



Proposal to the Senate Educational Policy Committee

*Please replace all text in italic with appropriate information before submitting your proposal.
Your entries should be in regular (not italic) font.*

PROPOSAL TITLE:

Revision of Curriculum Requirements for the Ph.D. in Aerospace Engineering, Department of Aerospace Engineering, College of Engineering

SPONSOR:

Philippe Geubelle, Department Head of Aerospace Engineering, geubelle@illinois.edu, 333-2651

COLLEGE CONTACT:

Rhonda McElroy, Director of Engineering Graduate and Professional Programs, rmcelroy@illinois.edu, 244-2745

BRIEF DESCRIPTION:

We propose to change the number of coursework credit hours required for the 64 credit hour Ph.D. degree in AE from 32 to 24. Correspondingly the number of dissertation credit hours will increase from 32 to 40, keeping the total at the 64 hours minimum requirement of the Graduate College. The proposed 64 credit hour Ph.D. degree requirements are described below. No change is proposed to our MS degree requirements.

- At least 24 credit hours of graduate-level courses beyond the MS. No more than 4 credit hours may be AE 597, Independent Study.
- At least 16 of the 24 credit hours must be 500-level courses of which at least 8 hours must be AE courses.
- AE 590 Seminar (0 credit hours)
- Advanced 500-level Mathematics course from approved list on AE website (3-4 credit hours), and counts toward the 500-level requirement.
- At least 40 credit hours of dissertation credit.
- Additional courses beyond the 8 hours of 500-level courses may be AE 400-level courses or other engineering graduate-level 400 or 500 level technical courses that are approved by advisor.

In addition, AE would like to add a 96 credit hour option to the current Ph.D. curriculum to allow students a direct admit into the Ph.D. program. Currently, graduate students are required to hold an approved MS degree before they can enter the Ph.D. program. Students without an approved master's must first complete our master's with thesis program in AE before entering the Ph.D. program. The current Ph.D. curriculum is a 64 credit hour curriculum.

Under the 96 credit hour curriculum, termed the Direct Ph.D., students will complete the following requirements, which are outlined in detail in Appendix A.

- 48 credit hours of graduate level coursework
 - 24 credit hours of 500-level coursework, including 12 hours of 500-level AE coursework.
 - 7-8 hours of Math (4 of the 7-8 taken must be at the 500-level and counts toward the 24 hour requirement)
 - Remaining credit hours of 400-500 level elective coursework per advisor approval and following the requirements in Appendix A
- 48 credit hours of thesis research
- Successful completion of the Qualifying, Preliminary, and Final Defense exams

These requirements (coursework and thesis) are the addition of the requirements of the AE MS-thesis degree plus the 64-hour Ph.D. program described above. In essence, the Direct Ph.D. students will fulfill exactly the same requirements as a student undertaking first an MS and then a Ph.D., but without preparing an MS thesis (or receiving an MS degree).

JUSTIFICATION:

Revised 64 Credit Hour Curriculum Justification

Current AE graduate degree coursework requirements include a minimum of 24 course credit hours for the MS with thesis and an additional 32 course credit hours for the Ph.D. The current Ph.D. course requirements include 24 hours at the 500-level with at least 16 of those hours in AE.

Based on surveys of Ph.D. course requirements in other UIUC departments and in AE engineering programs at peer universities (survey results available upon request), the existing AE Ph.D. course requirements were found to be higher than other comparable programs. Furthermore, based on a review of the experiences of our own Ph.D. students, we find that students can acquire both the depth and breadth of course-related knowledge and experience from a level of Ph.D. coursework set at 24 hours beyond the MS. This change in Ph.D. course requirements is consistent with allowing the doctoral students to complete their full degree requirements within a 4-year period, consistent with current time-to-graduation expectations, while pursuing and developing a research experience leading to a dissertation which embodies major results and analyses. Finally, a relaxation of AE-specific course requirements allows for a more diverse and interdisciplinary coursework program tailored to individual students needs in an increasing multidisciplinary research environment.

Addition of a 96-credit hour Option in the Ph.D. Curriculum Justification

The motivation to add a 96 credit hour Ph.D. program is to remain competitive with our peers that offer a direct admit to their Ph.D. program from a bachelor's degree. Examples of peer institutions with such programs include: University of Michigan, Georgia Tech, Purdue University, and University of Texas Austin.

Under the current curriculum, students without an approved master's degree must first be admitted into our master's with thesis program and then petition into our Ph.D. program. This is hindering our department from recruiting top talent into our program. Many students applying to the AE Ph.D. program want to be directly admitted into the Ph.D. program without the requirement of first completing a master's degree. Almost 100% of peer AE doctoral programs have an option to directly admit students to the Ph.D. program without requiring a prior MS degree. This difference places Illinois at a distinct competitive disadvantage when recruiting top applications who primarily desire a Ph.D.

BUDGETARY AND STAFF IMPLICATIONS: *(Please respond to each of the following questions.)*

1) Resources

- a. How does the unit intend to financially support this proposal?

There will not be any budgetary obligations due to these changes in the AE Ph.D. curriculum. The program implementation will be carried out with existing resources.

- b. How will the unit create capacity or surplus to appropriately resource this program? If applicable, what functions or programs will the unit no longer support to create capacity?

There are no capacity implications with respect to this proposed change. There will be no additional enrollment beyond the numbers currently supported by the department. Graduate student enrollment is limited by the number of research assistantships (faculty grants) and by available teaching assistantships.

- c. Will the unit need to seek campus or other external resources? If so, please provide a summary of the sources and an indication of the approved support.

No, there will be no additional financial obligations resulting from these changes.

- d. Please provide a letter of acknowledgment from the college that outlines the financial arrangements for the proposed program.

There are no financial implications for these requested changes.

2) Resource Implications

- a. Please address the impact on faculty resources including the changes in numbers of faculty, class size, teaching loads, student-faculty ratios, etc.

The proposed change to the 64 credit hour Ph.D. curriculum will possibly reduce the number of course class hours that AE Ph.D. students will take, in the case that they decide to strictly follow the course requirements and choose not to enroll in classes beyond those requirements. As a result, we do not anticipate changes in teaching

loads or class sizes. Rather, we expect that this change will provide the opportunity to offer a wider variety of graduate courses. Since this is a Ph.D. requirements change, we do not anticipate any change in student-faculty ratios.

With the implementation of a 96 credit hour Direct Ph.D. option, there will be no impact on faculty resources.

- b. Please address the impact on course enrollment in other units and provide an explanation of discussions with representatives of those units. (A letter of acknowledgement from units impacted should be included.)

This proposed change will provide more flexibility for Ph.D. student to choose appropriate graduate (500-level) courses, some in other units, while also reducing the number of those courses required to meet the Ph.D. 64 credit option degree requirements. We anticipate that these two outcomes will offset one another and not impact other units.

With the implementation of a 96 credit hour Direct Ph.D. option, we do not anticipate any impact on course enrollments in other units.

- c. Please address the impact on the University Library (A letter of estimated impact from the University Librarian must be included for all new program proposals. If the impact is above and beyond normal library business practices, describe provisions for how this will be resourced.)

These proposed changes will not impact the University Library.

- d. Please address the impact on technology and space (e.g. computer use, laboratory use, equipment, etc.)

There will be no impact on technology and space.

For new degree programs only:

- 3) Briefly describe how this program will support the University's mission, focus, and/or current priorities. Include specific objectives and measurable outcomes that demonstrate the program's consistency with and centrality to that mission.
- 4) Please provide an analysis of the market demand for this degree program. What market indicators are driving this proposal? What type of employment outlook should these graduates expect? What resources will be provided to assist students with job placement?
- 5) If this is a proposed graduate program, please discuss the programs intended use of waivers. If the program is dependent on waivers, how will the unit compensate for lost tuition revenue?

DESIRED EFFECTIVE DATE: Fall 2017

STATEMENT FOR PROGRAMS OF STUDY CATALOG: See Appendix B

CLEARANCES: (Clearances should include signatures and dates of approval. These signatures must appear on a separate sheet. If multiple departments or colleges are sponsoring the proposal, please add the appropriate signature lines below.)

Signatures:



Unit Representative: Prof. Philippe Geubelle

8-15-2016

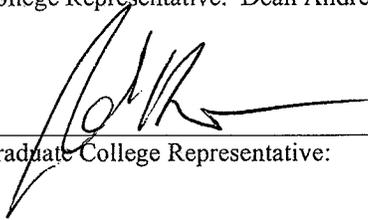
Date:



College Representative: Dean Andreas Cangelaris

9-2-2016

Date:



Graduate College Representative:

9/19/16

Date:

Council on Teacher Education Representative:

Date:

Appendix A: (Proposed Curriculum Revisions)

Revised 64 Credit Hour Curriculum

Current Requirements:	Current Hours	Revised Hours
<i>Ph.D. Class Requirements</i>		
Required Courses	3-4 Hours	3-4 Hours
Elective Courses	28-29 Hours	20-21 Hours
Total Thesis Required Hours	32 Hours	40 Hours
Total Hours Required	64 Hours	64 Hours

Revised 64 Credit Hour Curriculum

- At least 24 credit hours of graduate level courses beyond the MS.
- At least 40 credit hours of dissertation credit beyond the MS.

Required Courses:

- AE 590 Seminar (0 credit hours)
- Advanced 500-level Mathematics course from approved list on AE website (3-4 credit hours) and counts toward the 500-level requirement.

Elective Courses:

Students must complete 20-21 hours of elective courses, of which 16 hours must be 500-level courses, 8 hours of which must be 500-level **Aerospace Engineering** courses. No more than 4 hours may be in an AE 597 independent study course; independent study is not allowed with thesis advisor. Additional elective hours may be AE 400-level courses or other engineering graduate level 400 or 500 level technical courses that are approved by the advisor.

96-credit hour Option in the Direct Ph.D. Curriculum

Ph.D. Degree	Entering with M.S. Degree (current Ph.D. Curriculum)	Entering with B.S. Degree (addition to Ph.D. curriculum, consisting of the addition of the 64-hour Ph.D. requirements to the left plus the AE M.S. requirements)
<i>Total credit towards degree</i>	<i>64 hours</i>	<i>96 hours</i>
AE 599 Research (minimum applied toward degree)	40 hours	48 hours
Coursework	24 hours	48 hours <ul style="list-style-type: none"> • 24 hours of 500-level coursework including 12 hours

		<p>of 500-level AE coursework</p> <ul style="list-style-type: none"> • 7-8 hours of Math (4 of the 7-8 taken must be at the 500-level and counts toward the 24 hour requirement) • 20-21 hours of 400/500 elective AE coursework per advisor approval
<p>Other Requirements and Conditions (may overlap)</p>		
<p><i>Other requirements and conditions</i></p> <ul style="list-style-type: none"> • The minimum program GPA is 3.0 • Maximum of 4 hours of AE 597 (or other independent study) may be applied toward the elective coursework requirement. Independent study is not allowed with thesis advisor • 25% or more teaching assistantship for at least one semester. • Ph.D. exam and dissertation requirements: <ul style="list-style-type: none"> • Qualifying exam • Preliminary exam • Final exam or dissertation defense • Dissertation deposit 		

Required Courses:

- AE 590 Seminar (0 credit hours)
- 7-8 hours of Math (4 of the 7-8 taken must be at the 500-level)

Appendix B: Program of Study

Philippe Geubelle
306 Talbot Laboratory
104 South Wright Street
Urbana, IL 61801
PH: (217) 333-2651
<http://aerospace.illinois.edu/>

Director of Graduate Programs: Gregory Elliott

E-mail: ae@illinois.edu

Major: Aerospace Engineering
Degrees Offered: M.S. and Ph.D.

Online Program: Aerospace Engineering. M.S.

Medical Scholars Program: Doctor of Philosophy (Ph.D.) in Aerospace Engineering and Doctor of Medicine (M.D. through the [Medical Scholars Program](#))

Graduate Degree Programs

The Department of Aerospace Engineering (AE) offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy. The AE graduate program provides students with a strong background in engineering and applied science while placing emphasis on aircraft and spaceflight engineering. Students may major in one of the following general areas: aerodynamics, astrodynamics, combustion and propulsion, control systems, dynamical systems, fluid mechanics, structural mechanics, and materials. Opportunity also exists for specializing in:

1. computational science and engineering,
2. energy and sustainability engineering, and
3. systems engineering within the department's graduate programs

via the [Computational Science and Engineering \(CSE\) transcriptable Concentration](#), the [Energy and Sustainability Engineering \(EaSE\) Option](#), and the [Systems Engineering Track \(SE\)](#) for the AE non-thesis master students. Additional information about the Aerospace Engineering graduate program may be found on the department's [graduate program Web site](#).

Admission

The Department of Aerospace Engineering accepts applications for admission to the graduate program for both fall and spring semesters. The application deadline for the fall semester for the Ph.D. and M.S. with Thesis programs and for full consideration for funding opportunities is January 1. The application deadline for the MS Non-thesis for the fall semester is July 1. The deadline for spring admission for all programs is October 8.

Typically, the prerequisite for graduate study is the equivalent of the [B.S. in aerospace engineering](#); however, graduates of curricula leading to degrees in other fields of engineering, the physical sciences, or mathematics may also be admitted to advanced study. A minimum grade point average of 3.00 (A = 4.00) for the last two years of undergraduate study is required. However, having a GPA higher than the minimum is no guarantee of admission. Scores on the [Graduate Record Examination \(GRE\)](#) general test are required of all applicants. There are no minimum score requirements.

Applicants to the Aerospace Engineering graduate program are asked to complete a supplemental form that will capture additional information about their specific interests. Applicants receive an email after submitting the online application which contains the link to the supplemental form. Applicants may select up to three areas from the following list:

- aerodynamics
- aeroelasticity
- astrodynamics
- combustion
- computational mechanics
- control and estimation
- dynamical systems
- experimental mechanics
- fluid mechanics
- information technology
- materials
- propulsion
- robotics
- structural mechanics-structural dynamics
- systems engineering

All applicants whose native language is not English are required to submit a minimum [TOEFL](#) score of 103 (iBT), 257 (CBT), or 613 (PBT); or minimum [International English Language Testing System \(IELTS\)](#) academic exam scores of 7.0 overall and 6.0 in all subsections. No exemptions from the TOEFL are granted by the department. [Full admission status](#) is granted for those meeting the minimum requirements and having taken the TOEFL or IELTS since the scores required for admission to Aerospace Engineering are above the minimum scores demonstrating an acceptable level of English language proficiency. Applicants wishing to be considered for teaching assistantships must score 24 on the SPEAK portion of the TOEFL exam.

Students may apply to the Medical Scholars Program prior to beginning graduate school or while in the graduate program. Applicants to the Medical Scholars Program must meet the admissions standards for and be accepted into both Aerospace Engineering and the College of Medicine. An application to the Medical Scholars Program will also serve as the application to the Aerospace Engineering graduate program. Further information on this program is available by contacting the Medical Scholars Program (125 Medical Sciences Building, (217)-333-8146, mspo@illinois.edu).

For full information on AE admission requirements and how to apply, see the department's [graduate programs Web site](#).

Graduate Teaching Experience

M.S. students are not required to hold a teaching assistantship. Ph.D. students are required to hold a 25% teaching assistantship for at least one semester in order to meet the requirements for the Department of Aerospace Engineering doctoral program. Information about teaching assistantships can be found in the department's [Web site](#).

Faculty Research Interests

Research activities in the AE Department encompass a wide range of problem areas in aerospace engineering and related engineering disciplines cited in the Graduate Programs section above and more fully described at the department's [research area Web site](#).

Centers, Programs, and Institutes

Several nationally renowned interdisciplinary centers exist within the College of Engineering in which Aerospace Engineering faculty members along with many other campus faculty engage in research. A list of these, along with links to full descriptions, appears at the department's [interdisciplinary centers Web site](#). Among these are the Beckman Institute for Advanced Science and Technology, the Center for the Simulation of Advanced Rockets (CSTAR), the Coordinated Science Laboratory (CSL), the Micro and Nanotechnology Laboratory, and the National Center for Supercomputing Applications (NCSA).

Facilities and Resources

Members of the Aerospace Engineering Department have access to a wide range of excellent research facilities. These laboratories support a wide range of activity and are described at the department's [research laboratories Web site](#).

Financial Aid

Students in the M.S. non-thesis option are not provided funding by the department. Financial aid for graduate students in thesis graduate programs is available in the form of fellowships, teaching and research assistantships. A block grant from the National Aeronautics and Space Administration supports a multidisciplinary research and training program. Qualified candidates are considered for financial support upon application. In addition, graduate students making satisfactory progress toward their degrees may also be considered for financial support. All applicants, regardless of U.S. citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate [spoken English language proficiency](#) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the iBT or IELTS, a minimum score of 4CP is required on the [EPI test](#), offered on campus. All new teaching assistants are required to participate in the [Graduate Academy for College Teaching](#) conducted prior to the start of the semester.

Doctor of Philosophy

Entering with an approved MS (with curriculum adjusted as per proposal)

Code	Title	Hours
AE 599	Thesis Research (min-max applied toward degree)	40
AE 590	Seminar (continuous registration through the 4th semester after the qualifying exam for 0 hours)	0

Code	Title	Hours
	<u>One advanced 500-level mathematics course from an approved list (3-4 hours)</u>	3-4
	Elective courses – chosen in consultation with advisor (subject to Other Requirements and Conditions below).	20-21
Total Hours		64

Course List

Other Requirements and Conditions¹

Requirement	Description
A minimum of 16-8 hours of AE course credit overall at the 500-level, beyond beyond the master's degree.	
A minimum of 24-16 credit hours overall at the 500 level, beyond the bachelor's-master's degree, including the 8 hours of 500-level AE courses.	
A maximum of 8-4 hours of <u>AE 597</u> (or other independent study) may be applied toward the elective coursework requirement.	
A 25% or more teaching assistantship for at least one semester.	
A Master's degree is not required for admission to the Ph.D. program, but the Master's level requirements must be met (32 hours).	
Qualifying exam ²	
Preliminary exam	
Final exam or dissertation defense	
Dissertation deposit	
Minimum GPA:	3.0

Grad Other Degree Requirements

¹ For additional details and requirements refer to the department's [Website](#) and the [Graduate College Handbook](#).

² [Qualifying Exam information](#)

Entering with B.S. degree (new option being proposed)

	Hours
AE 599 Research (minimum applied toward degree)	48
Coursework <ul style="list-style-type: none"> 24 hours of 500-level coursework, including 12 hours of 500-level AE coursework 7-8 hours of Math (4 of the 7-8 taken must be at the 500-level and count toward the 24 hour requirement) 20-21 hours of 400/500 elective AE coursework per advisor approval 	48
AE 590 Seminar (continuous registration through the 4th semester after the qualifying exam for 0 hours)	0
Total Hours	96
Other Requirements and Conditions	
<ul style="list-style-type: none"> The minimum program GPA is 3.0 Maximum of 4 hours of AE 597 (or other independent study) may be applied toward the elective coursework requirement. Independent study is not allowed with thesis advisor 25% or more teaching assistantship for at least one semester. Ph.D. exam and dissertation requirements: <ul style="list-style-type: none"> Qualifying exam 	

- Preliminary exam
- Final exam or dissertation defense

Dissertation deposit



Senate Educational Policy Committee Proposal Check Sheet

PROPOSAL TITLE (Same as on proposal): Revision of the Curriculum Requirements for the Ph.D. in Aerospace Engineering, Department of Aerospace Engineering, College of Engineering

PROPOSAL TYPE (select all that apply below):

A. Proposal for a **NEW** or **REVISED** degree program. Please consult the Programs of Study Catalog for official titles of existing degree programs.

1. Degree program level:

Graduate Professional Undergraduate

2. Proposal for a new **degree** (e.g. B.S., M.A. or Ph.D.):

Degree name, "e.g., *Bachelor of Arts or Master of Science*": _____

3. Proposal for a new or revised **major, concentration, or minor**:

New or Revised **Major** in (name of existing or proposed major): Aerospace Engineering

New or Revised **Concentration** in (name of existing or proposed concentration): _____

New or Revised **Minor** in (name of existing or proposed minor): _____

4. Proposal to rename an existing major, concentration, or minor:

Major Concentration Minor

Current name: _____

Proposed new name: _____

5. Proposal to terminate an existing degree, major, concentration, or minor:

Degree Major Concentration Minor

Name of existing degree, major, or concentration: _____

6. Proposal involving a multi-institutional degree:

New Revision Termination

Name of existing Illinois (UIUC) degree: _____

Name of non-Illinois partnering institution: _____

Location of non-Illinois partnering institution:

State of Illinois US State: _____ Foreign country: _____

- B. Proposal to create a new academic unit (college, school, department, program or other academic unit):

Name of proposed new unit: _____

- C. Proposal to rename an existing academic unit (college, school, department, or other academic unit):

Current name of unit: _____

Proposed new name of unit: _____

- D. Proposal to reorganize existing units (colleges, schools, departments, or program):

1. Proposal to change the status of an existing and approved unit (e.g. change from a program to department)

Name of current unit including status: _____

2. Proposal to transfer an existing unit:

Current unit's name and home: _____

Proposed new home for the unit: _____

3. Proposal to merge two or more existing units (e.g., merge department A with department B):

Name and college of unit one to be merged: _____

Name and college of unit two to be merged: _____

Proposed name and college of new (merged) unit: _____

4. Proposal to terminate an existing unit:

Current unit's name and status: _____

- E. **Other educational policy proposals** (e.g., academic calendar, grading policies, etc.)

Nature of the proposal: _____

Revised 10/2012

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

EP.17.20

Office of the Provost and Vice Chancellor
for Academic Affairs

Swanlund Administration Building
601 East John Street
Champaign, IL 61820



September 20, 2016

Bettina Francis, Chair
Senate Committee on Educational Policy
Office of the Senate
228 English Building, MC-461

Dear Professor Francis:

Enclosed is a copy of a proposal from the College of Engineering to revise the Ph.D. in
Aerospace Engineering.

Sincerely,

A handwritten signature in cursive script that reads "Kathryn A. Martensen".

Kathryn A. Martensen
Assistant Provost

Enclosures

c: R. McElroy
P. Geubelle
J. Hart
A. McKinney

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Graduate College

204 Coble Hall
801 South Wright Street
Champaign, IL 61820-6210



Executive Committee

2016-2017 Members

Wojtek Chodzko-Zajko
Dean & Chair
Graduate College

Members

Kent Choquette
Electrical & Computer
Engineering

Eleanor Courtemanche
English

Peter Davis
Theatre

Luisa-Elena Delgado
Spanish & Portuguese

George Gaysna
Slavic Languages & Literature

Zachary Gordon
Chemistry

Julie Hengst
Speech & Hearing Science

Kevin Jackson
Accountancy

Karla Moller
Curriculum & Instruction

Kirsten Phelps
School of Information Science

Sandra Rodriguez-Zas
Animal Sciences

Mark Rood
Civil & Environmental
Engineering

Lisa Rosenthal
Art & Design

Angeliki Tzanetou
Classics

Michelle Wang
Statistics/Psychology/
Bioengineering

Kathy Martensen
Office of the Provost
207 Swanlund MC-304

Dear Kathy,

Enclosed please find the proposal titled: "Curriculum Revision to the Ph.D. Requirements for the Department of Aerospace Engineering".

The proposal was received by the Graduate College on September 2, 2016 and reviewed and approved by the Graduate College Executive Committee on September 13, 2016. The proposed program has been found to meet campus requirements and guidelines for graduate education.

I send the proposal to you now for further review.

Sincerely,

A handwritten signature in black ink, appearing to read 'John C. Hart', written over a horizontal line.

John C. Hart
Executive Associate Dean
Graduate College

c: P. Geubelle
R. McElroy
A. McKinney

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

College of Engineering
Executive Committee
306 Engineering Hall, MC-266
1308 West Green Street
Urbana, IL 61801



September 2, 2016

Associate Dean John Hart
Graduate College
204 Coble Hall
MC-322

Via: Andreas Cangellaris, Engineering College

Dear Dean Hart:

The College of Engineering Executive Committee has reviewed and approved the following curriculum revision. We now submit for campus approval.

**Curriculum Revision to the Ph.D. Requirements for the Department of Aerospace
Engineering**

Attached is a copy of the request

Sincerely yours,

A handwritten signature in cursive script that reads "David Padua".

David Padua, Vice Chair
Executive Committee

Approval Recommended:

A handwritten signature in cursive script, appearing to read "Andreas Cangellaris".

Andreas Cangellaris, Dean
College of Engineering

9-2-2016

Date

Harry Dankowicz
Rhonda McElroy
David Padua
Philippe Geubelle