

UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: Michael Santare phone number x-2246

Department: Mechanical Engineering email address santare@udel.edu

Date: November 12, 2010

Action: Policy change for graduate program
(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term 11 F
(use format 04F, 05W)

Current degree _____
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: PhD, MSME, MEM
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: _____
Proposed new name for revised or new major / minor / concentration / academic unit
(if applicable)

Revising or Deleting:

Undergraduate major / Concentration: _____
(Example: Applied Music -- Instrumental degree BMAS)

Undergraduate minor: _____
(Example: African Studies, Business Administration, English, Leadership, etc)

Graduate Program Policy statement change: Program Policy Statement Attached
(Must attach your Graduate Program Policy Statement)

Graduate Program of Study: Ph.D. in Mechanical Engineering; Master of Science in Mechanical Engineering (MSME); and Master of Engineering: Mechanical (MEM)
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

Graduate minor / concentration: _____

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.

List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?

(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

NONE

Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education: <http://www.ugs.udel.edu/gened/>

NOT APPLICABLE

Identify other units affected by the proposed changes:

(Attach permission from the affected units. If no other unit is affected, enter "None")

NONE

Describe the rationale for the proposed program change(s):

(Explain your reasons for creating, revising, or deleting the curriculum or program.)

The field of Mechanical Engineering is quickly changing due to global pressures and the impact of new and emerging technologies. Consequently, the faculty in Mechanical Engineering at UD is becoming increasingly diverse in its research pursuits, working in areas such as nanotechnology, biomedical engineering, energy conversion and environment, which are outside the traditional mainstream of mechanical engineering. This has led to the desire to create a more flexible graduate program, so that students with different backgrounds and interests can study and conduct research in these areas that cross traditional academic boundaries while earning their graduate degree in mechanical engineering. At the same time, the faculty wanted to have a way to assess the students' research potential early on in their Ph.D. studies.

This proposal addresses these concerns by changing the format of the Ph.D. Qualifying Examination and in so doing allows a simplification of the graduate degree program rules. The new Qualifying Exam eliminates one of three existing written qualifying exams and replaces it with a short oral presentation of selected papers in the students' research area of interest. This "Research Aptitude Exam" is designed to test a key element of the students' research potential; the ability to read, understand and interpret the literature. In addition, since each student's exam is based on his or her own research area, it allows for more flexibility in coursework selection. Therefore, as an adjunct to the modification of the qualifying exam, the department has also decided to simplify the course requirements by eliminating the "Template" wording from its policy statements for all three degrees.

This style of exam is currently used at some other departments around the US and at UD, and the department has tailored this particular Research Aptitude Exam to fit its current student population as well as to promote its strategic goals for the future.

Program Requirements:

(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and include a side-by-side comparison of the credit distribution before and after the proposed change.)

See attached Graduate Program Policy documents

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation)

Department Chairperson *[Signature]* Date 11/29/2010
Dean of College *[Signature]* Date 12/8/10
Chairperson, College Curriculum Committee *[Signature]* Date 11/22/2010
Chairperson, Senate Com. on UG or GR Studies _____ Date _____
Chairperson, Senate Coordinating Com. _____ Date _____
Secretary, Faculty Senate _____ Date _____
Date of Senate Resolution _____ Date to be Effective _____
Registrar _____ Program Code _____ Date _____
Vice Provost for Academic Affairs & International Programs _____ Date _____
Provost _____ Date _____
Board of Trustee Notification _____ Date _____

PH.D. in MECHANICAL ENGINEERING

The Ph.D. program in Mechanical Engineering consists of the Ph.D. Qualifier Examination as specified in Section III below, 33 credits of graduate level course work plus 9 credits of Doctoral Dissertation. The Ph.D. program is designed to allow for considerable flexibility in course selection and specialization of study. Course work must be completed with a cumulative grade point average of 3.0 or higher (see Graduate Catalog for relevant details). In addition, the student must pass a Candidacy Examination prior to completing the dissertation requirements. The Ph.D. should be obtainable in four years of full-time study after entering the program. There is no foreign language or teaching requirement for the Ph.D.

I. Course Requirements

- A. At least four courses (12 credits) at the 600 or higher level in Mechanical Engineering (MEEG)
- B. At least three courses (9 credits) at the 800 level.
- C. At least one course (3 credits) in mathematics (other than MEEG690).
- D. 9 credits of MEEG 969 Doctoral Dissertation.

An individual course can be used to meet more than one of the requirements A, B or C provided the total number of credits is at least 33. MEEG 868 cannot be used toward these requirements.

Students will submit a proposed course plan to the Dissertation Committee at the time of their candidacy exam. Upon approval, it will enter into the candidate's file. Deviations from the proposed plan must be approved by the Dissertation Committee. A copy of the course plan must be sent to the University Office of Graduate Studies.

II. Dissertation Requirements

A dissertation is required which demonstrates the student's ability to conduct independent research. A Dissertation Committee is selected by the advisor and approved by the Department Chairperson. This committee will also serve as the student's Candidacy Examination Committee. At least three Mechanical Engineering Department faculty members and at least one faculty member from another department will serve on the Dissertation Committee. The Committee will be chaired by the research advisor, who must be a regular full-time member of the Department of Mechanical Engineering Faculty. During the course of the research, the student will periodically review progress with the Committee.

The student must orally present the dissertation before the Dissertation

Committee at an open defense. The student shall supply final draft copies of the dissertation to members of the Committee at least two weeks before the oral defense. The dissertation must meet the academic and professional standards set forth by the University.

III. Qualifying Examination

The purpose of the qualifying examination is to assess the aptitude of a doctoral student in the early stages of the program. A student must be enrolled in the Ph.D. program, have a minimum GPA of 3.2 and a minimum of 12 graduate coursework credits to complete the qualifying exam.

The qualifying exam will consist of three parts

- a) a research aptitude exam based on the student's research interest area
- b) one math exam (based on the content in MEEG 690)
- c) one mechanical engineering topic exam (based on undergraduate-level mechanical engineering and the content in one of the core courses, MEEG 610, MEEG 620, MEEG 630, MEEG 640)

Part a) will be offered between the end of the first semester and the end of the second semester of study and will:

- i) Include a 2-3 page report reviewing and summarizing typically 3 or 4 published peer reviewed journal articles from the literature, in the student's research interest area. The journal articles will be selected by the student's advisor and no more than one of them shall have been authored by the advisor.
- ii) Include a 20 minute oral presentation of the above described report, followed by a period questioning related to the selected papers.
- iii) Be graded by a committee of at least three faculty members, including the student's research advisor and two other faculty members, not advising the student, appointed by the department chair. The criteria for grading will be established by the faculty and provided to the student ahead of the exam.

Parts b) and c) will be written exams, offered in early June and must be taken at the first opportunity after the completion of 12 graduate coursework credits toward the Ph.D.

In judging student performance on this examination, the faculty has three options: (i) outright passing, (ii) giving a second chance, and (iii) outright failing. If the student is given a second chance, the faculty will specify the parameters for taking and passing the second chance exam. These decisions will be made in a faculty meeting held as soon as possible following the grading of the exams. There will be no third chance given. A student who ultimately fails the Qualifying Examination is not eligible to continue in the Ph.D. program, but may apply to change his/her matriculation to the

Master's program.

IV. Candidacy Examination

The Ph.D. Candidacy Examination must be taken within one and a half years of successful completion of the Qualifying Examination and at least one year prior to the dissertation defense. The student will prepare a comprehensive, written research proposal and defend it orally before the Candidacy Examination Committee (the composition of which is specified in II). The Candidacy Examination is intended to test the student's ability to synthesize knowledge in the formulation of an independent research proposal. Performance is judged by the Candidacy Examination Committee, and any additional requirements they wish to impose must be satisfied before the student is admitted to candidacy. Additional requirements could include, but are not limited to: taking additional course work, modifying the written research proposal, and defending the revised proposal before the Candidacy Examination Committee. Satisfactory completion of any additional requirements must be approved by the student's Candidacy Examination Committee.

NOTE: Students already enrolled in the Ph.D. program can choose to switch to the new guidelines, or continue under the current guidelines.

PH.D. in MECHANICAL ENGINEERING

The Ph.D. program in Mechanical Engineering consists of the Ph.D. Qualifier Examination as specified in Section III below, 24 credits of graduate level course work plus 9 credits of Doctoral Dissertation. The Ph.D. program is designed to allow for considerable flexibility in course selection and specialization of study. Course work must be completed with a cumulative grade point average of 3.0 or higher (see Graduate Catalog for relevant details). In addition, the student must pass a Candidacy Examination prior to completing the dissertation requirements. The Ph.D. should be obtainable in four years of full-time study after entering the program. There is no foreign language or teaching requirement for the Ph.D.

I. Course Requirements

- A. At least four courses (12 credits) at the 600 or higher level in Mechanical Engineering (MEEG)
- B. At least three courses (9 credits) at the 800 level.
- C. At least one course (3 credits) in mathematics (other than MEEG690).
- D. 9 credits of MEEG 969 Doctoral Dissertation.

An individual course can be used to meet more than one of the requirements A, B or C provided the total number of credits is at least 24. MEEG 868 cannot be used toward these requirements. The Ph.D. qualifying exam is based on a 'template' that includes 'traditional' mechanical engineering courses MEEG 610, 620, 630, 640, and 690 as well as 'non-traditional' courses in particular areas of faculty expertise, as defined under Section III, Qualifying Examinations.

The three courses from the template that correspond to the three areas selected by the candidate for the Ph.D. qualifier examination cannot be counted towards the Ph.D. degree requirement.

Students will submit a proposed course plan to the Dissertation Committee at the time of their candidacy exam. Upon approval, it will enter into the candidate's file. Deviations from the proposed plan must be approved by the Dissertation Committee. A copy of the course plan must be sent to the University Office of Graduate Studies.

II. Dissertation Requirements

A dissertation is required which demonstrates the student's ability to conduct independent research. A Dissertation Committee is selected by the advisor and approved by the Department Chairperson. This committee will also serve as the student's Candidacy Examination Committee. At least three Mechanical Engineering Department faculty members and at least one faculty member from another department will serve on the Dissertation Committee. The Committee

will be chaired by the research advisor, who must be a regular full-time member of the Department of Mechanical Engineering Faculty. During the course of the research, the student will periodically review progress with the Committee.

The student must orally present the dissertation before the Dissertation Committee at an open defense. The student shall supply final draft copies of the dissertation to members of the Committee at least two weeks before the oral defense. The dissertation must meet the academic and professional standards set forth by the University.

III. Qualifying Examination

The purpose of the Ph.D. qualifying examination is to assess the aptitude of a doctoral student in the early stages of the program. Accordingly, upon completion of two semesters of study toward the doctoral degree, doctoral students must pass the next available *Qualifying Examination* (QE). The examination will be offered in early June. In judging student performance at this examination, the faculty has three options: (i) outright passing, (ii) giving a second chance, and (iii) outright failing. Students who have been given a second chance for the QE are examined orally in the subjects in which their performance was judged unsatisfactory. This shall be done in the September immediately following the QE. At least two faculty members, other than the student's advisor if already selected, must administer each oral examination. There will be no third chance given. A student who ultimately fails the Qualifying Examination is not eligible to continue in the Ph.D. program, but may apply to change his/her matriculation to the Master's program. The QE is based on a *template* that is flexible, yet assures uniformity of quality across examinations. The template is a set of courses not unlike the 'core courses' currently in effect, but in addition it mirrors the diversity of faculty research. It thus includes MEEG 690 Intermediate Mathematics; '*traditional*' mechanical engineering subjects (MEEG 610 Intermediate Solid Mechanics, MEEG 620 Intermediate Dynamics, MEEG 630 Intermediate Fluid Mechanics, and MEEG 640 Intermediate Heat Transfer); and '*non-traditional*' mechanical engineering subjects in particular areas of faculty expertise (biomedical engineering, nanomechanics, robotics, alternative energy, composite materials, etc.). This examination consists of separate written or oral exams in three areas: (1) Mathematics; (2) one *traditional* mechanical engineering subject (defined above); and (3) the *non-traditional* mechanical engineering subject of the student's choice, or a second *traditional* mechanical engineering subject.

Currently approved templates include:

Biomedical engineering: Qualifying exam is based on content covered in MEEG 683.

The template is updated/enlarged periodically, subject to full faculty approval by vote, to reflect changing faculty interests yet maintain the high quality of the

program. It will be the very grave responsibility of the Faculty of Mechanical Engineering to police the contents of the template. The Department Chair will be responsible that template courses are offered with the required frequency. The template will be posted on the Department's web site, making it available to all current and prospective students.

IV. Candidacy Examination

The Ph.D. Candidacy Examination must be taken within one and a half years of successful completion of the Qualifying Examination and at least one year prior to the dissertation defense. The student will prepare a comprehensive, written research proposal and defend it orally before the Candidacy Examination Committee (the composition of which is specified in II). The Candidacy Examination is intended to test the student's ability to synthesize knowledge in the formulation of an independent research proposal. Performance is judged by the Candidacy Examination Committee, and any additional requirements they wish to impose must be satisfied before the student is admitted to candidacy. Additional requirements could include, but are not limited to: taking additional course work, modifying the written research proposal, and defending the revised proposal before the Candidacy Examination Committee. Satisfactory completion of any additional requirements must be approved by the student's Candidacy Examination Committee.

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