in general. There is evidence of effort made to manipulate those conventions in ways that make their work stand out while still fulfilling the reader's expectations. However, those efforts are not as skillful as a level-five essay.
- Score of 3: the writer follows most of the conventions. However, they do so in a formulaic way that shows little attempt to engage the audience.
- Score of 2: the writer follows most of the conventions but does not do so consistently. They may also not follow some conventions, but the reader gets the sense the writer understands the conventions.
- Score of 1: the writer fails to follow most or any of the genre conventions and of academic writing in general.

Focus: The writing presents a unified, clear stance with respect to the characteristics of the assignment. In a given essay, each paragraph relates to that stance.

Terms related to this criterion: main idea, purpose, stance, thesis statement

- Score of 5: explicit, nuanced stance. The reader feels like the writer has constructed a complex, well thought-out point.
- Score of 4: stance is explicit and/or nuanced, but not to the degree of a five. The reader may feel like some minor points are missing or that the stance could be more complex.
- Score of 3: stance somewhat clear, but may be defined in general terms (i.e. "subject A and B are alike in some ways and different in others" or "I agree/disagree with X" without giving reasons for their stance)
- Score of 2: vague stance or purpose. It may only apply to part of the piece.
- Score of 1: no clear stance or purpose.

Grammar/Mechanics: the essay follows the conventions of Edited Academic English. This includes conventions for citing sources, regardless of the system used. An essay does not have to be perfect to receive a score of 5 in this criteria. Instead, consider whether the errors would either distract an average reader or make them doubt the writer's credibility.

Terms related to this criterion: diction/word choice, documentation, punctuation, sentence boundaries, sentence structure, spelling

- Score of 5: errors do not detract from the essay's central focus and from the smooth delivery of the writer's ideas. Few or no errors exist, and those that appear are minor or reflect obscure rules.
- Score of 4: errors are obvious but not to the point of distracting an average reader.
- Score of 3: grammatical, mechanical, spelling, and documentation errors begin to interfere with understanding the text's meaning. Patterns of status-marking error may exist (ex. sentence boundaries, verb endings).
- Score of 2: several distracting grammatical, mechanical, spelling, and documentation errors make understanding the text's meaning difficult. Multiple patterns of error exist.
- Score of 1: numerous distracting grammatical, mechanical, spelling, and documentation errors make understanding the text's meaning difficult or impossible.

Revision: the writer made changes between drafts to the essay's focus, organization, development, and/or style that lead to a more successful final essay. These changes can take place at any level of the text (overall, paragraph, or sentence). Invention and planning work used to create a rough draft counts as evidence of revision.

Terms related to this criterion: addition, deletion, substitution, and rearrangement. (Note: The last two are not done as often, even when they are needed.)

- Score of 5: almost all of the revisions make the final draft stronger than the original. The writer used all four forms of revision as appropriate.
- Score of 4: Most, but not all, of the revisions make the final draft stronger than the original. The writer used most of the forms of revision, but may have needed to use others. (ex. the added and deleted material, but should have also rearranged it).
- Score of 3: the draft includes some revisions that make the final draft stronger, but others are needed. The writer mostly used addition and deletion, even if substitution and rearrangement was also needed. Some of the revisions may distract from the draft's quality.
- Score of 2: the draft includes few revisions, most of which have no influence on the final draft's quality. The writer may have used only one form of revision even though others are needed.
- Score of 1: the draft includes very few revisions; most either have no influence on the final draft's quality or make it worse. It seems like the writer just retyped the original draft.
- Score of 0: no evidence of revision. The writer turned in only one draft and no invention/planning work.

Other Tools

Style Guide for Writing a Formal Biology Lab Report

(Compiled from a multitude of sources SP14 by Dr. Lorentzen, Kean University, revised summer 2014)

Overview of How to Format the Lab Report

Lab reports are expected to be typed on a computer, printed out, either stapled or paper clipped together and submitted to your instructor. Use double-spacing 11 or 12 point font for the document's narrative, while single spacing in illustrations is fine. Margin settings should be standard settings (likely 1 or 1 ½ inch). Multipage documents need page numbers. All illustrations must have a figure # (this includes both tables and graphs); tables also must have a title and other figures such as graphs must have both a title and a figure legend. Graphs are to be done on the computer but maybe submitted hand drawn if done so on graph paper. Proper grammar mechanics and spelling is expected along with paragraph organization for the written narrative.

Scientific writing is to be clear and concise as it is distinctly different from creative prose writing. Word choice is to be exact. You may write "I/we" rather than using third person (i.e. "the researcher did")...whichever you opt to you be consistent in use throughout the document. However, if you write such that every other sentence is "we did this....we did that..." you distract the reader from the work done so instead rearrange sentence structure where possible. While some scientists will say you have to use third person narrative, over the last decade or so, more and more scientists and professional journals encourage the use of I/we as I do. Note that numbers should be written as numerals when the number is greater than 10 or when associated with a unit of measurement. Never start a sentence with a number unless the number (no matter how large) is spelled out. It is best to use PAST TENSE OF THE VERB when writing your lab report.

Components of the Lab Report

COVER PAGE provides a descriptive **TITLE**, your name, lab partner's names, course name/number including section # and date of submission.

ABSTRACT is a single paragraph that is a concise but specific summary of each section of the lab report. While the abstract appears before the introduction in terms of placement in the report, it is common practice to actually write the abstract last once the rest of the report is done.

INTRODUCTION section provides relevant background information to understand what the lab report contains herein. It also must include a specific **PURPOSE STATEMENT** (or objective) of the work done and where applicable, your **HYPOTHESIS**.

Here is more information on how to compose a hypothesis:

Formulate your Research Hypothesis Statement as "IF....., THEN....." whereby your hypothesis follows the "if" & the "then" is followed by a possible testable possibility. Ex.: If rising carbon dioxide levels are contributing to global warming, then there should be a directly observable correlation between carbon dioxide content in the atmosphere & world temperature variation.

METHODS section is a formal narrative written in paragraph format that presents how the experiments were done such that a person of science could be reasonably expected to repeat them. You write how you did what you did, and you also include how you collected/analyzed the data obtained.

RESULTS section is where you report the data obtained in an unbiased manner. You may include illustrations of data. However, you still need formal narrative written in

paragraph format in which you tell what your data is while referring to any given numbered figures. For example, a sentence within a paragraph of your results section might be as follows: Figure 1 shows the production of carbon dioxide decreased after five minutes.

DISCUSSION section is where you interpret the data...what does the data obtained mean/imply? Does the data support your hypothesis or not? Explain. If relevant, how do your results compare with the expected results? What might be considered sources of potential error or what problems occurred while conducting the work? The lab manual may pose discussion questions on which you can reflect. Do not simply put answers to such questions in your lab report discussion section. Instead, use any discussion questions as a guide on a way to incorporate material into your formal written discussion narrative. The discussion must end with a brief and concise CONCLUSION that should be in synch with the stated purpose and/or hypothesis stated in the lab report. The conclusion should state the major finding(s) of the work, but it is NOT to be a summary of the entire work.

LITERATURE CITED section is the full reference listing of all sources that appear as in-text citation anywhere in the document. At a minimum, you should in your methods section in-text cite the lab manual used for the methods. Other sections in which citation maybe relevant is the introduction and discussion. All work contained in the lab report is to be the original writing of the student author. Paraphrases should be in-text cited and direct quotes contained within quotation marks.

The Name/Year Method for in-text citation is expected. Examples follow:

The gene we describe in this report is identical to the one first isolated in 1989 (Smith, 1991).

The incidence rate for cancer in 2010 in NY was higher than that of NJ (CDC, 2010).

Examples of in-text citation just given (which are likely a sentence in the introduction section of the lab report), have their full reference listings in the Literature Cited section as below:

CDC (2010) Centers for Disease Control & Prevention Website. Cancer prevention and control, cancer rates by state, incidence rates by state. [updated 24 Oct 2013] Accessed 13 June 2013 Available from:

<http://www.cdc.gov/cancer/dcpc/data/state.htm>

Smith, J. (1991) The pretend gene as a candidate for the cause of pretend disease. *Journal of Biology*. 47:113-117.

In the Name/Year system, references appear in alphabetical order in the Literature Cited Section of the lab report.

Sample BIO 1300/1400 Pre- and Post-Test

There are 10 questions on this test. Mark the answer with a No.2 pencil on the Scantron sheet. Put down your name on the Scantron sheet. Turn in this pre-test along with your Scantron sheet when you are done.

1. Water is an example of

- A) an atom made up of neutrons and protons
- B) a compound made up of the same molecules
- C) a molecule made up of atoms
- D) a chemical made up of molecules

2. The smallest unit of life is

- A) organisms
- B) organelles
- C) cells
- D) atoms
- E) molecules

3. Science assumes that natural laws (such as the law of gravity)

- A) apply uniformly through space and time
- B) change with time
- C) apply in a lab but not nature
- D) differ according to location

4. Which of the following statements regarding evolution is correct?

- A) Highly sophisticated organisms, such as humans, do not evolve.
- B) Evolution can quickly lead to the emergence of new species.
- C) Evolution can lead to the extinction of a species.
- D) Evolution occurs through the process of natural selection, which favors strong, smart, good-looking organisms.
- E) Evolution occurs over the course of an organism's lifetime.

(5-8) Identify each activity as an observation, a hypothesis, an experiment, or a theory. A choice may be used more than once, or not at all.

- A) an observation
- B) a hypothesis
- C) an experiment
- D) a theory

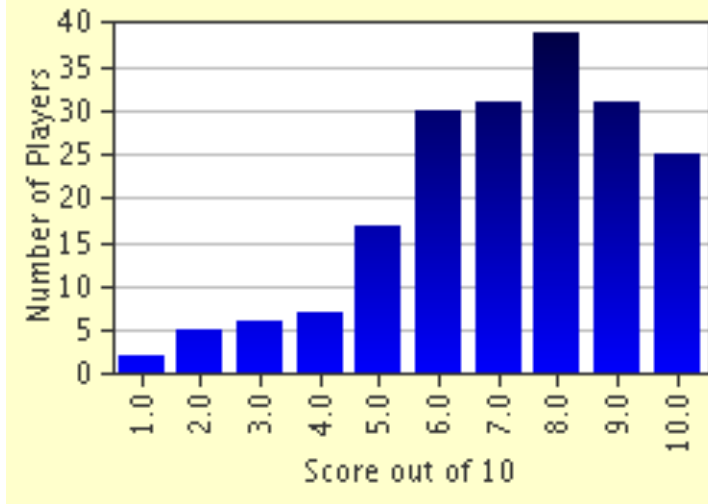
5. He determines that sales of the chef's salad have dropped.

6. She decides that the chef's salad needs a new dressing.

7. In a taste test, four bowls of lettuce are prepared with four new dressings: sesame seed, oil and vinegar, blue cheese, and anchovies.

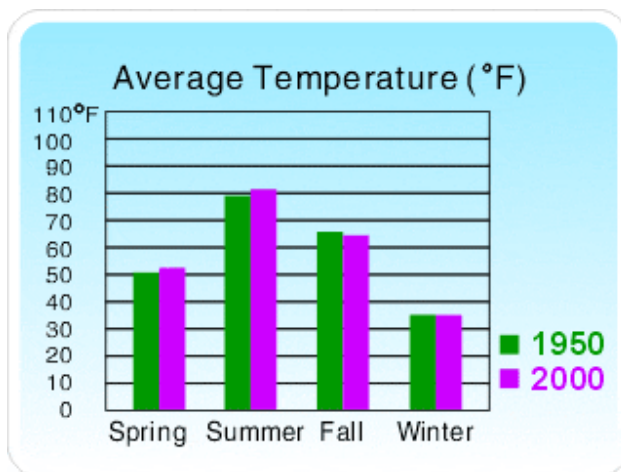
8. The tasters rate the dressing with sesame seeds the best.

9. Examine the graph below. Which statement is correct?



- A) The median score for all the players is 6.0.
- B) Most players scored 8.0 out of 10.
- C) There are more than 130 players.
- D) The average score of all the players is 8.0.
- E) The height of the bars indicates the score of the players.

10. Examine the graph below. Which statement is correct?



- A) The spring of 1950 is warmer than the spring of 2000.
- B) The summer of 1950 is more than 30°F warmer than the spring of 1950.
- C) Overall, year 1950 is warmer than year 2000.
- D) There are three variables in this graph, including one independent variable.
- E) None of the above.

(END OF PRE-TEST)

POST-TEST

There are 10 questions on this test. Mark the answer with a No.2 pencil on the Scantron. There is only one correct answer for each question. Once graded, your Scantron will be forwarded to Dr. Pu for analysis.

1. Grouping or organizing objects into categories based on characteristics of the objects is called

- A) Classifying them.
- B) Comparing them.
- C) Contrasting them.
- D) Evaluating them.

2. What does “matter” refer to?

- A) A solid, liquid, or gaseous substance
- B) Anything that takes up space
- C) Anything that has a weight
- D) Anything that can be made visible

3. How old is the earth?

- A) 45 billion years
- B) 4.5 billion years
- C) 450 million years
- D) 45 million years

4. Males of many bird species have colorful feathers. How is this explained by the theory of evolution?

- A) Male birds that did not have colorful feathers were not attractive to female birds, so they failed to produce offspring and died out.
- B) Colorful feathers are a beneficial trait and indicate that the males are capable of providing for the females and their young.
- C) Male birds gradually accumulated more genes that made their feathers colorful.
- D) Male birds gradually lost the genes that made their feathers not colorful.

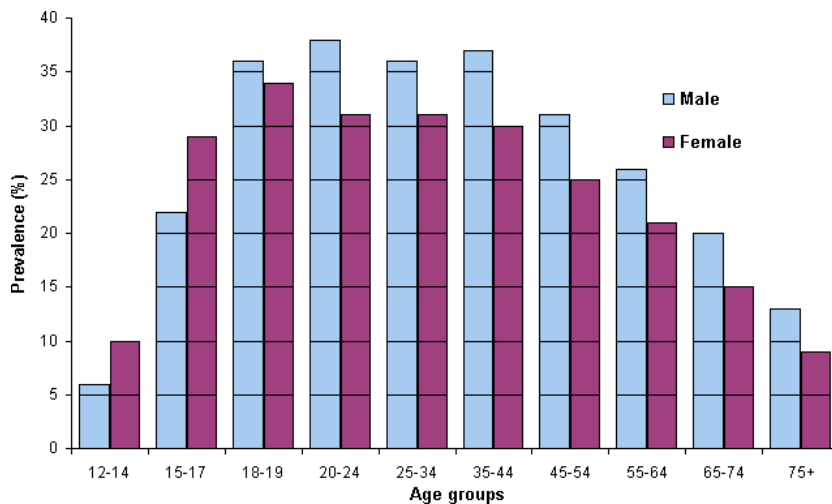
5. Before you conduct an experiment, which of the following should you do?

- A) Publish your results
- B) Write your conclusions
- C) Research the topic
- D) Brag to friends on Facebook

6. Sitting in class sweating profusely, you notice that the door seems to be closed every time you perspire in class. This is most closely associated with which step in the scientific method?

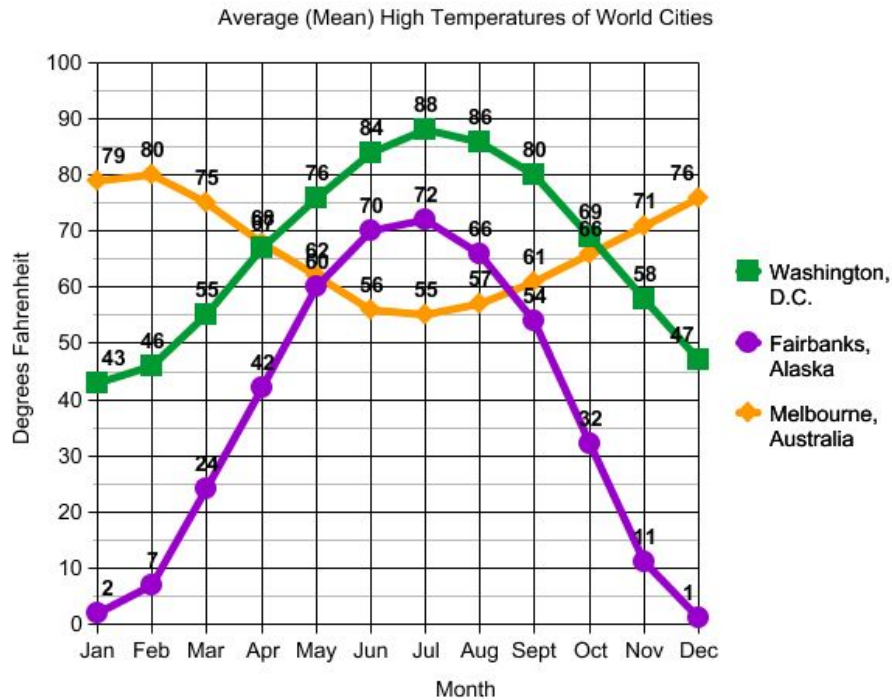
- A) Forming a hypothesis
 B) Making an observation
 C) Drawing a conclusion
 D) Recording data
7. In an experiment, the variable that is being tested is the
 A) Independent variable
 B) Dependent variable
 C) Control variable
 D) Responding variable
8. In testing whether indoor plants will grow better if you play music for them on a daily basis, the control group should be
 A) A group of plants in a different room with music playing.
 B) A group of plants in the same room with music playing.
 C) A group of plants in a different room with no music playing.
 D) A room with no plants but with music playing.

9. Examine the graph on the prevalence (%) of smokers below. Which statement is correct?



- A) There are two independent variables in this graph.
 B) When all age groups are considered (12-75+ years of age), there is a higher number of male smokers than female smokers
 C) When all age groups are considered (12-75+ years of age), there is a higher number of female smokers than male smokers.
 D) There are fewer smokers in the 12-14 age group than in the 75+ age group.

10. Examine the graph below. Which statement is correct?



- A) The average high temperature in Washington DC is higher than that in Melbourne throughout the year.
- B) The average high temperature in Fairbanks is lower than that in Melbourne throughout the year.
- C) The average high temperature indicates that Washington DC is hotter than Fairbanks by 18 degrees Fahrenheit in July.
- D) The average high temperature indicates that the coolest month in Melbourne is July.

(END OF POST-TEST)

Final Exams for Mandatory Classes

Name: _____

Bio 1300
VERSION A**Final Exam:** Chapters 5, 12, 13, 16 and 17

Directions: You may write on your exam. Record all answers on your Scantron Sheet. Each question is worth 2 points each.

1.) What is meant by the description "antiparallel" regarding the strands that make up DNA?

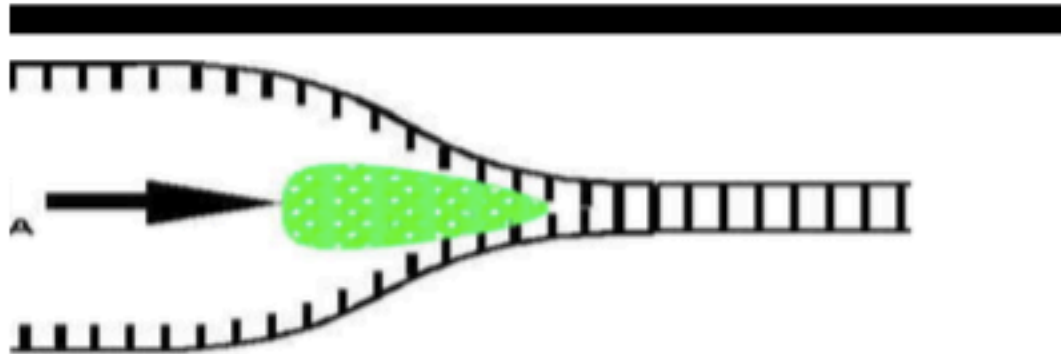
- A) The twisting nature of DNA creates nonparallel strands.
- B) The 5' to 3' direction of one strand runs counter to the 5' to 3' direction of the other strand.
- C) Base pairings create unequal spacing between the two DNA strands.
- D) One strand contains only purines and the other contains only pyrimidines.

2.) Which of the following best describes the kinetochore?

- a) a structure composed of several proteins that associate with the centromere region of a chromosome and that can bind to spindle microtubules
- b) centromere region of a metaphase chromosome at which the DNA can bind with spindle proteins
- c) array of vesicles that will form between two dividing nuclei and give rise to the metaphase plate
- d) ring of actin microfilaments that will cause the appearance of the cleavage furrow
- e) core of proteins that forms the cell plate in a dividing plant cell

3.) In bacteria, which enzyme catalyzes the elongation of a new DNA strand in the 5' → 3' direction?

- A) primase
- B) DNA ligase
- C) DNA polymerase III
- D) helicase
- E) Kornecnyase



4.) The enzyme depicted by pointer A in the photo above is active during the process of DNA synthesis. This enzyme is:

- A. DNA helicase
- B. Topoisomerase
- C. A Binding protein
- D. DNA Pol III
- E. DNA Pol I

5) The leading and the lagging strands differ in that _____.

- A) the leading strand is synthesized in the same direction as the movement of the replication fork, and the lagging strand is synthesized in the opposite direction
- B) the leading strand is synthesized by adding nucleotides to the 3' end of the growing strand, and the lagging strand is synthesized by adding nucleotides to the 5' end
- C) the lagging strand is synthesized continuously, whereas the leading strand is synthesized in short Okazaki fragments that are ultimately stitched together
- D) the leading strand is synthesized at twice the rate of the lagging strand
- E) The leading strand loves Arianna Grande whereas the lagging strand loves Britney Spears

6) A new DNA strand elongates only in the 5' to 3' direction because _____.

- A) DNA polymerase begins adding nucleotides at the 5' end of the template
- B) the shape of the DNA molecule prevents addition of nucleotides at the 3' end
- C) replication must progress toward the replication fork
- D) DNA polymerase can add nucleotides only to the free 3' end

7) What is the function of topoisomerase?

- A) relieving strain in the DNA ahead of the replication fork (preventing supercoiling)
- B) elongating new DNA at a replication fork by adding nucleotides to the existing chain
- C) unwinding of the double helix
- D) stabilizing single-stranded DNA strands at the replication fork

8) What is the role of DNA ligase in the elongation of the lagging strand during DNA replication?

- A) It synthesizes RNA nucleotides to make a primer.
- B) It joins Okazaki fragments together.
- C) It unwinds the parental double helix.
- D) It stabilizes the unwound parental DNA.

9) Which of the following help(s) to hold the DNA strands apart while they are being replicated?

- A) primase
- B) ligase
- C) DNA polymerase
- D) single-strand DNA binding proteins
- E) RNA polymerase

10) Semiconservative replication involves a template. What is the DNA template?

- A) single-stranded binding proteins
- B) DNA polymerase
- C) one strand of the DNA molecule
- D) an RNA molecule
- E) DNA Helicase

11) Provide the complimentary DNA base sequence to the following DNA strand:

5' ACTATGGTACAAC 3'

- A) 3' TGATACCATGTTG 5'
- B) 5' TGATACCATGTTG 3'
- C) 3' TGATCCATGTTGCG 5'
- D) 3' ACTATGGTACAAC 5'
- E) 5' UGAUAACCAUGUUG 3'

12) In eukaryotic cells, chromosomes are composed of _____.

- A) DNA and RNA
- B) DNA only
- C) DNA and proteins
- D) DNA and phospholipids

13) What is the final result of MITOSIS in a human?

- A) genetically identical diploid (2n) somatic cells
- B) genetically different diploid (2n) somatic cells
- C) genetically identical haploid (1n) somatic cells
- D) genetically identical diploid (2n) gamete cells

14) The first gap in the cell cycle (G₁ Phase) corresponds to _____.

- A) The first growth phase (normal growth and cell function)
- B) the phase in which DNA is being replicated
- C) the beginning stage of mitosis
- D) the phase between DNA replication and the M phase

15) The mitotic spindle is a microtubular structure that is involved in _____.

- A) unwinding the DNA in DNA synthesis/replication
- B) triggering the compaction and condensation of chromosomes
- C) dissolving the nuclear membrane
- D) separation of sister chromatids
- E) making pizza

16) Metaphase is characterized by _____.

- A) aligning or "meeting" of chromosomes at the equator
- B) splitting of the centromeres
- C) cytokinesis
- D) separation of sister chromatids
- E) Disappearance of the nuclear envelope

17) How is plant cell cytokinesis different from animal cell cytokinesis?

- A) Plant cells form a cleavage furrow; animal cells form a cell plate
- B) Plant cells form a cell plate; animal cells form a cleavage furrow.
- C) The structural proteins of plant cells separate the two cells; in animal cells, a cell membrane separates the two daughter cells.
- D) Plant cells divide after metaphase but before anaphase; animal cells divide after anaphase.
- E) Plant and animal cytokinesis both form a cell plate

18) Mitosis is a continuous sequence of events best described by discrete stages. The proper order of these stages is:

- A) Anaphase, Prophase, Metaphase, Telophase
- B) Anaphase, Telophase, Prophase, Metaphase
- C) Prophase, Metaphase, Anaphase, Telophase
- D) Prophase, Anaphase, Telophase, Metaphase
- E) Metaphase, Anaphase, Prophase, Telophase

19) In which stage of Meiosis does Crossing Over occur?

- A) Prophase I
- B) Metaphase I
- C) Prophase II
- D) Metaphase II
- E) Anaphase I

20.) In which phase of Meiosis do sister chromatids separate?

- A) Telophase I
- B) Telophase II
- C) Anaphase I
- D) Anaphase II
- E) Prophase I

21) Patrick the starfish lost one of his five arms. He will regenerate a new arm. Patrick's new arm will regenerate by a process known as:

- A) Meiosis
- B) Mitosis

22) Which of the following statements are TRUE about mitosis.

- A.) Four haploid cells are produced.
- B.) It is the process responsible for the reproduction of sex cells.
- C.) Crossing over occurs during prophase I
- D.) Two identical daughter cells are produced
- E.) It is considered a "reduction division."

23) Which of the following processes produces gametes?

- a. Mitosis
- b. Meiosis

24) Which of the following stages of the Cell Cycle are NOT present in INTERPHASE?

- A. G2 phase
- B. S phase
- C. G1 phase
- D. Anaphase

25) Gametes have 23 pairs of chromosomes. This statement is _____.

- A) True
- B) False

26) Meiosis II is similar to mitosis in that:

- A) Sister Chromatids separate during anaphase
- B) DNA replicates before the division
- C) The daughter cells are diploid
- D) Homologous Chromosomes cross over
- E) Both create four haploid cells

- 27) **The Central Dogma states that...**
- A) Genetic Material flows from DNA→RNA→Proteins
 - B) Genetic Material flows from DNA→Proteins→RNA
 - C) Genetic Material flows from RNA→DNA→RNA
 - D) Genetic Material flows from Proteins→RNA→DNA
 - E) Genetic Material flows from the bathroom to the kitchen
- 28) **Which of the following happens at the conclusion of meiosis I?**
- A) Homologous chromosomes of a pair are separated from each other.
 - B) The chromosome number per cell remains the same.
 - C) Sister chromatids are separated.
 - D) Four daughter cells are formed.
- 29) **Alternate versions of a gene are known as:**
- A) Homologues
 - B) Alleles
 - C) Diploid
 - D) Haploid
 - E) Meiosis
- 30) **Ribosomes are comprised of:**
- A) rRNA and protein
 - B) tRNA and protein
 - C) DNA and protein
 - D) mRNA and protein
 - E) Protein only
- 31) **A particular triplet of bases in the template strand of DNA is 5' AGT 3'. The corresponding codon for the mRNA transcribed is _____.**
- A) 3' UCA 5'
 - B) 3' UGA 5'
 - C) 5' TCA 3'
 - D) 3' ACU 5'
- 32) **Codons are three-base sequences that specify the addition of a single amino acid. How do eukaryotic codons and prokaryotic codons compare?**
- A) Prokaryotic codons usually contain different bases than those of eukaryotes.
 - B) Prokaryotic codons usually specify different amino acids than those of eukaryotes.
 - C) Prokaryotes do not have codons
 - D) Codons are a nearly universal language among all organisms.
 - E) Prokaryotic Codons resemble Selena Gomez, whereas Eukaryotic codons resemble Adele