

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 H. Santare phone number X 2246

Department: Mechanical Engineering email address santare@udel.edu

Date: 10/22/09

Action: add a new 4+1 BME/MEM graduate degree option in Mechanical Engineering
(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 10 F
(use format 04F, 05W)

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

Proposed change leads to the degree of: BME, MEM (no change)
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: 4+1 BME/MEM
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: _____
(Must attach your Graduate Program Policy Statement)

Graduate Program of Study: _____
(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.

Attached

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")

NA

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

NA

Identify other units affected by the proposed changes:

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

NA

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

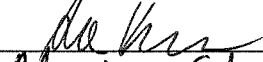


(Explain your reasons for creating, revising, or deleting the curriculum or program.)

Currently, the department of Mechanical Engineering offers the MEM (Masters of Engineering, Mechanical) as a non-thesis master's degree. This degree is offered primarily as a part-time, professional master's degree program for working professionals. At any given time, we typically have one or two students pursuing this degree while working full-time. In an effort to expand our professional degree enrollment (consistent with the University strategic plan), we propose to include full-time students in this program as well. This proposed 4+1 BME/MEM program will give our highly-qualified and highly-motivated undergraduate students the opportunity to earn both the BME and MEM degrees in five years of full-time study.

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.)

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

Department Chairperson  Date 11/18/09
Dean of College  Date 11/20/09
Chairperson, College Curriculum Committee  Date 11/23/09
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 _____

Proposal for creation of a 4+1 BME/MEM Program In Mechanical Engineering

Background: A number of programs around the country have introduced 4+1 and similar programs whereby students can earn both a bachelor's and master's degree in five year of full-time study. This is a mechanism for the programs to retain some of their most highly-qualified undergraduate students for graduate and professional studies. The Department of Mechanical Engineering proposes to create such a program. This is in line with the University of Delaware's plans to increase its professional and graduate degree offerings, as outlined in its Path to Prominence™, strategic plan (<http://www.udel.edu/prominence/>).

Currently, the department of Mechanical Engineering offers two types of Master's degrees:

- MSME; Master's of Science in Mechanical Engineering (24 credits of coursework + 6 credits of thesis), and
- MEM; Master's of Engineering, Mechanical (30 credits of coursework with no thesis)

The MEM degree is offered primarily as a part-time, professional master's degree program for working professionals. At any given time, we typically have one or two students pursuing this degree while working full-time. In an effort to expand the professional graduate degree enrollment in Mechanical Engineering, we propose a 4+1 BME/MEM program as a path for our highly-qualified and highly-motivated undergraduate students to earn an MEM degree in one year of full-time study beyond the BME.

Summary of Proposal: The following format is proposed for the new 4+1 BME/MEM program in Mechanical Engineering:

- Students will complete all the required credits for the BME.
- Students will take two 600-level technical electives as part of the requirements for their BME degree. These courses are to be chosen from the courses required for the MEM and will also count towards the MEM degree requirements.
- Students will complete an additional 24 credits of coursework to meet the course requirements for the MEM degree.

Benefits: The benefits to the student are that both degrees can be completed in less time than the two degrees earned sequentially, and therefore at a reduced cost. Moreover, the modified admissions requirements (see below) will provide the student a streamlined application procedure. The benefits to the department include: 1) Increased enrollment in graduate level courses; 2) a mechanism to attract some of our top BME graduates into graduate study, and 3) the increased possibility of retaining some of these students as Ph.D. candidates.

Admission requirements: In order to ensure that the students admitted are capable of succeeding in this challenging program, a minimum GPA of 3.3 at the end of the junior year in the BME degree will be required for admission. However, since the department faculty will have first-hand knowledge of the students' academic ability, the GRE requirement will be waived.

Graduation requirements: Students must achieve a 3.0 GPA (B average) in their graduate work to earn the MEM.

In the following pages, we submit a copy of the Mechanical Engineering program and policy statement with editing to reflect the proposed creation of the 4+1 program. The changes are in red.

GRADUATE PROGRAM

Mechanical Engineering

ADMISSION TO PROGRAM

Students are admitted into the graduate program for either a Master's or a doctoral, Ph.D., degree. For students with a bachelor's degree in engineering the following minimum criteria will normally be applied:

1. A baccalaureate degree in mechanical engineering or in a closely related field of science or mathematics.
2. An undergraduate grade point average in engineering, science and mathematics courses of at least 3.0 on a 4.0 scale.
3. A minimum of at least three letters of strong support from former teachers or supervisors.
4. A minimum combined Quantitative and Verbal score of 1200 in the Graduate Record Examination Aptitude Test.
5. A minimum score of 600 (or IBT equivalent) in the Test of English as a Foreign Language for students whose first language is not English. This test is not required of students whose first language is English and who have received an undergraduate or post-graduate degree from a College or University in which English is the sole language of instruction.

Admission with financial aid is granted on a competitive basis; therefore, satisfaction of the above minimum standards does not guarantee admission. All admissions require approval of the Office of Graduate Studies.

For applicants with no prior training in engineering, the same minimum criteria will apply. In addition, their records will be reviewed in relation to the intended program of study. Provisional status with specific remedial work may be a basis for acceptance of such applicants.

The acceptance of applicants who have already received a Master's degree in engineering will be based on the above minimum criteria and the results of their graduate work.

ADMISSION TO THE 4+1 BME/MEM PROGRAM

The department offers a special 4+1 BME/MEM program for highly-qualified undergraduate students. This program allows the student to earn both the BME and the MEM degree in 5 years of full-time study in Mechanical Engineering at the University of Delaware. Students would normally apply in the spring of their junior year. For admission to this program the following minimum criteria will be applied:

1. An undergraduate grade point average of at least 3.3 on a 4.0 scale at the end of their junior year.
2. A minimum of two letters of strong support from professors at the University of Delaware.

ADVISEMENT

A temporary academic advisor is assigned to new students when they are admitted to the

Department. Students select their permanent advisor once they become familiar with the department, and clear about their research interests. The permanent advisor will be someone whose interest matches the interest of the student insofar as possible. For students on Research Assistantships, the advisor directs their research and advises them on course selection.

MASTER of SCIENCE in MECHANICAL ENGINEERING (MSME)

The Master of Science in Mechanical Engineering (MSME) program consists of 24 credit hours of graduate level coursework, plus 6 credits of Master's Thesis. Coursework must be completed with a grade point average of 3.0 or higher. The requirements are designed both to provide a balanced program in Mechanical Engineering and to allow for a degree of specialization. Students should be able to complete all degree requirements, including the thesis, in 18 to 24 months of full-time study.

I. Course Requirements

A. The following five courses are required (15 credits):

- MEEG 690 Intermediate Engineering Mathematics
- Two from the following list of '*traditional*' mechanical engineering courses:
 - MEEG 610 Intermediate Solid Mechanics
 - MEEG 620 Intermediate Dynamics
 - MEEG 630 Intermediate Fluid Mechanics
 - MEEG 640 Intermediate Heat Transfer
- Two additional courses either from the list immediately above or from a list (template) of approved ME '*non-traditional*' mechanical engineering courses.

Students may petition the Graduate Committee to substitute a more advanced (e.g., 800-level) course on the same topic for one of these required courses.

B. One additional graduate level course (3 credits) in mathematics or numerical methods. The student makes this selection with the documented approval of the Department's Graduate Committee which has the authority to decide on acceptable courses.

C. Two additional elective graduate level courses (6 credits) in engineering or mathematical, physical or biological sciences. The student makes these selections with the documented approval of the department's Graduate Committee which has the authority to decide on acceptable courses.

D. 6 credits of MEEG 869 Master's Thesis.

II. Thesis Requirements

A thesis is required which demonstrates the student's ability to conduct scholarly research. Entering graduate students are expected to choose a thesis advisor and research topic during their first semester in the Department so that they can initiate research and choose appropriate elective courses.

At the completion of the thesis research, candidates for the MSME degree must defend their thesis orally to a committee of at least three faculty members. The committee will be chaired by the thesis advisor who, along with at least one other committee member, must be regular full-time faculty in the Department of Mechanical Engineering. The thesis is to be submitted to committee members at least two weeks in advance of the defense and shall meet the academic and professional standards set forth by the University. Upon acceptance of the thesis, the Committee recommends approval to the Department Chairperson.

MASTER OF ENGINEERING: MECHANICAL (MEM)

The Master of Engineering: Mechanical (MEM) program consists of 30 credit hours of graduate level coursework. Coursework must be completed with a grade point average of 3.0 or higher. The requirements are designed to provide a general program and to allow for some concentration of study within Mechanical Engineering. It will be possible to complete this program taking courses in the late afternoon, early evening, and/or in a distance format.

Engineering Outreach can help facilitate part-time graduate education. This degree is not available to students who have been enrolled in the MSME degree program.

Course Requirements

A. The following five courses are required (15 credits):

- MEEG 690 Intermediate Engineering Mathematics
- Two from the following list of '*traditional*' mechanical engineering courses:
 - MEEG 610 Intermediate Solid Mechanics
 - MEEG 620 Intermediate Dynamics
 - MEEG 630 Intermediate Fluid Mechanics
 - MEEG 640 Intermediate Heat Transfer
- Two additional courses either from the list immediately above or from a list (template) of approved ME '*non-traditional*' mechanical engineering courses.

Students may petition the Graduate Committee to substitute a more advanced (e.g., 800-level) course on the same topic for one of these required courses.

B. One additional graduate level course (3 credits) in mathematics or numerical methods. The student makes this selection with the documented approval of the Department's Graduate Committee which has the authority to decide on acceptable courses.

C. One additional graduate level course (3 credits) in Mechanical Engineering. Three credits of MEEG 868 Research can be used toward this requirement. The student makes this selection with the documented approval of the department's Graduate Committee which has the authority to decide on acceptable courses.

D. Three additional graduate level courses (9 credits) in engineering, mathematical, physical or biological sciences or business and economics. The student makes these selections with the documented approval of the department's Graduate Committee which has the authority to decide on acceptable courses.

4+1 BME/MEM PROGRAM

Students admitted to the 4+1 BME/MEM program must meet all the above requirements for the MEM degree. However, these students are required to complete two of the required courses (from category A above) during enrollment in the BME degree. These two courses can also be counted toward meeting the technical elective requirement of the BME degree.

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 page 213 of the 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.

Individuals admitted to the Ph.D. program in Mechanical Engineering may be offered admission with the conditional requirement to complete 9 of the 15 credits of courses that are specified for MSME students in I.A above, in addition to the normal requirements for the degree. The courses needed for preparation 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.

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.

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