10-2-2014

Educational Policies Committee Minutes, October 2, 2014

Utah State University

EDUCATIONAL POLICIES COMMITTEE MINUTES

2 October 2014

A meeting of the Educational Policies Committee was held on 2 October 2014 at 3:00 pm in Old Main 136 (Champ Hall Conference Room)

Present: Larry Smith, Chair
Roland Squire, Registrar's Office
Heidi Kesler, Curriculum Retention
Michele Hillard, Secretary
Richard Mueller, College of Science
Karen Mock, Quinney College of Natural Resources
Kevin Olson, Caine College of the Arts (representing Nick Morrison)
Norm Jones, General Education Subcommittee Chair
Kacy Lundstrom, Libraries
Ed Reeve, Curriculum Subcommittee Chair
Kelly Fadel, Huntsman School of Business
Thom Fronk, Engineering
Melanie Nelson, USU-Eastern
Scott Bates, Academic Standards Subcommittee Chair
Eddy Berry, Humanities and Social Sciences
Jared Schultz, Education and Human Services
Derek Hastings, Graduate Studies Senator

Absent: Doug Fiefia, USUSA President
Scott DeBerard, Graduate Council
Nathan Straight, Regional Campuses

Visitors: Dawn Kirby, SR Associate Dean, College of Humanities and Social Sciences
Mehmet Tekerek (visiting professor)

A meeting of the Educational Policies Committee will be held on 2 October 2014 at 3:00 pm in Old Main 136 (Champ Hall Conference Room)

I. Approval of the minutes of the 9 September 2014 meeting (see below)

Norm Jones moved to approve the minutes of the 9 September 2014 meeting. Eddy Berry seconded; minutes approved.

II. Subcommittee Reports

a. Curriculum Subcommittee (Ed Reeve)

Ed Reeve reviewed the Curriculum Subcommittee business.

All courses were approved.

The Request from the Department of Computer Science to reduce the number of PhD credits was approved. (see below)

The Request from the Department of Geology to discontinue the current BS degree in Applied Environmental Geoscience and create an emphasis in Applied Environmental Geoscience in the existing BS was approve pending minor revisions. (see below)

The Request from the Department of Mechanical and Aerospace Engineering to offer a PhD in Aerospace Engineering was approved. (see below)

Discussion on degree standardization in the catalog including the Gen Ed and using a template for consistency.

Norm Jones moved to approve the business of the Curriculum Subcommittee. Richard Mueller seconded; motion approved.

b. Academic Standards Subcommittee (Scott Bates)

Minutes April 17th, 2014

Present: Scott Bates (Chair, Emma Eccles Jones College of Education and Human Services), Thomas Fronk (College of Engineering), Stephanie Hamblin (Advising), Dawn Kirby (College of Humanities and Social Sciences), Clifford Skousen (Huntsman School of Business), Roland Squire (Registrar's Office).

Absent: Doug Fiefia (USU/SA).

Guests: Melanie Bowen (Registrar's office), BrandE Faupell (Human Resources), Richard Mueller (College of Science)Brandy Reeves (Registrar's Office), Marci Smith (Registrar's Office).Agenda April 17th, 2014

OLD BUSINESS

Revision to the Academic Record Adjustment and Request for Refund Policy (Guest: BrandE Faupell, HR; documents attached). The attached revision to the Academic Record Adjust and Request for Refund Policy was discussed.

The inclusion of a definition of "immediate family," which was based on the human resources bereavement policy, was clarified. Specifically, the word "partner" was to be included; this brings the policy in-line with various HR and other campus-wide policies. In addition, the phrase "persons living in the same household" was to be excluded as it could be confusing and less-relevant to students (although it is

currently included in HR policies on bereavement).

In addition, language that specified documentation was to come from a "medical doctor, physicians assistant, or nurse practitioner" was revised to include "licensed caregiver" in order to allow any licensed caregiver to provide necessary evidence for the policy's intent (to provide a record adjustment and/or refund). It was specifically discussed that mental health issues could be a reasonable use of the policy.

VOTE 2014-04-17-1. Motion to approve the new policy and relevant forms as revised (attached). Moved: Roland Squire. Seconded: Dawn Kirby. Outcome: passed

NEW BUSINESS

The Excused Absence Policy was discussed (Guest: Richard Mueller). Specifically:

- The location of the policy in student code was seen as problematic—the current policy is a part of the code related to student groups, but the policy has been expanded to include other students (outside of student groups) therefore, the current location is no longer a logical one.
- Issues related to instructor implementation of this policy were discussed. Example: if students in a class are allowed to "drop one of four exams," an excused absence should not limit a student's access to this class policy. That is, an excused absence should not simply be identified as "the dropped exam."
- The issues around the scope of the policy were discussed. Specifically, lab courses that require significant set-up time were discussed in the context of this policy, as was the idea that there should be a limit to the number of excused absences.
- The role of the Academic Standard Subcommittee of the EPC was discussed. Specifically whether or not Academic Standard Subcommittee of the EPC had a role in this policy.

Action: Bates will meet with chair of EPC to discuss processes and, if it is determined that EPC would welcome a revision proposal from Academic Standard Subcommittee of the EPC, Bates will draft suggested changes to the existing student code and general catalogue; submit it to discussion and vote of the Academic Standard Subcommittee of the EPC in the first meeting of the fall, 2014.

B. Dual Course Listing Policy was to be discussed. This issue was tabled until fall 2014.

FUTURE BUSINESS

There was a discussion of other topics that could potentially be relevant to the Academic Standards Subcommittee of the EPC. Including:

- Issues around the IELI credits policy
- The "significant feedback on the exam" and grades as related to the withdrawal policy.
- The inclusion of proficiency in ASL being credited, as would proficiency in other languages.

These three issues were retained for fall, 2014. A request for new issues/concerns will be circulated for the next meeting in the fall.

NEXT MEETING

The next meeting of the Academic Standards Subcommittee of the EPC will be fall, 2014.

Richard Mueller moved to approve the business of the Academic Standards Subcommittee. Eddy Berry seconded; motion approved.

Larry Smith suggested having an athletics representative on the Academic Standards subcommittee to discuss issues regarding missing tests and other items.

ISL issue – isn't being considered/credited. Test through languages but not ISL.

c. General Education Subcommittee (Norm Jones)

September 16, 2014, 8:30 A.M.
Champ Hall Conference Room

Present: Dean Adams, College of Engineering; Janet Anderson, Provost's Office; Eddy Berry, Social Sciences; Dan Coster, Quantitative Intensive; Brock Dethier, Writing Program; Doug Fiefia, USUAS President; Laura Gelfand; Caine College of the Arts; Norm Jones, Chair; Dawn Kirby, College of Humanities and Social Sciences; Harrison Kleiner, Connections; Kacy Lundstrom, Library; Brian McCuskey, Humanities; Kris Miller, Honors; Karen Mock, Natural Resources; Bob Mueller, Regional Campus; Dick Mueller, College of Science; Melanie Nelson, USU Eastern; Lauren Skousen, Secretary; Larry Smith, Provost's Office

Absent: Lawrence Culver, American Institutions; Kathy Chudoba, Business; Cindy Dewey, Creative Arts; Ryan Dupont, Life and Physical Sciences; Stephanie Hamblin, University Advising; Mary Leavitt, Advising; Shelley Lindauer, Emma Eccles Jones College of Education; John Mortensen, Student Services; Lee Rickords, College of Agriculture and Applied Sciences

Call to Order – Norm Jones

Approval of Minutes – August 19, 2014
Motion to approve made by Brian McCuskey; seconded by Laura Gelfand.

Course Approvals
MUSC 3030 (DHA).....Cindy Dewey
Motion to approve made by Laura Gelfand; seconded by Brian McCuskey. Approved.

Course/Designation Removals
N/A

Syllabi Approvals
HONR 1340 (BSS) ..... Eddy Berry
Motion to approve made by Eddy Berry; seconded by Richard Mueller. Maria Norton is the instructor of the approved syllabi. Approved.

NDFS 5230/6230 (CI)..... Brock Dethier
Motion to approve made by Brock Dethier; seconded by Eddy Berry. Heidi Wengreen is the instructor of the approved syllabi. Approved.

Business
Vote for Chair Elect 2015-2016
Prior to this meeting there was one nomination for chair elect: Dawn Kirby. Floor opened to other nominations. Motion to accept Dawn Kirby's nomination by acclamation made by Dick Mueller. All approved.
The Regents' General Education Task Force will hold the "What is an Educated Person XVII?": Building and Assessing the Whole Degree" Conference Oct. 30-31, 2014 at the Zermatt Resort, Midway, UT. Members of the Committee who are interested in attending should talk to Norm.

In the next few months, the National Institute for Outcomes Learning Assessment and the American Association of Colleges and Universities will publish profiles of USU's Gen Ed program as a model of what can be done to integrate Gen Ed into the curriculum.

After more than a decade of handling transfer and articulation issues in General Education, along with general curricular appeals, Norm is turning the job of enforcement over to our new Vice Provost, Janet Anderson. He will continue to handle appeals until October 1, after which they should be directed to Janet, Janet.anderson@usu.edu. All issues concerning policies and course approvals will continue to come to the Gen Ed Subcommittee of the EPC, which Norm continues to chair.

Kelly Fadel moved to approve the business of the General Education Subcommittee. Karen Mock seconded; motion approved.

Other Business

Faculty Senate will not have consent agenda items in this year's meeting. Oral reports will be made to the Faculty Senate.

Adjourned: 3:20 pm

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: *Utah State University*
Proposed Title:
Currently Approved Title:
School or Division or Location:
Department(s) or Area(s) Location: *Department of Computer Science, College of Engineering*
Recommended Classification of Instructional Programs (CIP) Code[1] (for new programs):
Current Classification of Instructional Programs (CIP) Code (for existing programs): *11.07*
Proposed Beginning Date (for new programs): *upon approval*
Institutional Board of Trustees' Approval Date:

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar		
SECTION NO.		**ITEM**
5.1.1	☐	Minor*
5.1.2	☐	Emphasis*
5.2.1	☐	(CER P) Certificate of Proficiency*
5.2.3	☐	(GCR) Graduate Certificate*
5.4.1	☐	New Administrative Unit
	☐	Administrative Unit Transfer
	☐	Administrative Unit Restructure
	☐	Administrative Unit Consolidation
5.4.2	☐	Conditional Three-Year Approval for New Centers, Institutes, or Bureaus
5.4.3	☐	New Center
	☐	New Institute
	☐	New Bureau
5.5.1	☐	Out-of-Service Area Delivery of Programs
5.5.2	☐	Program Transfer
	☒	Program Restructure
	☐	Program Consolidation
5.5.3	☐	Name Change of Existing Programs
5.5.4	☐	Program Discontinuation
	☐	Program Suspension
5.5.5	☐	Reinstatement of Previously Suspended Program
	☐	Reinstatement of Previously Suspended Administrative Unit

**Requires "Section V: Program Curriculum" of Abbreviated Template*

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Signature **Date:** *09/04/2014*
Printed Name: *Nicholas S. Flann*

[1] CIP codes must be recommended by the submitting institution. For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.

Program Request - Abbreviated Template
Utah State University
Ph.D. Computer Science
09/01/2014

Section I: Request

The Computer Science Department requests to reduce the total minimum number of credit hours required to complete a Ph.D. to 70 hours, a reduction from the current value of 90. The change is motivated by the desire to bring USU Computer Science in line with other Ph.D. programs within the College of Engineering and with other CS Ph.D. programs at peer institutions, which require no more than 72 hours. We anticipate that this change will increase the competitiveness and effectiveness of our PhD program while having a minimal impact on aggregate instructional activities since reductions in credit hours per student will be offset by an increasing PhD program and student enrollment in classes.

All numbers are minimum credit hours	Existing Ph.D. Program without MS	with MS	**New Proposed Ph.D. program without MS**	**with MS**
7000 level CS	12	12	**9**	**9**
Awarded from MS	0	30 (fixed)	**0**	**0 to 30**
Seminar CS7900	2	2	**2**	**2**
Dissertation	27	27	**18**	**18**
Additional courses	33	3	**21**	**3**
Remaining courses/dissertation			**20**	**38 – (hours awarded from MS)**
Minimum Total	90	90	**70**	**70**

There are three principal areas of change: a) the number of minimum dissertation credits is reduced by 9 hours, b) the minimum number of PhD classes is reduced by one class, c) satisfying the remaining credits needed becomes more flexible.

Section II: Need

Computer Science is one of the fastest growing job markets in the world, increasing the demand for graduates at BS, MS and PhD levels. New graduates in the USU CS department are experiencing multiple job offers at salaries higher than previous years. Significantly, this trend also applies to the PhD level principally because computer-related companies (such as Microsoft, Amazon, Google, Apple etc.) have growing internal research labs that seek PhDs to lead research and development of future products. Research shows that more than half of PhD graduates work in industry rather than academia (Taulbee Survey http://cra.org/resources/taulbee/))

According to the Computing Research Association annual Taulbee Survey, Computer Science programs around the country are producing more PhDs than ever before, but increasing demand has kept pace and this additional supply has not diminished employment or salary. Indeed, the Taulbee Survey reports an almost 100% placement and employment of PhDs in professional jobs. Salaries available from the Bureau of Labor Statistics (http://www.bls.gov/ooh/computer-and-information-technology/home.htm) give the median salary for computer research scientists at $100,800 and tenure-track assistant professors at $85,000 (for smaller public universities) and $100,000 (for large private universities).

In response to these rapid changes and positive future prospects the USU CS PhD program needs to modernize to become more competitive, efficient and tailored to current and future market conditions. The principal problem with the current program is that it takes too long to complete because of unnecessary and burdensome requirements. Specifically, the current minimum 90 credit hour requirement is outdated and exceptionally high compared to peer institutions within the intermountain region and around the country as summarized below (click on the university name to review the complete requirements, or follow the link in the next table):

University	Total	Min. Class	Min. Dissertation
University of Utah	50	27	14
BYU	66	48	18
Montana State Univ.	60	18	18
University of Nevada	72	30	24
Univ. of Pittsburgh	72	36	36
Virginia Commonwealth Univ.	70	42	18
UNC Charlotte	72	18	36
Iowa State Univ.	72	18	36

This reduction in credit hours to 70 brings the USU program into the range of peer institutions and combined with the new streamlined exam and student evaluation procedures (discussed below), will increase the effectiveness and PhD productivity of the department, but not diminish the quality of the PhD product. In fact, it is anticipated that a process more focused on productivity than credit hours will increase the quality of our PhDs.

University	Web link
University of Utah	http://www.cs.utah.edu/graduate/hb2013-14/gradhbk2013-14-phd_cs.html
BYU	https://cs.byu.edu/graduate-policy-handbook-phd-program
Montana State Univ.	http://www.cs.montana.edu/phd-courses.html
University of Nevada	http://www.unr.edu/degrees/computer-science-and-engineering/phd?view=requirements
Univ. of Pittsburgh	https://cs.pitt.edu/grad/phd.php
Virginia Commonwealth Univ.	http://www.pubapps.vcu.edu/Bulletins/graduate/?did=20281
UNC Charlotte	https://cci.uncc.edu/degree-requirements-current
Iowa State Univ.	https://www.cs.iastate.edu/graduate/cs_phd.php

In tandem with this proposed change, the CS department has implemented a new exam schedule (http://cs.usu.edu/htm/ph-d-examination-policy/) and is introducing a new annual evaluation policy of PhD student's productivity similar to the procedure for faculty evaluations. Students enter data describing their research, teaching and service contributions into a digital measure-like system and are then ranked using a published rubric. Student progress is reviewed by the departmental graduate committee and anonymized data is presented to the faculty, enabling faculty to identify poor and excellent students. The department then recognizes excellent students with awards during the annual graduate student reception. Students making unacceptable progress will be warned their first year and then if no improvement is made the second year, departmental support will be withdrawn.

Section III: Institutional Impact

It is anticipated that this change will enable the CS department to increase enrolment within the CS PhD program while maintaining or increasing admission standards because we will be offering a more competitive product.

No change in administrative structure will be required.

The CS department is growing in faculty and in students so it is anticipated that planned and actual new hires in faculty will fully support these proposed changes in the PhD program. No new staff will be needed. Current facilities will continue to be adequate.

Section IV: Finances

We anticipate no major cost increases or savings from this change.
In addition to those standard procedures in place for PhD and plan A MS students, faculty in the CS department include monies for tuition awards in their grant proposals as required by the COE.

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: Utah State University
Proposed Title: B.S. in Geology w/ Applied Environmental Geoscience Emphasis (new emphasis)
Currently Approved Title: B.S. in Applied Environmental Geoscience (to be discontinued)
School or Division or Location: College of Science
Department(s) or Area(s) Location: Geology
Recommended Classification of Instructional Programs (CIP) Code[2] (for new programs): 40.0601
Current Classification of Instructional Programs (CIP) Code (for existing programs): 40.0699
Proposed Beginning Date (for new programs): 01/07/2015
Institutional Board of Trustees' Approval Date:

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar		
SECTION NO.		**ITEM**
5.1.1	☐	Minor*
5.1.2	X	Emphasis*
5.2.1	☐	(CER P) Certificate of Proficiency*
5.2.3	☐	(GCR) Graduate Certificate*
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5.5.1	☐	Out-of-Service Area Delivery of Programs
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	☐	Program Restructure
	☐	Program Consolidation
5.5.3	☐	Name Change of Existing Programs
5.5.4	X	Program Discontinuation
	☐	Program Suspension
5.5.5	☐	Reinstatement of Previously Suspended Program
	☐	Reinstatement of Previously Suspended Administrative Unit

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____

Signature **Date:**

[2] CIP codes must be recommended by the submitting institution. For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.

Program Request - Abbreviated Template
Utah State University
Bachelor of Science in Geology with an Applied Environmental Geoscience Emphasis
08/22/2014

Section I: Request

This request is to discontinue the current Bachelor of Science degree in Applied Environmental Geoscience and instead create an emphasis in Applied Environmental Geoscience in the existing Bachelor of Science degree in Geology.

Section II: Need

The Bachelor of Science (BS) in Applied Environmental Geoscience (AEG) has been in place for more than four years, but very few students have chosen to pursue this degree. From interviews with these students as well as other Geology majors, a serious concern that has been expressed is the value of the AEG degree, both in terms of its employability following graduation and its desirability for prospective graduate programs. Consequently, the Department of Geology at Utah State University has decided to discontinue the BS in AEG and instead offer an AEG emphasis in the existing BS in Geology due to the professional recognition of USU's Geology BS that already exists among both potential employers and other institutions of higher education that offer graduate degrees in the Earth and Geological Sciences.

Furthermore, because of concerns expressed by AEG majors during interviews regarding some of the elective courses for the BS in AEG, the Department of Geology has reassessed the curriculum and has made changes to the electives for the AEG emphasis in the BS in Geology that will make it more beneficial and attractive to students, and thus more enticing to potential majors. Please note, however, that the total number of credit hours required for both the BS in AEG and the AEG emphasis in the BS in Geology is exactly the same.

Finally, while the current AEG majors will be accommodated to allow completion of their degrees according to the existing requirements after the program is discontinued, all of the students interviewed have expressed their desire to switch to the AEG emphasis in Geology if it is approved for the reasons described above.

Section III: Institutional Impact

The proposed change is not anticipated to affect enrollments in any other instructional programs of affiliated departments or programs, nor will the proposed change affect any existing administrative structures. No changes in faculty or staff will be required, nor will any new physical facilities or modification to existing facilities be required. No equipment will need to be committed to initiate this change.

Section IV: Finances

The proposed change is not anticipated to result in any costs or savings to the Geology Department, College of Science, or Utah State University, nor are any budgetary impacts on other programs or units within Utah State University anticipated.

Section V: Program Curriculum

All Program Courses (with New Courses in Bold)

Course Prefix and Number	Title	Credit Hours
Required Courses	GEO 1110 - Physical Geology	3
	GEO 1115 - Physical Geology Laboratory	1
	GEO 3200 - Earth Through Time	4
	GEO 3500 - Minerals and Rocks	4
	GEO 3550 - Sedimentation and Stratigraphy	4
	GEO 3600 - Geomorphology	4
	GEO 3700 - Structural Geology	4
	GEO 4700 - Geologic Field Methods	3
	GEO 5200 - Geology Field Camp	5
	GEO 5600 - Geochemistry	3
	CHEM 1210 - Principles of Chemistry I	4
	CHEM 1215 - Principles of Chemistry Lab I	1
	CHEM 1220 - Principles of Chemistry II	4
	CHEM 1225 - Principles of Chemistry Lab II	1
	MATH 1210 - Calculus I	4
	STAT 3000 - Statistics for Scientists	3
	PHYS 2210 - Physics for Sci and Engr I	4
	PHYS 2215 - Physics for Sci and Engr Lab I	1
	BIOL 1610 - Biology I	4
	BIOL 1620 - Biology II	4
	GEOG 1800 - Intro to GIS	3
	Sub-Total	**68**
Elective Courses	PSC 3000 - Fundamentals of Soil Sci **and**	4
	PSC 5130 – Soil Genesis, Morph, and Class	4
	OR	
	WATS 3700 – Fund of Watershed Sci **and**	3
	WATS 4490 – Small Watershed Hydrology	4
	GEO 5630 – Geologic Image Analysis **or**	3
	WATS 4930 – Adv GIS and Spatial Anal **or**	3
	WATS 5003 – Remote Sensing Land Surf **or**	4
	WILD 5750 – Applied Remote Sensing	3
	BIOL 2220 – General Ecology **or**	3
	CHEM 3650 – Environmental Chemistry **or**	3
	PSC 3820 – Climate and Climate Change	3
	Sub-Total	**13 - 15**
Track/Options (if applicable)		
	Sub-Total	
*(This is the same number of credits as the BS in AEG)	**Total Number of Credits**	**81 - 83**

Program Schedule

Freshman Year

Fall Semester (13 credits)

GEO 1110 - Physical Geology (3)
GEO 1115 - Physical Geology Laboratory (1)
CHEM 1210 - Principles of Chemistry I (4)
CHEM 1215 - Principles of Chemistry Laboratory I (1)
MATH 1210 - Calculus I (4)

Spring Semester (13 credits)

GEO 3200 - Earth Through Time (4)
GEO 3500 - Minerals and Rocks (4)
CHEM 1220 - Principles of Chemistry II (4)
CHEM 1225 - Principles of Chemistry Laboratory II (1)

Sophomore Year

Fall Semester (13 credits)

GEO 3550 - Sedimentation and Stratigraphy (4)
PHYS 2210 - Physics for Science and Engineering I (4)
PHYS 2215 - Physics for Science and Engineering Laboratory I (1)
BIOL 1610 - Biology I (4)

Spring Semester (14 credits)

GEO 3700 - Structural Geology (4)
GEO 5600 - Geochemistry (3)
BIOL 1620 - Biology II (4)
STAT 3000 - Statistics for Scientists (3)

Junior Year

Fall Semester (10 credits)

GEO 3600 - Geomorphology (4)
GEO 4700 - Geologic Field Methods (3)
GEOG 1800 - Introduction to Geographic Information Systems (3)

Spring Semester (6 - 7 credits)

PSC 3000 - Fundamentals of Soil Science (4) **or**
WATS 3700 - Fundamentals of Watershed Science (3)
BIOL 2220 - General Ecology (3) **or**
CHEM 3650 - Environmental Chemistry (3) **or**
PSC 3820 - Climate and Climate Change (3)

Summer Semester (5 credits)

GEO 5200 - Geology Field Camp (5)

Senior Year

Fall Semester (0 - 7 credits)

PSC 5130 - Soil Genesis, Morphology, and Classification (4) (if PSC 3000 taken in previous spring)
WILD 5750 - Applied Remote Sensing (3) (if neither WATS 4930 nor WATS 5003 taken in following spring)

Spring Semester (0 - 8 credits)

WATS 4490 - Small Watershed Hydrology (4) (if WATS 3700 taken in previous spring)
WATS 4930 - Advanced GIS and Spatial Analysis (3) **or**
WATS 5003 - Remote Sensing of Land Surfaces (4) (if WILD 5750 not taken in fall)

Cover/Signature Page – Full Template

Institution Submitting Request: *Utah State University*
Proposed Title: *PhD Degree in Aerospace Engineering*
School or Division or Location: *College of Engineering*
Department(s) or Area(s) Location: *Mechanical and Aerospace Engineering*
Recommended Classification of Instructional Programs (CIP) Code[3] : *14.0201*
Proposed Beginning Date: *08/01/2015*
Institutional Board of Trustees' Approval Date: *MM/DD/YEAR*

Proposal Type (check all that apply):

Regents' Agenda Items		
R401-4 and R401-5 Approval by Committee of the Whole		
SECTION NO.		**ITEM**
4.1.1	☐	(AAS) Associate of Applied Science Degree
4.1.2	☐	(AA) Associate of Arts Degree
	☐	(AS) Associate of Science Degree
4.1.3	☐	Specialized Associate Degree
4.1.4	☐	Baccalaureate Degree
4.1.5	☐	K-12 School Personnel Programs
4.1.6	☐	Master's Degree
4.1.7	X	Doctoral Degree
5.2.2	☐	(CER C) Certificate of Completion
5.2.4	☐	Fast Tracked Certificate

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____
Signature **Date:**

Printed Name:

_____

R 401 Executive Summary
Utah State University
PhD Degree in Aerospace Engineering
Department of Mechanical and Aerospace Engineering
August 2014

Program Description

The Department of Mechanical and Aerospace Engineering (MAE) at USU seeks to offer a new PhD (Doctor of Philosophy) degree program in Aerospace Engineering to complement the current MS in Aerospace Engineering and the current MS and PhD programs in Mechanical Engineering. Aerospace Engineering is the primary branch of engineering associated with design, construction, testing, and technology development for all types of flying vehicles including airplanes, rockets, missiles, and spacecraft. Currently, the PhD in Mechanical Engineering degree is being used to accommodate both mechanical and aerospace engineering graduate students who successfully complete the Mechanical Engineering doctoral program. The proposed new degree program will establish a separate degree path for aerospace engineering graduate students and attract new students that specifically desire a PhD graduate degree in Aerospace Engineering. This can be accomplished without any change to our current faculty, staff, and coursework.

Role and Mission Fit

The proposed PhD graduate degree program in Aerospace Engineering is consistent with the role of USU as set forth in Regent's Policy R312. The PhD in Aerospace Engineering will support the Regent's mission for a doctoral granting institution "*through discovery, creation, and transmission of knowledge through a graduate educational program."* More specifically, Regent's Policy R312-4.1.2 states that "*the mission of Utah State University is to be one of the nation's premier student centered land grant and space grant universities by fostering the principle that academics come first; by cultivating diversity of thought and culture; and by serving the public through learning, discovery, and engagement.*" Additionally, the proposed program is complementary to ongoing research at the Space Dynamics Lab (SDL). In a letter of support from the USU Research Foundation (USURF), President Scott Hinton states that *"USURF and SDL would welcome and encourage an Aerospace PhD at USU. We think that the program you are proposing would complement and support much of the work that is the core of SDL's business."*

Faculty

The MAE department has 16 tenured and tenure-track faculty members, all with doctoral degrees. Eight faculty members, including four with doctoral degrees in Aerospace Engineering, have expertise directly related to the proposed aerospace engineering program as well as current research projects in aerospace that will support the proposed PhD degree program.

Labor Market Demand

Nearly 80,000 engineers are currently employed in aerospace, significantly higher than the number employed in computer hardware, nuclear engineering, biomedical engineering or chemical engineering, among other fields. (IEEE, http://www.todaysengineer.org/2012/may/career-focus.asp) Over the decade from 2012 to 2022, the Bureau of Labor Statistics projects a 7% growth in employment for aerospace engineers. Overall, Utah is one of the top ten states in the nation in the concentration of aerospace employment. Given the large

concentration of aerospace industries in Utah, USU graduates with a PhD in aerospace engineering will clearly be "first in line" to fill these available high-paying positions; keeping "home-grown" talent "close to home."

Student Demand

Presently the MAE department supports a PhD in Mechanical Engineering. A new PhD in Aerospace Engineering will provide graduate students with an option that is more focused on the specialized topics that are central to aerospace engineering. Graduates with a PhD in aerospace engineering will be better prepared and more competitive in the aerospace industry. Students wanting a PhD degree in aerospace engineering will be able to stay in Utah rather than go out of state. As stated previously, this change will help to keep home-grown talent close to home.

When the PhD in Aerospace Engineering program is approved, there exists a potential for an initial small decrease in the number of students pursuing a PhD in Mechanical Engineering. However, because of the previously-described market demand and the desire of many students to choose a program with a PhD in Aerospace Engineering, overall enrollment is in MAE's PhD programs is projected to increase during the next five years.

Statement of Financial Support

Indicate from which of the following the funding for this new degree program will be generated:

- Legislative Appropriation ..... ☐
- Grants..... ☒
- Reallocated Funds..... ☒
- Tuition dedicated to the program ..... ☐
- Other ..... ☒

The MAE's full-time PhD graduate students receive graduate research or graduate teaching assistantships to help finance their education. All of the research assistantships are supported by grants and contracts initiated by the faculty. These grants and contracts also provide research equipment, materials, and supplies used by the students in their courses and research associated with the PhD degree.

Similar Programs Already Offered in the USHE

Currently, there no Aerospace Engineering PhD degree within the Utah System of Higher Education. Thus, offering the Aerospace PhD degree better positions USU to capture regional talent that would otherwise leave the state. A flourishing PhD program in aerospace engineering will likely attract students who would not have previously considered USU.

R 401 Proposal
PhD Degree in Aerospace Engineering
Department of Mechanical and Aerospace Engineering
Utah State University

Section I: The Request

Utah State University (USU) requests approval to offer the Doctor of Philosophy degree in Aerospace Engineering effective Fall Semester 2015. The program has been approved by the institutional Board of Trustees on xx.

Section II: Program Description

Overview

The Department of Mechanical and Aerospace Engineering (MAE) at USU seeks to offer a new PhD (Doctor of Philosophy) degree program in Aerospace Engineering to complement the current MS in Aerospace Engineering and the current MS and PhD programs in Mechanical Engineering. Aerospace Engineering is the primary branch of engineering associated with design, construction, testing, and technology development for all types of flying vehicles including airplanes, rockets, missiles, and spacecraft. Currently, the PhD in Mechanical Engineering degree is being used to accommodate both mechanical and aerospace engineering graduate students who successfully complete the Mechanical Engineering doctoral program. The proposed new degree program will establish a separate degree path for aerospace engineering graduate students and attract new students that specifically desire a PhD graduate degree in Aerospace Engineering. MAE offers sufficient foundation and aerospace courses that provide the breadth and depth needed for a quality aerospace PhD degree program without the need to develop any new courses.

PhD Degree Requirements

The PhD degree requires 72 credit hours beyond the bachelor's degree and 42 credit hours beyond the Master's degree and will comply with all Graduate School requirements for PhD programs of study including a formal dissertation. All students must pass 3 PhD Qualifier Exams, a dissertation proposal defense, and a final dissertation defense. PhD degree requirements also consists of core courses (5000-, 6000-, and 7000-level) in aerospace engineering, advanced mathematics, technical electives, and quality aerospace research. A summary of PhD degree requirements is provided below.

Aerospace Engineering (PhD) Degree Requirements

Beyond the BS - 72 credits

Coursework*:

24 credits (minimum) Aerospace Core
- must include MAE 5500 and 5560 if not previously completed

21 credits (minimum) Aerospace Electives/Other
- No more than 6 credits MAE 7930 Doctoral Publications
- No more than 6 credits MAE 5930/6930/7930 Independent Study courses.

Beyond the MS - 42 credits

Coursework*:

12 credits (minimum) Aerospace Core
- must include MAE 5500 and 5560 if not previously completed

6 credits (minimum) Aerospace Electives/Other
- No more than 6 credits MAE 7930 Doctoral Publications
- No more than 6 credit MAE 5930/6930/7930 Independent Study courses.

6 credits advanced math	3 credits advanced math
Dissertation Research 21 credits MAE 7970	**Dissertation Research** 21 credits MAE 7970
Dissertation Proposal & Final Defense	**Dissertation Proposal & Final Defense**
*No more than 21 credits of 5000- level coursework	*No more than 15 credits of 5000- level coursework

Purpose of the Degree

The new degree program will attract new PhD students to the MAE graduate studies and research program and provide graduate students with the opportunity to receive a degree more directly aligned with the academic and research skills that are critical to the aerospace industry. Students completing this degree program will possess skills sought by research organizations in industry, government, and academia requiring advanced design, research, and technical management in aerospace engineering. The PhD in Aerospace Engineering will support the Utah-based aerospace industry, as well as other prominent regional and national aerospace companies and research laboratories.

Institutional Readiness

The new degree program will be administered by the MAE Department, which has in place the administrative infrastructure necessary to manage the program. There is a graduate committee that oversees the graduate programs and a full-time staff member assigned to the graduate program. Presently, the MAE department supports a PhD program in Mechanical Engineering. The PhD program in Aerospace Engineering will place more emphasis on core aerospace engineering coursework, but will not require additional institutional resources or the development of new courses. In a very real sense, the level of effort and cost to administer this degree program will be the same as that already being accomplished for the Mechanical Engineering PhD degree.

Faculty

Eight faculty members in MAE have appropriate backgrounds and research interests in aerospace engineering to support the program. In the past, these faculty members have supported the MS program in Aerospace Engineering and a degree specialization in aerospace under the MS program in mechanical engineering.

Professors:

Christine Hailey - PhD Mechanical Engineering, University of Oklahoma, 1985 (aerodynamics and flight mechanics)

Associate Professors:

Rees Fullmer – PhD Mechanics Engineering, University of Utah, 1985 (guidance, navigation and control)
Steven Folkman - PhD Mechanical Engineering, Utah State University, 1990 (aerospace structures)
David Geller - PhD Space Physics and Astronomy, Rice University, 1999 (guidance, navigation and control)
Steven Whitmore - PhD Aerospace Engineering, University of California, Los Angeles, 1989 (flight mechanics and propulsion)

Assistant Professors:

Aaron Katz - PhD Aeronautics and Astronautics, Stanford University, 2009 (computational fluid dynamics)

Currently two additional faculty positions are being filled at the assistant professor level to support the needs of the Aerospace Engineering curriculum.

Staff
Additional staff lines will not be required. The current resources within the Department of Mechanical and Aerospace Engineering will be able to accommodate this new program.

Library and Information Resources
Two major library resources needed for the new program are the IEEE Xplore database and a series of journals produced by the American Institute of Aeronautics and Astronautics. The Merrill-Cazier library presently subscribes to these resources. See attached letter from the Merrill-Cazier Library.

Admission Requirements
Applicants with a bachelor's or master's degree in Aerospace Engineering or Mechanical Engineering from an ABET-accredited program can apply. For unrestricted admission to the program, students are required to have a minimum 3.3 GPA and successfully pass the GRE exam. The subject GRE is not required. Additional coursework in aerospace engineering fundamentals may be required in individual cases. All graduate students are expected to have a working knowledge of a computer programming language.

Student Advisement
The mechanics of admission to the programs and fulfilling program requirements are handled by our full-time staff graduate advisor. As students are admitted to the program, they are assigned a temporary faculty advisor who guides them on which courses to take the first semester and how to prepare for the PhD Qualification Exams. During the first semester, students select a graduate committee and a major professor who advise them throughout the rest of their program.

Justification for the Number of Credits
The number of credits required for this program is the same as the currently offered PhD in Mechanical Engineering which is overseen by the Graduate School.

External Review and Accreditation
As with the current PhD program in Mechanical Engineering and practice throughout the United States, no accreditation will be sought.

Projected Enrollment

Table 1. Projected enrollment for the PhD Aerospace Engineering Degree.

Year	Student FTE	Student Headcount	# of Faculty	Mean FTE-to-Faculty Ratio
1	4	4	8	0.50
4	6	6	8	0.75
3	8	8	8	1.00
4	9	9	8	1.13
5	10	10	8	1.25

Section III: Need

Program Need

Within the intermountain region, only Arizona State University, University of Arizona, and the University of Colorado at Boulder offer PhD programs in Aerospace Engineering. There are no Aerospace Engineering PhD degree programs in Wyoming, Nevada or Idaho, or within the Utah System of Higher Education (USHE). Thus, offering the Aerospace PhD degree better positions USU to capture regional talent that would otherwise leave the state. A flourishing PhD program in aerospace engineering will likely attract students who would not have previously considered USU.

Labor Market Demand

Nearly 80,000 engineers are currently employed in aerospace, significantly higher than the number employed in computer hardware, nuclear engineering, biomedical engineering or chemical engineering, among other fields. (IEEE, http://www.todaysengineer.org/2012/may/career-focus.asp) According to the U.S. Department of Labor, Bureau of Labor Statistics, aerospace engineers are expected to have a 7% growth in employment during the decade of 2012 to 2022.

Overall, Utah is one of the top ten states in the nation in the concentration of aerospace employment. In 2011, the Economic Development Corporation of Utah listed the leading aerospace organizations in Northern Utah. Largest amongst these organizations is Hill Air Force Base (HAFB) located just south of the city of Ogden, and near the towns of Clearfield, Riverdale, Roy, Sunset, and Layton. HAFB is the host unit for the USAF Material Command's 75th Air Base Wing. This unit provides support for the Ogden Air Logistics Complex (OALC) and its subordinate organizations. The OALC is the worldwide manager for a wide range of aircraft, engines, missiles, software, avionics, and accessories components. The largest private employer is Alliant Technology Systems (ATK) with the Space Systems Division groups located in Magna and Promontory, and its Aerospace Structures Division in Clearfield.
These large-scale employers are supported by a significant group of medium-sized employers including Aircraft and Space Defense Groups of Moog Inc., the Parker-Hannifin Corporation, Boeing Utah Company, and the Northrop Grumman Space and Missile Systems Group, all of Layton, Utah.

The Space Dynamics Laboratory, North Logan, Utah is a University Affiliated Research and Development Center (UARC) and a sub-unit of the Utah State University Research Foundation (USURF). It is a medium-sized non-commercial employer of aerospace engineers. SDL expects to continue to hire new PhD aerospace engineers as they have done for the past 50 years, and it would be to SDL's advantage if these PhD engineers were "home-grown" right in their own backyard.

Multiple small private supplier and integration organizations provide to this network of large-to medium scale employers. Examples of these small support vendors include Compositex, Inc., Sandy, Utah, a manufacturer of rocketry cases and nozzles; Groen Brothers Aviation Global, Inc., Salt lake City, Utah, a designer of high-performance rotorcraft for both civil and military applications; Borsight, Inc., Ogden, Utah, an aerospace systems integrator; and Hypercomp, Inc., Brigham City, Utah, a manufacturer of composite pressure vessels.

Despite the changing environment of the aerospace industry, where NASA's operations have scaled back significantly, demand for aerospace engineers by private, commercial, and national defense employers is still strong. Over the decade from 2012 to 2022, the Bureau of Labor Statistics projects a 7% growth in employment for aerospace engineers. This growth is primarily driven by two emerging markets 1) unmanned aerial vehicle (UAV) and their integration into civil airspace, and 2) commercial space ventures both crewed and robotic. These emerging markets will require the creation and development of a wide swath of highly specialized technologies in order to become viable, and will clearly support a large pool of employees with

advanced aerospace engineering degrees. Given the large concentration of aerospace industries in Utah, USU graduates with a PhD in aerospace engineering will clearly be "first in line" to fill these high-paying positions; keeping "home-grown" talent "close to home." USU and SDL already host the annual "SmallSAT" international conference on small spacecraft technologies; and the introduction of the PhD degree in Aerospace Engineering will better position Utah State to become the de facto leader of small spacecraft world.

Student Demand
Presently the MAE department supports a PhD in Mechanical Engineering. A new PhD in Aerospace Engineering will provide graduate students with an option that is more focused on the specialized topics that are central to aerospace engineering. Graduates with a PhD in aerospace engineering will be better prepared and more competitive in the aerospace industry. Students wanting a PhD degree in aerospace engineering will be able to stay in Utah rather than go out of state. As stated previously, this change will help to keep home-grown talent close to home.

When the PhD in Aerospace Engineering program is approved, there exists a potential for an initial small decrease in the number of students pursuing a PhD in Mechanical Engineering. However, because of the previously-described market demand and the desire of many students to choose a program with a PhD in Aerospace Engineering, overall enrollment is in MAE's PhD programs is projected to increase during the next five years.

Section IV: Impact and Benefits

Collaborations with and Impact on Other USHE Institutions
There will be no impact on other USHE institutions.

Benefits
The PhD in Aerospace Engineering will directly impact the goals of the USHE to prepare a workforce and develop advanced aerospace technologies that will directly impact Utah's economy. This proposed degree will make USU graduates more competitive for aerospace engineering positions within Utah as well as elsewhere in the aerospace industry. By having more engineers educated and trained for their needs, the Utah aerospace companies are, presumably, going to be more competitive in competing for new contracts and developing new aerospace technologies.

Consistency with Institutional Mission
The mission of USU is to be one of the nation's premier student-centered land-grant and space-grant universities by fostering the principle that academics come first, by cultivating diversity of thought and culture, and by serving the public through learning, discovery, and engagement.

The proposed PhD in Aerospace Engineering enhances the University's reputation as a space-grant institution through both its graduates and research productivity. It supports the University Mission Statement in the following ways:

1. The department becomes more student-centered by providing a program to meet the needs of the students.

2. The doctoral program will improve academics in aerospace engineering by fostering research in the forefront of the field, consistent with the USU mission to be one of the nation's premier space-grant universities.

The doctoral program will serve the public by application of the research produced. It will also serve the growing aerospace industry in Utah with a better-prepared work force.

Section V: Program and Student Assessment

Program Assessment

The major goal for the program is to graduate PhD students with expertise in aerospace engineering and who are prepared to meet the needs of research organizations in industry and academia. Attainment of this goal will be measured by the placement rate of graduates within local and national research laboratories in industry, government, and academia.

Expected Standards of Performance

The standard of performance for all students is a grade of C or better in all classes required for the degree and to maintain an overall program GPA of 3.0 or higher in order to graduate with a PhD degree. In addition, all PhD students must satisfactorily pass a set of qualification exams within 3 semesters of being admitted to the aerospace engineering PhD program, and pass a dissertation defense upon completion of their dissertation research. PhD students are also expected to publish in peer-reviewed journals before completing their PhD program of study. These standards are already well established in the Graduate School as well as for the existing Mechanical Engineering PhD degree program.

Section VI: Finances

Funding Sources

The proposed PhD in Aerospace Engineering builds on MAE's MS in Aerospace Engineering Program and the aerospace specialization in place within MAE's undergraduate program. Additional funding is not required.

Reallocation

No budget transfers or reallocations will be requested or needed to offer a quality program as explained in the next section.

Impact on Existing Budget

A new aerospace PhD degree will enhance the MAE graduate program with virtually no impact on existing budgets.

Faculty: This new degree will have no impact on faculty salaries since new faculty positions are not needed to offer the degree. In reality, each professor is constantly managing his/her time to maintain a research program that includes preparing proposals, contract management, student mentoring, teaching courses, publishing research results, and providing University and professional service. Experience has shown that even though the required student contact time increases with the number of graduate advisees, the overall workload may not increase but actually decrease because there is more graduate student support for developing and maintaining the research productivity. The MAE Faculty feels that the benefits of the projected enrollment offset the time costs to manage the program.

Staff: This new degree program will have no impact on staff work load and staff salaries.

Facilities: During the past five years, the MAE department has been planning for and working toward increased graduate enrollment and has sufficient office/study space to accommodate the expected small enrollment increase. Most of the incidental cost associated with graduate students is already covered by the research grants/contracts and F&A return such that the impact on E&G funds is essentially zero.

Operating Costs: Increase in enrollment results in increased copy service charges and other miscellaneous expenses. MAE has already been using electronic communications more and more to curb paper and copy expenses. This will continue such that these costs will be minimal for this degree program. In summary, the additional work load imposed by this degree is minimal and will have no impact on tasks that would normally be done by current faculty and staff.

Budget Explanation: Salaries, wages, and benefits represent the expenses associated with teaching the courses for the new PhD Aerospace program. Since these courses are already being taught, the revenue to pay for these expenses is simply a reallocation within current department funds. Thus, the difference, revenue less expenses, is zero. The teaching expenses are based on eight faculty members with an approximately 50% teaching role assignment, and with a 50/50 split between mechanical engineering courses and aerospace engineering courses. The expenses are thus approximately 25% of our current salaries, wages, and benefits for these faculty members. Note that any additional expenses associated with research will be externally funded.

Comments for Table 2:

- FTE = 10 credits
- Tuition increase is estimated at 8%.
- Salary and Wages increase is estimated at 3%.
- Benefit increase follows the Sponsored Programs rates
- No new funding is required for this program.

Table 2. Projected Aerospace PhD Program Revenue and Expenses

		Year 1	Year 2	Year 3	Year 4	Year 5
Students						
	Projected FTE	4	6	8	9	10
	Cost Per FTE	12,173	10,843	9,811	9,455	9,139
	Student/Faculty Ratio	0.50	0.75	1.00	1.13	1.25
Projected Tuition						
	Gross Tuition	21,897	35,473	51,081	62,063	74,476
	Tuition to Program	0	0	0	0	0
5 Year Budget Projection						
		Year 1	Year 2	Year 3	Year 4	Year 5
Expenses						
	Salaries & Wages					
	Benefits					

	Total Personnel	N/A – All costs are currently covered in existing programs. There are no additional faculty or staff FTE, library or other operational funds required				
	Current Expense					
	Travel					
	Capital					
	Library Expense					
Total Expense						
Revenue						
	Legislative Appropriation					
	Grants	N/A – Funded through existing resources				
	Reallocation					
	Tuition to Program					
	Fees					
Total Revenue						
Difference	Revenue-Expense	0	0	0	0	0

Appendix A: Program Curriculum

All Program Courses

PhD Beyond BS

Course Requirements	Credit Hours (minimum)
Core Courses	24
Math Courses	6
Dissertation Research	21
Technical electives/other credits	21
Total Credits	72

PhD Beyond MS

Course Requirements	Credit Hours (minimum)
Core Courses	12
Math Course	3
Dissertation Research	21
Technical electives/other credits	6
Total Credits	42

Existing Aerospace Core Courses

Fall Semester

- MAE 5500 Aerodynamics
- MAE 5560 Dynamics of Space Flight
- MAE 6500 Potential Flow
- MAE 6510 Aircraft Dynamics and Flight Simulation
- MAE 6540 Advanced Astrodynamics
- MAE 7540 Advanced Astrodynamics Techniques/Applications

Spring Semester

- MAE 6340 Spacecraft Attitude Control
- MAE 6560 Spacecraft Navigation
- MAE 6930 Advanced Control of Aero Vehicles

Summer Semester

- MAE 6530 Advanced Propulsion
- MAE 6570 Optimal Space Guidance
- MAE 6930 Monte Carlo and Linear Covariance Techniques
- MAE 7560 Optimal Estimation/Aerospace

Aerospace Technical Electives

Fall Semester

- MAE 5310 Dynamic Systems and Controls
- MAE 5420 Compressible Fluid Flow
- MAE 6180 Dynamics & Vibrations
- MAE 6410 Fluid Dynamics

MAE 7360 Optimal and Robust Control
MAE 6320 Linear Multivariable Control
ECE 5230 Space Systems Engineering
ECE 6240 Space Environment Engineering
ECE 6650 Optics I

Spring Semester

MAE 5440 Computational Fluid Dynamics
MAE 5510 Dynamics of Atmospheric Flight
MAE 5540 Propulsion Systems
MAE 6440 Advanced Computational Fluid Dynamics
MAE 6490 Turbulence*
MAE 6550 Advanced Structural Analysis
MAE 7330 Nonlinear and Adaptive Control
MAE 7350 Intelligent Control Systems

All Semesters (Fall, Spring, and Summer)

MAE 5930, 6930, 7930 Special Topics (must be Aero focused)

Approved Mathematics Courses

a. MATH 5270: Complex Variables
b. MATH 5410: Methods of Applied Mathematics
c. MATH 5420: Partial Differential Equations
d. MATH 5460: Introduction to Theory and Application of Nonlinear Dynamics Systems
e. MATH 5760: Stochastic Processes
f. MATH 6270: Complex Variables
g. MATH 6410: Ordinary Differential Equations I
h. MATH 6420: Partial Differential Equations I
i. MATH 6440: Ordinary Differential Equations II
j. MATH 6450: Partial Differential Equations II
k. MATH 6470: Advanced Asymptotic Methods
l. MATH 6610: Numerical Analysis
m. MATH 6620: Numerical Analysis
n. MATH 6640: Optimization
o. ECE 6010: Stochastic Processes in Electronic Systems
p. ECE 6030: Mathematical Methods for Signals and Systems
q. STAT 5200 Design of Experiments
r. MAE 7560 Optimal Estimation for Aerospace Systems

New Courses to be Added in the Next Five Years

No new courses are currently planned. However, to enhance the program and continually strengthen its relevance, it is expected that new courses will be integrated over time into the program using well established practices.

Appendix B: Program Schedule

The following is a sample program of study for the Aerospace Engineering PhD beyond the BS.

PhD Aerospace Engineering (Year 1)			**Yr 1 Credits**
Fall 1	**Spring 1**	**Summer 1**	
MAE 5500	MAE 6340	MAE 6530	
MAE 5560	MAE 5540[1]		
MAE 5420[1]	MAE 5440[1]		
9 hours	9 hours	3	21
[1] Technical Elective			

PhD Aerospace Engineering (Year 2)			**Yr 2 Credits**
Fall 2	**Spring 2**	**Summer 2**	
MAE 6500	MAE 6560	MAE 6570	
MAE 6540	Math 5420		
MAE 5310[1]	MAE 6440[1]		
9 hours	9 hours	3 hours	21
[1] Technical Elective			

PhD Aerospace Engineering (Year 3)			**Yr 3 Credits**
Fall 3	**Spring 3**	**Summer 3**	
MAE 6410[1]	MAE 7970	MAE 7560[m]	
ECE 5230[1]			
6 hours	9 hours	3 hours	18
[1] Technical Elective	[m] Math Course		

PhD Aerospace Engineering (Year 4)			**Yr 4 Credits**
Fall 4	**Spring 4**	**Summer 4**	
MAE 7970	MAE 7970		
6 hours	6 hours		12
		Total Credits	72

The following is a sample program of study for the Aerospace Engineering PhD beyond the MS.

PhD Aerospace Engineering (Year 1)			**Yr 1 Credits**
Fall 1	**Spring 1**	**Summer 1**	
MAE 5500	MAE 6340	MAE 6530	
MAE 5560	MAE 5540[1]		
MAE 5420[1]	MATH 5420		
9 hours	9 hours	3	21
[1] Technical Elective			

PhD Aerospace Engineering (Year 2)			**Yr 2 Credits**
Fall 2	**Spring 2**	**Summer 2**	
MAE 7970	MAE 7970		
6 hours	6 hours		12
[1] Technical Elective			

PhD Aerospace Engineering (Year 3)			**Yr 3 Credits**
Fall 3	**Spring 3**	**Summer 3**	
MAE 7970	MAE 7970		
6 hours	3 hours		9
		Total Credits	42

Appendix C: Faculty

Professors:
Christine Hailey - PhD Mechanical Engineering, University of Oklahoma, 1985 (aerodynamics and flight mechanics)

Associate Professors:
Rees Fullmer – PhD Mechanics Engineering, University of Utah, 1985 (guidance, navigation and control)
Steven Folkman - PhD Mechanical Engineering, Utah State University, 1990 (aerospace structures)
David Geller - PhD Space Physics and Astronomy, Rice University, 1999 (guidance, navigation and control)
Steven Whitmore - PhD Aerospace Engineering, University of California, Los Angeles, 1989 (propulsion)

Assistant Professors:
Aaron Katz - PhD Aeronautics and Astronautics, Stanford University, 2009 (computational fluid dynamics)

Currently two additional faculty positions are being filled at the assistant professor level to support the needs of the Aerospace Engineering curriculum.

EDUCATIONAL POLICIES COMMITTEE MINUTES

4 September 2014

A meeting of the Educational Policies Committee was held on 4 September 2014 at 3:00 pm in Old Main 136 (Champ Hall Conference Room)

Present: Larry Smith, Chair
Roland Squire, Registrar's Office
Heidi Kesler
Michele Hillard, Secretary
Richard Mueller, College of Science
Karen Mock, Quinney College of Natural Resources
Kevin Olson, Caine College of the Arts (representing Nick Morrison)
Norm Jones, General Education Subcommittee Chair
Flora Shrode (representing Kacy Lundstrom), Libraries
Ed Reeve, Curriculum Subcommittee Chair
Kelly Fadel, Huntsman School of Business
Nathan Straight, Regional Campuses
Thom Fronk, Engineering
Betty Hassell (representing Melanie Nelson), USU-Eastern

Absent: Scott Bates, Academic Standards Subcommittee Chair
Jared Schultz, Education and Human Services
Doug Fiefia, USUSA President
Derek Hastings, Graduate Studies Senator
Dawn Kirby (representing Eddy Berry), Humanities and Social Sciences
Scott DeBerard, Graduate Council

I. Approval of the minutes of the 3 April 2014 meeting

Dick Mueller moved to approve the minutes of the 3 April 2014 meeting. Ed Reeve seconded; motion approved.

II. Subcommittee Reports

a. Curriculum Subcommittee (Ed Reeve)
All courses and changes were approved including the additions of Math & Stats prerequisites.

Norm Jones moved to approve the business of the Curriculum Subcommittee. Richard Mueller seconded; motion approved.

b. Academic Standards Subcommittee (Scott Bates) – No Report

No August 2014 meeting of the Academic Standards Committee.

c. General Education Subcommittee (Norm Jones)

Dick Mueller moved to approve the report of the 19 August 2014 Gen Ed meeting. Kelly Fadel seconded; motion approved.

August 19, 2014, 8:30 A.M.
Champ Hall Conference Room

Present: Dean Adams, College of Engineering; Lawrence Culver, American Institutions; Laura Gelfand, Caine College of the Arts; Norm Jones, Chair; Dawn Kirby, College of Humanities and Social Sciences; Harrison Kleiner, Connections; Shelley Lindauer, Emma Eccles Jones College of Education; Brian McCuskey, Humanities; Kris Miller, Honors; Bob Mueller, Regional Campuses; Dick Mueller, College of Science; Melanie Nelson, USU Eastern; Lauren Skousen, Secretary

Absent: Eddy Berry, Social Sciences; Kathy Chudoba, Business; Dan Coster, Quantitative Intensive; Brock Dethier, Communication Intensive; Cindy Dewey, Creative Arts; Ryan Dupont, Life & Physical Sciences; Doug Fiefia, ASUSU President; Stephanie Hamblin, University Advising; Mary Leavitt, Advising; Kacy Lundstrom, Library; John Mortensen, Student Services; Karen Mock, Natural Resources; Lezlie Park, Writing Program; Lee Rickords, College of Agriculture and Applied Sciences; Larry Smith, Provost's Office

Call to Order – Norm Jones

Approval of Minutes – April 15, 2014
Motion to approve made by Shelley Lindauer; seconded by Brian McCuskey.

Course Approvals
HIST 4822 (DHA) - Withdrawn..... Brian McCuskey
Faculty member withdrew submission.

RELS 3050 (DHA/CI) DHA Approved - CI Withdrawn .....Brian McCuskey/Brock Dethier
CI has been pending since November 19th meeting; will now be removed.

SW 4100 (CI) Approved .....Brock Dethier
Motion to approve made by Dawn Kirby; seconded by Bob Mueller.

Course/Designation Removals
N/A

Syllabi Approvals
N/A

Business
Updated Gen Ed Website:
Norm Jones walked the committee through the website updates as well as the electronic approval process via DocuSign. The general consensus was that the website had been drastically improved and there was excitement over the new tools (syllabus tracking, IDEA course evaluations, electronic approval process, etc.). Brian McCuskey suggested linking the designation criteria to the Citizen Scholar Degree Profile so that faculty members are less likely to focus solely on the degree profile while neglecting the designation criteria.

Nominations and vote for Chair Elect 2015-2016:

Norm Jones called for nominations for Chair elect for 2015-16. Dawn Kirby has been nominated, but nominations remain open. The vote will be held at the September meeting.

III. Other Business

Review of EPC and remind everyone of the R401 approval and review process. Larry handed out the timeline, process flow chart, and R401 submission guide and discussed the policy and procedures.

Meeting adjourned at 3:30 pm

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: *Utah State University*
Proposed Title:
Currently Approved Title:
School or Division or Location:
Department(s) or Area(s) Location: *Department of Computer Science, College of Engineering*
Recommended Classification of Instructional Programs (CIP) Code[1] (for new programs):
Current Classification of Instructional Programs (CIP) Code (for existing programs): *11.07*
Proposed Beginning Date (for new programs): *upon approval*
Institutional Board of Trustees' Approval Date:

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar		
SECTION NO.		ITEM
5.1.1	☐	Minor*
5.1.2	☐	Emphasis*
5.2.1	☐	(CER P) Certificate of Proficiency*
5.2.3	☐	(GCR) Graduate Certificate*
5.4.1	☐	New Administrative Unit
	☐	Administrative Unit Transfer
	☐	Administrative Unit Restructure
	☐	Administrative Unit Consolidation
5.4.2	☐	Conditional Three-Year Approval for New Centers, Institutes, or Bureaus
5.4.3	☐	New Center
	☐	New Institute
	☐	New Bureau
5.5.1	☐	Out-of-Service Area Delivery of Programs
5.5.2	☐	Program Transfer
	☒	Program Restructure
	☐	Program Consolidation
5.5.3	☐	Name Change of Existing Programs
5.5.4	☐	Program Discontinuation
	☐	Program Suspension
5.5.5	☐	Reinstatement of Previously Suspended Program
	☐	Reinstatement of Previously Suspended Administrative Unit

**Requires "Section V: Program Curriculum" of Abbreviated Template*

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Signature Date: *09/04/2014*
Printed Name: *Nicholas S. Flann*

[1] CIP codes must be recommended by the submitting institution. For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.

Program Request - Abbreviated Template
Utah State University
Ph.D. Computer Science
09/01/2014

Section I: Request

The Computer Science Department requests to reduce the total minimum number of credit hours required to complete a Ph.D. to 70 hours, a reduction from the current value of 90. The change is motivated by the desire to bring USU Computer Science in line with other Ph.D. programs within the College of Engineering and with other CS Ph.D. programs at peer institutions, which require no more than 72 hours. We anticipate that this change will increase the competitiveness and effectiveness of our PhD program while having a minimal impact on aggregate instructional activities since reductions in credit hours per student will be offset by an increasing PhD program and student enrollment in classes.

All numbers are minimum credit hours	Existing Ph.D. Program		New Proposed Ph.D. program	
	without MS	with MS	without MS	with MS
7000 level CS	12	12	9	9
Awarded from MS	0	30 (fixed)	0	0 to 30
Seminar CS7900	2	2	2	2
Dissertation	27	27	18	18
Additional courses	33	3	21	3
Remaining courses/dissertation			20	38 – (hours awarded from MS)
Minimum Total	90	90	70	70

There are three principal areas of change: a) the number of minimum dissertation credits is reduced by 9 hours, b) the minimum number of PhD classes is reduced by one class, c) satisfying the remaining credits needed becomes more flexible.

Section II: Need

Computer Science is one of the fastest growing job markets in the world, increasing the demand for graduates at BS, MS and PhD levels. New graduates in the USU CS department are experiencing multiple job offers at salaries higher than previous years. Significantly, this trend also applies to the PhD level principally because computer-related companies (such as Microsoft, Amazon, Google, Apple etc.) have growing internal research labs that seek PhDs to lead research and development of future products. Research shows that more than half of PhD graduates work in industry rather than academia (Taulbee Survey http://cra.org/resources/taulbee/))

According to the Computing Research Association annual Taulbee Survey, Computer Science programs around the country are producing more PhDs than ever before, but increasing demand has kept pace and this additional supply has not diminished employment or salary. Indeed, the Taulbee Survey reports an almost 100% placement and employment of PhDs in professional jobs. Salaries available from the Bureau of Labor Statistics (http://www.bls.gov/ooh/computer-and-

information-technology/home.htm) give the median salary for computer research scientists at $100,800 and tenure-track assistant professors at $85,000 (for smaller public universities) and $100,000 (for large private universities).

In response to these rapid changes and positive future prospects the USU CS PhD program needs to modernize to become more competitive, efficient and tailored to current and future market conditions. The principal problem with the current program is that it takes too long to complete because of unnecessary and burdensome requirements. Specifically, the current minimum 90 credit hour requirement is outdated and exceptionally high compared to peer institutions within the intermountain region and around the country as summarized below (click on the university name to review the complete requirements, or follow the link in the next table):

University	Total	Min. Class	Min. Dissertation
University of Utah	50	27	14
BYU	66	48	18
Montana State Univ.	60	18	18
University of Nevada	72	30	24
Univ. of Pittsburgh	72	36	36
Virginia Commonwealth Univ.	70	42	18
UNC Charlotte	72	18	36
Iowa State Univ.	72	18	36

This reduction in credit hours to 70 brings the USU program into the range of peer institutions and combined with the new streamlined exam and student evaluation procedures (discussed below), will increase the effectiveness and PhD productivity of the department, but not diminish the quality of the PhD product. In fact, it is anticipated that a process more focused on productivity than credit hours will increase the quality of our PhDs.

University	Web link
University of Utah	http://www.cs.utah.edu/graduate/hb2013-14/gradhbk2013-14-phd_cs.html
BYU	https://cs.byu.edu/graduate-policy-handbook-phd-program
Montana State Univ.	http://www.cs.montana.edu/phd-courses.html
University of Nevada	http://www.unr.edu/degrees/computer-science-and-engineering/phd?view=requirements
Univ. of Pittsburgh	https://cs.pitt.edu/grad/phd.php
Virginia Commonwealth Univ.	http://www.pubapps.vcu.edu/Bulletins/graduate/?did=20281
UNC Charlotte	https://cci.uncc.edu/degree-requirements-current
Iowa State Univ.	https://www.cs.iastate.edu/graduate/cs_phd.php

In tandem with this proposed change, the CS department has implemented a new exam schedule (http://cs.usu.edu/htm/ph-d-examination-policy/) and is introducing a new annual evaluation policy of PhD student's productivity similar to the procedure for faculty evaluations. Students enter data describing their research, teaching and service contributions into a digital measure-like system and are then ranked using a published rubric. Student progress is reviewed by the departmental graduate committee and anonymized data is presented to the faculty, enabling faculty to identify poor and excellent students. The department then recognizes excellent students with awards during the

annual graduate student reception. Students making unacceptable progress will be warned their first year and then if no improvement is made the second year, departmental support will be withdrawn.

Section III: Institutional Impact

It is anticipated that this change will enable the CS department to increase enrolment within the CS PhD program while maintaining or increasing admission standards because we will be offering a more competitive product.

No change in administrative structure will be required.

The CS department is growing in faculty and in students so it is anticipated that planned and actual new hires in faculty will fully support these proposed changes in the PhD program. No new staff will be needed.

Current facilities will continue to be adequate.

Section IV: Finances

We anticipate no major cost increases or savings from this change.

In addition to those standard procedures in place for PhD and plan A MS students, faculty in the CS department include monies for tuition awards in their grant proposals as required by the COE.

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: Utah State University
Proposed Title: B.S. in Geology with Applied Environmental Geoscience Emphasis (new emphasis)
Currently Approved Title: B.S. in Applied Environmental Geoscience (to be discontinued)
School or Division or Location: College of Science
Department(s) or Area(s) Location: Geology
Recommended Classification of Instructional Programs (CIP) Code[1] (for new programs): 40.0601
Current Classification of Instructional Programs (CIP) Code (for existing programs): 40.0699
Proposed Beginning Date (for new programs): 01/07/2015
Institutional Board of Trustees' Approval Date:

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar		
SECTION NO.		ITEM
5.1.1	☐	Minor*
5.1.2	X	Emphasis*
5.2.1	☐	(CER P) Certificate of Proficiency*
5.2.3	☐	(GCR) Graduate Certificate*
5.4.1	☐	New Administrative Unit
	☐	Administrative Unit Transfer
	☐	Administrative Unit Restructure
	☐	Administrative Unit Consolidation
5.4.2	☐	Conditional Three-Year Approval for New Centers, Institutes, or Bureaus
5.4.3	☐	New Center
	☐	New Institute
	☐	New Bureau
5.5.1	☐	Out-of-Service Area Delivery of Programs
5.5.2	☐	Program Transfer
	☐	Program Restructure
	☐	Program Consolidation
5.5.3	☐	Name Change of Existing Programs
5.5.4	X	Program Discontinuation
	☐	Program Suspension
5.5.5	☐	Reinstatement of Previously Suspended Program
	☐	Reinstatement of Previously Suspended Administrative Unit

**Requires "Section V: Program Curriculum" of Abbreviated Template*

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____
Signature Date:

Printed Name:

[1] CIP codes must be recommended by the submitting institution. For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.

Program Request - Abbreviated Template
Utah State University
Bachelor of Science in Geology with an Applied Environmental Geoscience Emphasis
08/22/2014

Section I: Request

This request is to discontinue the current Bachelor of Science degree in Applied Environmental Geoscience and instead create an emphasis in Applied Environmental Geoscience in the existing Bachelor of Science degree in Geology.

Section II: Need

The Bachelor of Science (BS) in Applied Environmental Geoscience (AEG) has been in place for more than four years, but very few students have chosen to pursue this degree. From interviews with these students as well as other Geology majors, a serious concern that has been expressed is the value of the AEG degree, both in terms of its employability following graduation and its desirability for prospective graduate programs. Consequently, the Department of Geology at Utah State University has decided to discontinue the BS in AEG and instead offer an AEG emphasis in the existing BS in Geology due to the professional recognition of USU's Geology BS that already exists among both potential employers and other institutions of higher education that offer graduate degrees in the Earth and Geological Sciences.

Furthermore, because of concerns expressed by AEG majors during interviews regarding some of the elective courses for the BS in AEG, the Department of Geology has reassessed the curriculum and has made changes to the electives for the AEG emphasis in the BS in Geology that will make it more beneficial and attractive to students, and thus more enticing to potential majors. Please note, however, that the total number of credit hours required for both the BS in AEG and the AEG emphasis in the BS in Geology is exactly the same.

Finally, while the current AEG majors will be accommodated to allow completion of their degrees according to the existing requirements after the program is discontinued, all of the students interviewed have expressed their desire to switch to the AEG emphasis in Geology if it is approved for the reasons described above.

Section III: Institutional Impact

The proposed change is not anticipated to affect enrollments in any other instructional programs of affiliated departments or programs, nor will the proposed change affect any existing administrative structures. No changes in faculty or staff will be required, nor will any new physical facilities or modification to existing facilities be required. No equipment will need to be committed to initiate this change.

Section IV: Finances

The proposed change is not anticipated to result in any costs or savings to the Geology Department, College of Science, or Utah State University, nor are any budgetary impacts on other programs or units within Utah State University anticipated.

Section V: Program Curriculum

THIS SECTION OF THE TEMPLATE REQUIRED FOR EMPHASES, MINORS, AND CERTIFICATES ONLY

All Program Courses (with New Courses in Bold)

Course Prefix and Number	Title	Credit Hours
Required Courses	GEO 1110 - Physical Geology	3
	GEO 1115 - Physical Geology Laboratory	1
	GEO 3200 - Earth Through Time	4
	GEO 3500 - Minerals and Rocks	4
	GEO 3550 - Sedimentation and Stratigraphy	4
	GEO 3600 - Geomorphology	4
	GEO 3700 - Structural Geology	4
	GEO 4700 - Geologic Field Methods	3
	GEO 5200 - Geology Field Camp	5
	GEO 5600 - Geochemistry	3
	CHEM 1210 - Principles of Chemistry I	4
	CHEM 1215 - Principles of Chemistry Lab I	1
	CHEM 1220 - Principles of Chemistry II	4
	CHEM 1225 - Principles of Chemistry Lab II	1
	MATH 1210 - Calculus I	4
	STAT 3000 - Statistics for Scientists	3
	PHYS 2210 - Physics for Sci and Engr I	4
	PHYS 2215 - Physics for Sci and Engr Lab I	1
	BIOL 1610 - Biology I	4
	BIOL 1620 - Biology II	4
	GEOG 1800 - Intro to GIS	3
	Sub-Total	68
Elective Courses	PSC 3000 - Fundamentals of Soil Sci and	4
	PSC 5130 – Soil Genesis, Morph, and Class	4
	OR	
	WATS 3700 – Fund of Watershed Sci and	3
	WATS 4490 – Small Watershed Hydrology	4
	GEO 5630 – Geologic Image Analysis or	3
	WATS 4930 – Adv GIS and Spatial Anal or	3
	WATS 5003 – Remote Sensing Land Surf or	4
	WILD 5750 – Applied Remote Sensing	3
	BIOL 2220 – General Ecology or	3
	CHEM 3650 – Environmental Chemistry or	3
	PSC 3820 – Climate and Climate Change	3
	Sub-Total	13 - 15
Track/Options (if applicable)		
	Sub-Total	
*(This is the same number of credits as the BS in AEG)	Total Number of Credits	81 - 83

Program Schedule

Freshman Year (29 credits)

Fall Semester (13 credits)

GEO 1110 - Physical Geology (BPS) (3)
GEO 1115 - Physical Geology Laboratory (1)
CHEM 1210 - Principles of Chemistry I (4)
CHEM 1215 - Principles of Chemistry Laboratory I (1)
MATH 1210 - Calculus I (QL) (4)

Spring Semester (16 credits)

GEO 3200 - Earth Through Time (DSC) (4)
GEO 3500 - Minerals and Rocks (4)
CHEM 1220 - Principles of Chemistry II (BPS) (4)
CHEM 1225 - Principles of Chemistry Laboratory II (1)
ENGL 1010 - Introduction to Writing: Academic Prose (CL1) (3)

Sophomore Year (30 credits)

Fall Semester (16 credits)

GEO 3550 - Sedimentation and Stratigraphy (4)
BIOL 1610 - Biology I (4)
PHYS 2210 - Physics for Science and Engineering I (QI) (4)
PHYS 2215 - Physics for Science and Engineering Laboratory I (1)
ENGL 2010 - Intermediate Writing: Research Writing in a Persuasive Mode (CL2) (3)

Spring Semester (14 credits)

GEO 3700 - Structural Geology (4)
BIOL 1620 - Biology II (BLS) (4)
Breadth American Institutions (BAI) course (3)
Breadth Creative Arts (BCA) course (3)

Junior Year (30-31 credits)

Fall Semester (13 credits)

GEO 3600 - Geomorphology (4)
GEO 4700 - Geologic Field Methods (CI) (3)
GEOG 1800 - Introduction to Geographic Information Systems (3)
Breadth Humanities (BHU) course (3)

Spring Semester (12-13 credits)

STAT 3000 - Statistics for Scientists (QI) (3)
PSC 3000 - Fundamentals of Soil Science (4) or
WATS 3700 - Fundamentals of Watershed Science (3)
BIOL 2220 - General Ecology (3) or
CHEM 3650 - Environmental Chemistry (3) or
PSC 3820 - Climate and Climate Change (3)
Breadth Social Sciences (BSS) course (3)

Summer Semester (5 credits)

GEO 5200 - Geology Field Camp (5)

Senior Year (30-31 credits)

Fall Semester (15 credits)

PSC 5130 - Soil Genesis, Morphology, and Classification (4) (if PSC 3000 taken in previous spring)
WILD 5750 - Applied Remote Sensing (3) (if neither WATS 4930 nor WATS 5003 taken in following spring)

Communications Intensive (CI) course (3)
Depth Humanities and Creative Arts (DHA) course (3)
Electives (2-9)

Spring Semester (15-16 credits)

GEO 5600 - Geochemistry (3)
WATS 4490 - Small Watershed Hydrology (4) (if WATS 3700 taken in previous spring)
WATS 4930 - Advanced GIS and Spatial Analysis (3) or
WATS 5003 - Remote Sensing of Land Surfaces (4) (if WILD 5750 not taken in fall)
Depth Social Sciences (DSS) course (3)
Electives (2-9)

Cover/Signature Page – Full Template

Institution Submitting Request: Utah State University
Proposed Title: PhD Degree in Aerospace Engineering
School or Division or Location: College of Engineering
Department(s) or Area(s) Location: Mechanical and Aerospace Engineering
Recommended Classification of Instructional Programs (CIP) Code[1] : 14.0201
Proposed Beginning Date: 08/01/2015
Institutional Board of Trustees' Approval Date: MM/DD/YEAR

Proposal Type (check all that apply):

Regents' Agenda Items		
R401-4 and R401-5 Approval by Committee of the Whole		
SECTION NO.		ITEM
4.1.1	☐	(AAS) Associate of Applied Science Degree
4.1.2	☐	(AA) Associate of Arts Degree
	☐	(AS) Associate of Science Degree
4.1.3	☐	Specialized Associate Degree
4.1.4	☐	Baccalaureate Degree
4.1.5	☐	K-12 School Personnel Programs
4.1.6	☐	Master's Degree
4.1.7	X	Doctoral Degree
5.2.2	☐	(CER C) Certificate of Completion
5.2.4	☐	Fast Tracked Certificate

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____
Signature Date:

Printed Name:

R 401 Executive Summary
Utah State University
PhD Degree in Aerospace Engineering
Department of Mechanical and Aerospace Engineering
August 2014

Program Description

The Department of Mechanical and Aerospace Engineering (MAE) at USU seeks to offer a new PhD (Doctor of Philosophy) degree program in Aerospace Engineering to complement the current MS in Aerospace Engineering and the current MS and PhD programs in Mechanical Engineering. Aerospace Engineering is the primary branch of engineering associated with design, construction, testing, and technology development for all types of flying vehicles including airplanes, rockets, missiles, and spacecraft. Currently, the PhD in Mechanical Engineering degree is being used to accommodate both mechanical and aerospace engineering graduate students who successfully complete the Mechanical Engineering doctoral program. The proposed new degree program will establish a separate degree path for aerospace engineering graduate students and attract new students that specifically desire a PhD graduate degree in Aerospace Engineering. This can be accomplished without any change to our current faculty, staff, and coursework.

Role and Mission Fit

The proposed PhD graduate degree program in Aerospace Engineering is consistent with the role of USU as set forth in Regent's Policy R312. The PhD in Aerospace Engineering will support the Regent's mission for a doctoral granting institution "*through discovery, creation, and transmission of knowledge through a graduate educational program."* More specifically, Regent's Policy R312-4.1.2 states that "*the mission of Utah State University is to be one of the nation's premier student centered land grant and space grant universities by fostering the principle that academics come first; by cultivating diversity of thought and culture; and by serving the public through learning, discovery, and engagement.*" Additionally, the proposed program is complementary to ongoing research at the Space Dynamics Lab (SDL). In a letter of support from the USU Research Foundation (USURF), President Scott Hinton states that *"USURF and SDL would welcome and encourage an Aerospace PhD at USU. We think that the program you are proposing would complement and support much of the work that is the core of SDL's business."*

Faculty

The MAE department has 16 tenured and tenure-track faculty members, all with doctoral degrees. Eight faculty members, including four with doctoral degrees in Aerospace Engineering, have expertise directly related to the proposed aerospace engineering program as well as current research projects in aerospace that will support the proposed PhD degree program.

Labor Market Demand

Nearly 80,000 engineers are currently employed in aerospace, significantly higher than the number employed in computer hardware, nuclear engineering, biomedical engineering or chemical engineering, among other fields. (IEEE, http://www.todaysengineer.org/2012/may/career-focus.asp) Over the decade from 2012 to 2022, the Bureau of Labor Statistics projects a 7% growth in employment for aerospace engineers. Overall, Utah is one of the top ten states in the nation in the concentration of aerospace employment. Given the large concentration of aerospace industries in Utah, USU graduates with a PhD in aerospace engineering will clearly be "first in line" to fill these available high-paying positions; keeping "home-grown" talent "close to home."

Student Demand

Presently the MAE department supports a PhD in Mechanical Engineering. A new PhD in Aerospace Engineering will provide graduate students with an option that is more focused on the specialized topics that are central to aerospace engineering. Graduates with a PhD in aerospace engineering will be better prepared and more competitive in the aerospace industry. Students wanting a PhD degree in aerospace engineering will be able to stay in Utah rather than go out of state. As stated previously, this change will help to keep home-grown talent close to home.

When the PhD in Aerospace Engineering program is approved, there exists a potential for an initial small decrease in the number of students pursuing a PhD in Mechanical Engineering. However, because of the previously-described market demand and the desire of many students to choose a program with a PhD in Aerospace Engineering, overall enrollment is in MAE's PhD programs is projected to increase during the next five years.

Statement of Financial Support

Indicate from which of the following the funding for this new degree program will be generated:

- Legislative Appropriation ..... ☐
- Grants ..... ☒
- Reallocated Funds..... ☒
- Tuition dedicated to the program..... ☐
- Other ..... ☒

The MAE's full-time PhD graduate students receive graduate research or graduate teaching assistantships to help finance their education. All of the research assistantships are supported by grants and contracts initiated by the faculty. These grants and contracts also provide research equipment, materials, and supplies used by the students in their courses and research associated with the PhD degree.

Similar Programs Already Offered in the USHE

Currently, there no Aerospace Engineering PhD degree within the Utah System of Higher Education. Thus, offering the Aerospace PhD degree better positions USU to capture regional talent that would otherwise leave the state. A flourishing PhD program in aerospace engineering will likely attract students who would not have previously considered USU.

R 401 Proposal
PhD Degree in Aerospace Engineering
Department of Mechanical and Aerospace Engineering
Utah State University

Section I: The Request

Utah State University (USU) requests approval to offer the Doctor of Philosophy degree in Aerospace Engineering effective Fall Semester 2015. The program has been approved by the institutional Board of Trustees on xx.

Section II: Program Description

Overview

The Department of Mechanical and Aerospace Engineering (MAE) at USU seeks to offer a new PhD (Doctor of Philosophy) degree program in Aerospace Engineering to complement the current MS in Aerospace Engineering and the current MS and PhD programs in Mechanical Engineering. Aerospace Engineering is the primary branch of engineering associated with design, construction, testing, and technology development for all types of flying vehicles including airplanes, rockets, missiles, and spacecraft. Currently, the PhD in Mechanical Engineering degree is being used to accommodate both mechanical and aerospace engineering graduate students who successfully complete the Mechanical Engineering doctoral program. The proposed new degree program will establish a separate degree path for aerospace engineering graduate students and attract new students that specifically desire a PhD graduate degree in Aerospace Engineering. MAE offers sufficient foundation and aerospace courses that provide the breadth and depth needed for a quality aerospace PhD degree program without the need to develop any new courses.

PhD Degree Requirements

The PhD degree requires 72 credit hours beyond the bachelor's degree and 42 credit hours beyond the Master's degree and will comply with all Graduate School requirements for PhD programs of study including a formal dissertation. All students must pass 3 PhD Qualifier Exams, a dissertation proposal defense, and a final dissertation defense. PhD degree requirements also consists of core courses (5000-, 6000-, and 7000-level) in aerospace engineering, advanced mathematics, technical electives, and quality aerospace research. A summary of PhD degree requirements is provided below.

Aerospace Engineering (PhD) Degree Requirements	
Beyond the BS - 72 credits	**Beyond the MS -** 42 credits
Coursework*: 24 credits (minimum) Aerospace Core • must include MAE 5500 and 5560 if not previously completed 21 credits (minimum) Aerospace Electives/Other • No more than 6 credits MAE 7930 Doctoral Publications • No more than 6 credits MAE 5930/6930/7930 Independent Study courses. 6 credits advanced math **Dissertation Research** 21 credits MAE 7970 **Dissertation Proposal & Final Defense** *No more than 21 credits of 5000- level coursework	**Coursework*:** 12 credits (minimum) Aerospace Core • must include MAE 5500 and 5560 if not previously completed 6 credits (minimum) Aerospace Electives/Other • No more than 6 credits MAE 7930 Doctoral Publications • No more than 6 credit MAE 5930/6930/7930 Independent Study courses. 3 credits advanced math **Dissertation Research** 21 credits MAE 7970 **Dissertation Proposal & Final Defense** *No more than 15 credits of 5000- level coursework

Purpose of the Degree

The new degree program will attract new PhD students to the MAE graduate studies and research program and provide graduate students with the opportunity to receive a degree more directly aligned with the academic and research skills that are critical to the aerospace industry. Students completing this degree program will possess skills sought by research organizations in industry, government, and academia requiring advanced design, research, and technical management in aerospace engineering. The PhD in Aerospace Engineering will support the Utah-based aerospace industry, as well as other prominent regional and national aerospace companies and research laboratories.

Institutional Readiness

The new degree program will be administered by the MAE Department, which has in place the administrative infrastructure necessary to manage the program. There is a graduate committee that oversees the graduate programs and a full-time staff member assigned to the graduate program. Presently, the MAE department supports a PhD program in Mechanical Engineering. The PhD program in Aerospace Engineering will place more emphasis on core aerospace engineering coursework, but will not require additional institutional resources or the development of new courses. In a very real sense, the level of effort and cost to administer this degree program will be the same as that already being accomplished for the Mechanical Engineering PhD degree.

Faculty

Eight faculty members in MAE have appropriate backgrounds and research interests in aerospace engineering to support the program. In the past, these faculty members have supported the MS program in Aerospace Engineering and a degree specialization in aerospace under the MS program in mechanical engineering.

Professors:
Christine Hailey - PhD Mechanical Engineering, University of Oklahoma, 1985 (aerodynamics and flight mechanics)

Associate Professors:
Rees Fullmer – PhD Mechanics Engineering, University of Utah, 1985 (guidance, navigation and control)
Steven Folkman - PhD Mechanical Engineering, Utah State University, 1990 (aerospace structures)
David Geller - PhD Space Physics and Astronomy, Rice University, 1999 (guidance, navigation and control)
Steven Whitmore - PhD Aerospace Engineering, University of California, Los Angeles, 1989 (flight mechanics and propulsion)

Assistant Professors:
Aaron Katz - PhD Aeronautics and Astronautics, Stanford University, 2009 (computational fluid dynamics)
Currently two additional faculty positions are being filled at the assistant professor level to support the needs of the Aerospace Engineering curriculum.

Staff
Additional staff lines will not be required. The current resources within the Department of Mechanical and Aerospace Engineering will be able to accommodate this new program.

Library and Information Resources
Two major library resources needed for the new program are the IEEE Xplore database and a series of journals produced by the American Institute of Aeronautics and Astronautics. The Merrill-Cazier library presently subscribes to these resources. See attached letter from the Merrill-Cazier Library.

Admission Requirements
Applicants with a bachelor's or master's degree in Aerospace Engineering or Mechanical Engineering from an ABET-accredited program can apply. For unrestricted admission to the program, students are required to have a minimum 3.3 GPA and successfully pass the GRE exam. The subject GRE is not required. Additional coursework in aerospace engineering fundamentals may be required in individual cases. All graduate students are expected to have a working knowledge of a computer programming language.

Student Advisement
The mechanics of admission to the programs and fulfilling program requirements are handled by our full-time staff graduate advisor. As students are admitted to the program, they are assigned a temporary faculty advisor who guides them on which courses to take the first semester and how to prepare for the PhD Qualification Exams. During the first semester, students select a graduate committee and a major professor who advise them throughout the rest of their program.

Justification for the Number of Credits
The number of credits required for this program is the same as the currently offered PhD in Mechanical Engineering which is overseen by the Graduate School.

External Review and Accreditation

As with the current PhD program in Mechanical Engineering and practice throughout the United States, no accreditation will be sought.

Projected Enrollment

Table 1. Projected enrollment for the PhD Aerospace Engineering Degree.

Year	Student FTE	Student Headcount	# of Faculty	Mean FTE-to-Faculty Ratio
1	4	4	8	0.50
4	6	6	8	0.75
3	8	8	8	1.00
4	9	9	8	1.13
5	10	10	8	1.25

Section III: Need

Program Need

Within the intermountain region, only Arizona State University, University of Arizona, and the University of Colorado at Boulder offer PhD programs in Aerospace Engineering. There are no Aerospace Engineering PhD degree programs in Wyoming, Nevada or Idaho, or within the Utah System of Higher Education (USHE). Thus, offering the Aerospace PhD degree better positions USU to capture regional talent that would otherwise leave the state. A flourishing PhD program in aerospace engineering will likely attract students who would not have previously considered USU.

Labor Market Demand

Nearly 80,000 engineers are currently employed in aerospace, significantly higher than the number employed in computer hardware, nuclear engineering, biomedical engineering or chemical engineering, among other fields. (IEEE, http://www.todaysengineer.org/2012/may/career-focus.asp) According to the U.S. Department of Labor, Bureau of Labor Statistics, aerospace engineers are expected to have a 7% growth in employment during the decade of 2012 to 2022.

Overall, Utah is one of the top ten states in the nation in the concentration of aerospace employment. In 2011, the Economic Development Corporation of Utah listed the leading aerospace organizations in Northern Utah. Largest amongst these organizations is Hill Air Force Base (HAFB) located just south of the city of Ogden, and near the towns of Clearfield, Riverdale, Roy, Sunset, and Layton. HAFB is the host unit for the USAF Material Command's 75th Air Base Wing. This unit provides support for the Ogden Air Logistics Complex (OALC) and its subordinate organizations. The OALC is the worldwide manager for a wide range of aircraft, engines, missiles, software, avionics, and accessories components. The largest private employer is Alliant Technology Systems (ATK) with the Space Systems Division groups located in Magna and Promontory, and its Aerospace Structures Division in Clearfield.

These large-scale employers are supported by a significant group of medium-sized employers including Aircraft and Space Defense Groups of Moog Inc., the Parker-Hannifin Corporation, Boeing Utah Company, and the Northrop Grumman Space and Missile Systems Group, all of Layton, Utah.

The Space Dynamics Laboratory, North Logan, Utah is a University Affiliated Research and Development Center (UARC) and a sub-unit of the Utah State University Research Foundation (USURF). It is a medium-sized non-commercial employer of aerospace engineers. SDL expects to continue to hire new PhD aerospace engineers as they have done for the past 50 years, and it would be to SDL's advantage if these PhD engineers were "home-grown" right in their own backyard.

Multiple small private supplier and integration organizations provide to this network of large-to medium scale employers. Examples of these small support vendors include Compositex, Inc., Sandy, Utah, a manufacturer of rocketry cases and nozzles; Groen Brothers Aviation Global, Inc., Salt lake City, Utah, a designer of high-performance rotorcraft for both civil and military applications; Borsight, Inc., Ogden, Utah, an aerospace systems integrator; and Hypercomp, Inc., Brigham City, Utah, a manufacturer of composite pressure vessels.

Despite the changing environment of the aerospace industry, where NASA's operations have scaled back significantly, demand for aerospace engineers by private, commercial, and national defense employers is still strong. Over the decade from 2012 to 2022, the Bureau of Labor Statistics projects a 7% growth in employment for aerospace engineers. This growth is primarily driven by two emerging markets 1) unmanned aerial vehicle (UAV) and their integration into civil airspace, and 2) commercial space ventures both crewed and robotic. These emerging markets will require the creation and development of a wide swath of highly specialized technologies in order to become viable, and will clearly support a large pool of employees with advanced aerospace engineering degrees. Given the large concentration of aerospace industries in Utah, USU graduates with a PhD in aerospace engineering will clearly be "first in line" to fill these high-paying positions; keeping "home-grown" talent "close to home." USU and SDL already host the annual "SmallSAT" international conference on small spacecraft technologies; and the introduction of the PhD degree in Aerospace Engineering will better position Utah State to become the de facto leader of small spacecraft world.

Student Demand

Presently the MAE department supports a PhD in Mechanical Engineering. A new PhD in Aerospace Engineering will provide graduate students with an option that is more focused on the specialized topics that are central to aerospace engineering. Graduates with a PhD in aerospace engineering will be better prepared and more competitive in the aerospace industry. Students wanting a PhD degree in aerospace engineering will be able to stay in Utah rather than go out of state. As stated previously, this change will help to keep home-grown talent close to home.

When the PhD in Aerospace Engineering program is approved, there exists a potential for an initial small decrease in the number of students pursuing a PhD in Mechanical Engineering. However, because of the previously-described market demand and the desire of many students to choose a program with a PhD in Aerospace Engineering, overall enrollment is in MAE's PhD programs is projected to increase during the next five years.

Section IV: Impact and Benefits

Collaborations with and Impact on Other USHE Institutions
There will be no impact on other USHE institutions.

Benefits
The PhD in Aerospace Engineering will directly impact the goals of the USHE to prepare a workforce and develop advanced aerospace technologies that will directly impact Utah's economy. This proposed degree will make USU graduates more competitive for aerospace engineering positions within Utah as well as elsewhere in the aerospace industry. By having more engineers educated and trained for their needs, the Utah aerospace companies are, presumably, going to be more competitive in competing for new contracts and developing new aerospace technologies.

Consistency with Institutional Mission
The mission of USU is to be one of the nation's premier student-centered land-grant and space-grant universities by fostering the principle that academics come first, by cultivating diversity of thought and culture, and by serving the public through learning, discovery, and engagement.

The proposed PhD in Aerospace Engineering enhances the University's reputation as a space-grant institution through both its graduates and research productivity. It supports the University Mission Statement in the following ways:

1. The department becomes more student-centered by providing a program to meet the needs of the students.
2. The doctoral program will improve academics in aerospace engineering by fostering research in the forefront of the field, consistent with the USU mission to be one of the nation's premier space-grant universities.

The doctoral program will serve the public by application of the research produced. It will also serve the growing aerospace industry in Utah with a better-prepared work force.

Section V: Program and Student Assessment

Program Assessment
The major goal for the program is to graduate PhD students with expertise in aerospace engineering and who are prepared to meet the needs of research organizations in industry and academia. Attainment of this goal will be measured by the placement rate of graduates within local and national research laboratories in industry, government, and academia.

Expected Standards of Performance
The standard of performance for all students is a grade of C or better in all classes required for the degree and to maintain an overall program GPA of 3.0 or higher in order to graduate with a PhD degree. In addition, all PhD students must satisfactorily pass a set of qualification exams within 3 semesters of being admitted to the aerospace engineering PhD program, and pass a dissertation defense upon completion of their dissertation research. PhD students are also expected to publish in peer-reviewed journals before

completing their PhD program of study. These standards are already well established in the Graduate School as well as for the existing Mechanical Engineering PhD degree program.

Section VI: Finances

Funding Sources

The proposed PhD in Aerospace Engineering builds on MAE's MS in Aerospace Engineering Program and the aerospace specialization in place within MAE's undergraduate program. Additional funding is not required.

Reallocation

No budget transfers or reallocations will be requested or needed to offer a quality program as explained in the next section.

Impact on Existing Budget

A new aerospace PhD degree will enhance the MAE graduate program with virtually no impact on existing budgets.

Faculty: This new degree will have no impact on faculty salaries since new faculty positions are not needed to offer the degree. In reality, each professor is constantly managing his/her time to maintain a research program that includes preparing proposals, contract management, student mentoring, teaching courses, publishing research results, and providing University and professional service. Experience has shown that even though the required student contact time increases with the number of graduate advisees, the overall workload may not increase but actually decrease because there is more graduate student support for developing and maintaining the research productivity. The MAE Faculty feels that the benefits of the projected enrollment offset the time costs to manage the program.

Staff: This new degree program will have no impact on staff work load and staff salaries.

Facilities: During the past five years, the MAE department has been planning for and working toward increased graduate enrollment and has sufficient office/study space to accommodate the expected small enrollment increase. Most of the incidental cost associated with graduate students is already covered by the research grants/contracts and F&A return such that the impact on E&G funds is essentially zero.

Operating Costs: Increase in enrollment results in increased copy service charges and other miscellaneous expenses. MAE has already been using electronic communications more and more to curb paper and copy expenses. This will continue such that these costs will be minimal for this degree program. In summary, the additional work load imposed by this degree is minimal and will have no impact on tasks that would normally be done by current faculty and staff.

Budget Explanation: Salaries, wages, and benefits represent the expenses associated with teaching the courses for the new PhD Aerospace program. Since these courses are already being taught, the revenue to pay for these expenses is simply a reallocation within current department funds. Thus, the difference, revenue less expenses, is zero. The teaching expenses are based on eight faculty members with an approximately 50% teaching role assignment, and with a 50/50 split between mechanical engineering

courses and aerospace engineering courses. The expenses are thus approximately 25% of our current salaries, wages, and benefits for these faculty members. Note that any additional expenses associated with research will be externally funded.

Comments for Table 2:

- FTE = 10 credits
- Tuition increase is estimated at 8%.
- Salary and Wages increase is estimated at 3%.
- Benefit increase follows the Sponsored Programs rates
- No new funding is required for this program.

Table 2. Projected Aerospace PhD Program Revenue and Expenses

		Year 1	Year 2	Year 3	Year 4	Year 5
Students						
	Projected FTE	4	6	8	9	10
	Cost Per FTE	12,173	10,843	9,811	9,455	9,139
	Student/Faculty Ratio	0.50	0.75	1.00	1.13	1.25
Projected Tuition						
	Gross Tuition	21,897	35,473	51,081	62,063	74,476
	Tuition to Program	0	0	0	0	0
5 Year Budget Projection						
		Year 1	Year 2	Year 3	Year 4	Year 5
Expenses						
	Salaries & Wages	N/A – All costs are currently covered in existing programs. There are no additional faculty or staff FTE, library or other operational funds required				
	Benefits					
	Total Personnel					
	Current Expense					
	Travel					
	Capital					
	Library Expense					
Total Expense						
Revenue						
	Legislative Appropriation	N/A – Funded through existing resources				
	Grants					
	Reallocation					
	Tuition to Program					
	Fees					
Total Revenue						

Commented [JoeV1]: There are many definitions of FTE, but the Regents use 10 credit hours at the graduate level per FTE, so that is probably what we should use

Commented [JoeV2]: This just makes it extremely clear that there are NOT any new costs, but existing appropriations within the department that will be shifted to the new program.

Commented [JoeV3]: See attached spreadsheet for details. This is the average Cost per FTE of Doctoral students only

Commented [JoeV4]: See attached spreadsheet for details.

Commented [JoeV5]: When a proposed program doesn't require any additional funds, we usually included some generic language like "N/A – All costs are currently covered in existing programs. There are no additional faculty or staff FTE, library or other operational funds required". By putting numbers in there it implies that the faculty support this program exclusively, which we know is not the case.
We can definitely estimate numbers to go in this section, as contained in the attached spreadsheet, but we traditionally haven't had to.

Commented [JoeV6]: When a proposed program doesn't require any additional funds, we usually included some generic language like "N/A – Funded through existing resources".

Difference	Revenue-Expense	0	0	0	0	0

Appendix A: Program Curriculum

All Program Courses

PhD Beyond BS	
Course Requirements	Credit Hours (minimum)
Core Courses	24
Math Courses	6
Dissertation Research	21
Technical electives/other credits	21
Total Credits	72

PhD Beyond MS	
Course Requirements	Credit Hours (minimum)
Core Courses	12
Math Course	3
Dissertation Research	21
Technical electives/other credits	6
Total Credits	42

Existing Aerospace Core Courses

Fall Semester

MAE 5500 Aerodynamics
MAE 5560 Dynamics of Space Flight
MAE 6500 Potential Flow
MAE 6510 Aircraft Dynamics and Flight Simulation
MAE 6540 Advanced Astrodynamics
MAE 7540 Advanced Astrodynamics Techniques/Applications

Spring Semester

MAE 6340 Spacecraft Attitude Control
MAE 6560 Spacecraft Navigation
MAE 6930 Advanced Control of Aero Vehicles

Summer Semester

MAE 6530 Advanced Propulsion
MAE 6570 Optimal Space Guidance
MAE 6930 Monte Carlo and Linear Covariance Techniques
MAE 7560 Optimal Estimation/Aerospace

Aerospace Technical Electives

Fall Semester

MAE 5310 Dynamic Systems and Controls
MAE 5420 Compressible Fluid Flow
MAE 6180 Dynamics & Vibrations

MAE 6410 Fluid Dynamics
MAE 7360 Optimal and Robust Control
MAE 6320 Linear Multivariable Control
ECE 5230 Space Systems Engineering
ECE 6240 Space Environment Engineering
ECE 6650 Optics I

Spring Semester

MAE 5440 Computational Fluid Dynamics
MAE 5510 Dynamics of Atmospheric Flight
MAE 5540 Propulsion Systems
MAE 6440 Advanced Computational Fluid Dynamics
MAE 6490 Turbulence*
MAE 6550 Advanced Structural Analysis
MAE 7330 Nonlinear and Adaptive Control
MAE 7350 Intelligent Control Systems

All Semesters (Fall, Spring, and Summer)

MAE 5930, 6930, 7930 Special Topics (must be Aero focused)

Approved Mathematics Courses

a. MATH 5270: Complex Variables
b. MATH 5410: Methods of Applied Mathematics
c. MATH 5420: Partial Differential Equations
d. MATH 5460: Introduction to Theory and Application of Nonlinear Dynamics Systems
e. MATH 5760: Stochastic Processes
f. MATH 6270: Complex Variables
g. MATH 6410: Ordinary Differential Equations I
h. MATH 6420: Partial Differential Equations I
i. MATH 6440: Ordinary Differential Equations II
j. MATH 6450: Partial Differential Equations II
k. MATH 6470: Advanced Asymptotic Methods
l. MATH 6610: Numerical Analysis
m. MATH 6620: Numerical Analysis
n. MATH 6640: Optimization
o. ECE 6010: Stochastic Processes in Electronic Systems
p. ECE 6030: Mathematical Methods for Signals and Systems
q. STAT 5200 Design of Experiments
r. MAE 7560 Optimal Estimation for Aerospace Systems

New Courses to be Added in the Next Five Years

No new courses are currently planned. However, to enhance the program and continually strengthen its relevance, it is expected that new courses will be integrated over time into the program using well established practices.

Appendix B: Program Schedule

The following is a sample program of study for the Aerospace Engineering PhD beyond the BS.

PhD Aerospace Engineering (Year 1)			Yr 1 Credits
Fall 1	Spring 1	Summer 1	
MAE 5500	MAE 6340	MAE 6530	
MAE 5560	MAE 5540[1]		
MAE 5420[1]	MAE 5440[1]		
9 hours	9 hours	3	21

[1] Technical Elective

PhD Aerospace Engineering (Year 2)			Yr 2 Credits
Fall 2	Spring 2	Summer 2	
MAE 6500	MAE 6560	MAE 6570	
MAE 6540	Math 5420		
MAE 5310[1]	MAE 6440[1]		
9 hours	9 hours	3 hours	21

[1] Technical Elective

PhD Aerospace Engineering (Year 3)			Yr 3 Credits
Fall 3	Spring 3	Summer 3	
MAE 6410[1]	MAE 7970	MAE 7560[m]	
ECE 5230[1]			
6 hours	9 hours	3 hours	18

[1] Technical Elective [m] Math Course

PhD Aerospace Engineering (Year 4)			Yr 4 Credits
Fall 4	Spring 4	Summer 4	
MAE 7970	MAE 7970		
6 hours	6 hours		12

Total Credits	72

The following is a sample program of study for the Aerospace Engineering PhD beyond the MS.

PhD Aerospace Engineering (Year 1)			Yr 1 Credits
Fall 1	Spring 1	Summer 1	
MAE 5500	MAE 6340	MAE 6530	
MAE 5560	MAE 5540[1]		
MAE 5420[1]	MATH 5420		
9 hours	9 hours	3	21

[1] Technical Elective

PhD Aerospace Engineering (Year 2)			Yr 2 Credits
Fall 2	Spring 2	Summer 2	
MAE 7970	MAE 7970		
6 hours	6 hours		12

[1] Technical Elective

PhD Aerospace Engineering (Year 3)			Yr 3 Credits
Fall 3	Spring 3	Summer 3	
MAE 7970	MAE 7970		
6 hours	3 hours		9

Total Credits	42

Appendix C: Faculty

Professors:

Christine Hailey - PhD Mechanical Engineering, University of Oklahoma, 1985 (aerodynamics and flight mechanics)

Associate Professors:

Rees Fullmer – PhD Mechanics Engineering, University of Utah, 1985 (guidance, navigation and control)
Steven Folkman - PhD Mechanical Engineering, Utah State University, 1990 (aerospace structures)
David Geller - PhD Space Physics and Astronomy, Rice University, 1999 (guidance, navigation and control)
Steven Whitmore - PhD Aerospace Engineering, University of California, Los Angeles, 1989 (propulsion)

Assistant Professors:

Aaron Katz - PhD Aeronautics and Astronautics, Stanford University, 2009 (computational fluid dynamics)
Currently two additional faculty positions are being filled at the assistant professor level to support the needs of the Aerospace Engineering curriculum.

Signature Page

Institution Submitting Proposal:	Utah State University
College:	College of Engineering
Department:	Mechanical and Aerospace Engineering
Program Title:	Doctor of Philosophy (PhD) in Aerospace Engineering
Recommended Classification of Instructional Programs (CIP) Code:	14.0201
Degree to be Awarded:	Doctor of Philosophy (PhD) in Aerospace Engineering
Proposed Beginning Date:	Fall 2015

Institutional Signatures

_____ Department Head (Robert Spall), Date

_____ Dean (Christine Hailey), Date

_____ Graduate School Dean (Mark McLellan), Date

_____ Chief Academic Officer (Noelle E. Cockett), Date

_____ President (Stan L. Albrecht), Date

August 2014