

**UNIVERSITY FACULTY SENATE FORMS****Revised 3-15-10****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:** Robert L. Opila phone number 302-831-3128

**Department:** Materials Science and Engineering email address opila@udel.edu

**Date:** 14 January 2010

**Action:** revise 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** 10F  
(use format 04F, 05W)

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

**Proposed change leads to the degree of:** PhD  
(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:** \_\_\_\_\_  
(**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:** Soft Materials, Hard Materials, Composites

**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")

- The following courses, totaling 14 credits, are required of all students. Equivalent courses may be substituted as approved by the faculty advisor and Chairperson:

MSEG 608	Structure and Properties of Materials I (4 credits) NEW
MSEG 609	Structure and Properties of Materials II (4 credits) NEW
MSEG 803	Equilibria in Materials Systems (3 credits)
MSEG 804	Kinetics in Materials Systems (3 credits)

2. Students must select a concentration and complete the required courses for that concentration

Soft Materials Concentration

MSEG 832 Principles of Polymer Synthesis (3 credits) RENUMBERED  
 MSEG 833 Polymer Synthesis and Characterization Laboratory (3 cr.) RNUM  
 MSEG 835 Polymer Physics (3 credits) RENUMBERED

Hard Materials Concentration

MSEG 640 Applied Quantum Mechanics I (3 credits) NEW  
 MSEG 841 Solid State Materials I (3 credits) NEW  
 MSEG 842 Solid State Materials II (3 credits) NEW

Composite Materials Concentration

MSEG 832 Principles of Polymer Synthesis (3 credits) RENUMBERED  
 MSEG 817 Composite Materials (3 credits)

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

**Identify other units affected by the proposed changes:**

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

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

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

This revision of the required curriculum for Ph.D. students in the UD Materials Science and Engineering Department is intended to address two key problems with our current curriculum requirements. First, the present curriculum requires all students to take advanced courses in both solid state materials and polymers. Students who will pursue research in one of these areas generally have a better foundation in that subject than students who will pursue research in other areas. Consequently, instructors find it difficult to provide the graduate education appropriate for students who will pursue research in that field without overwhelming and losing students with different backgrounds who will work in other fields. Second, the existing curriculum was designed so that required courses are offered in alternating years. This was necessary given the small size of the department, but precluded the establishment of formal prerequisites for advanced graduate classes, which has made it necessary to spend significant class time on background material more effectively taught in a prerequisite class.

The growing size of the department now makes it possible to establish a sequence of courses that build upon one another. Discussions among the faculty have also led to the conclusion that it is not necessary for students in one area of research to have a particularly deep understanding of the fundamentals underlying other research areas. Instead, it is most important that all materials science graduate students have a familiarity with all key aspects of materials science and a common vocabulary to use. This revision of the curriculum is intended to address both of these issues by establishing a core group of classes taken by all students followed by track-specific requirements appropriate to a student's field of research. The core classes will teach concepts essential to all materials research, introduce the essential elements of various subfields, and build a common vocabulary. The track-specific courses will be taught at the appropriate level to provide a foundation for students pursuing research in those fields.

University of Delaware graduate programs must require at least 10 courses. The proposed curriculum for the UD Materials Science and Engineering department will contain four core courses that all students are required to take: Structure and Properties of Materials I, Structure and Properties of Materials II, Equilibria in Materials Systems, and Kinetics in Materials Systems. In addition there will be 2-3 track-specific required courses as described below. The tracks are: soft materials, hard materials, and composites. Students can then choose 3-4 elective courses to reach the required 10 courses. Any course not required for a student's track would count as an elective (i.e. a hard materials

student could take polymer synthesis as an elective). Attendance at the MSEG seminar series will also be strongly encouraged.

### 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.)

NEW:

- The following courses, totaling 14 credits, are required of all students. Equivalent courses may be substituted as approved by the faculty advisor and Chairperson:

MSEG 608 Structure and Properties of Materials I (4 credits) NEW  
 MSEG 609 Structure and Properties of Materials II (4 credits) NEW  
 MSEG 803 Equilibria in Materials Systems (3 credits)  
 MSEG 804 Kinetics in Materials Systems (3 credits)

- Students must select a concentration and complete the required courses for that concentration

#### Soft Materials Concentration

MSEG 832 Principles of Polymer Synthesis (3 credits) RENUMBERED  
 MSEG 833 Polymer Synthesis and Characterization Laboratory (3 cr.) RNUM  
 MSEG 835 Polymer Physics (3 credits) RENUMBERED

#### Hard Materials Concentration

MSEG 640 Applied Quantum Mechanics I (3 credits) NEW  
 MSEG 841 Solid State Materials I (3 credits) NEW  
 MSEG 842 Solid State Materials II (3 credits) NEW

#### Composite Materials Concentration

MSEG 832 Principles of Polymer Synthesis (3 credits) RENUMBERED  
 MSEG 817 Composite Materials (3 credits)

- The remaining 7-10 credits of elective courses will be chosen after discussion with the student's advisor, and will usually be related to the student's area of research. Courses required for a different specialization can count as elective courses.

OLD:

- The following 3 credit courses totaling 15 credits, or their equivalent as approved by the faculty advisor and Chairperson, are required:

MSEG 803 Equilibria in Materials Systems  
 MSEG 804 Kinetics in Materials Systems  
 MSEG 602 Structure of Materials  
 MSEG 607 Physical Properties of Materials I  
 MSEG 630 Introduction to the Science & Engineering of Polymer Systems

- The remaining 21 credits of elective courses will be chosen after discussion with the advisor, and will usually be related to the student's area of research interest. Up to a maximum of 6 credits (out of 21) of research (MSEG 868) may be taken prior to the admission to Candidacy.

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

Department Chairperson \_\_\_\_\_ Date \_\_\_\_\_

Dean of College \_\_\_\_\_ Date \_\_\_\_\_

Chairperson, College Curriculum Committee \_\_\_\_\_ Date \_\_\_\_\_

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 \_\_\_\_\_

Revised 02/09/2009 /khs