



Office of the Registrar  
FORM 40G REV. 10/10

PURDUE UNIVERSITY  
REQUEST FOR ADDITION, EXPIRATION,  
OR REVISION OF A GRADUATE COURSE  
(50000-60000 LEVEL)

Graduate Council Doc. No. 15-3 a

DEPARTMENT Materials Engineering

EFFECTIVE SESSION MSE 52700  
Spring 2016 201620

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> 1. New course with supporting documents (complete proposal form) | <input type="checkbox"/> 7. Change in course attributes              |
| <input type="checkbox"/> 2. Add existing course offered at another campus                            | <input type="checkbox"/> 8. Change in instructional hours            |
| <input type="checkbox"/> 3. Expiration of a course   | <input type="checkbox"/> 9. Change in course description             |
| <input checked="" type="checkbox"/> 4. Change in course number                                       | <input type="checkbox"/> 10. Change in course requisites             |
| <input type="checkbox"/> 5. Change in course title   | <input type="checkbox"/> 11. Change in semesters offered             |
| <input type="checkbox"/> 6. Change in course credit/type   | <input type="checkbox"/> 12. Transfer from one department to another |

PROPOSED:

EXISTING:

Subject Abbreviation MSE

Subject Abbreviation MSE

Course Number 52700

Course Number 597M

Long Title Introduction To Biomaterials

Short Title Biomaterials

Abbreviated title will be entered by the Office of the Registrar if omitted, (30 CHARACTERS ONLY)

TERMS OFFERED

Check All That Apply:

Fall  Spring  Summer

CAMPUS(ES) INVOLVED

Calumet  N. Central  
 Cont Ed  Tech Statewide  
 Ft. Wayne  W. Lafayette  
 Indianapolis

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. 3  
 2. Variable Credit Range:  
 Minimum Cr. Hrs. \_\_\_\_\_  
 (Check One) To  Or   
 Maximum Cr. Hrs. \_\_\_\_\_  
 3. Equivalent Credit: Yes  No   
 4. Thesis Credit: Yes  No

COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only   
 2. Satisfactory/Unsatisfactory Only   
 3. Repeatable   
 Maximum Repeatable Credit: \_\_\_\_\_  
 4. Credit by Examination   
 6. Special Fees   
 6. Registration Approval Type  
 Department  Instructor   
 7. Variable Title   
 8. Honors   
 9. Full Time Privilege   
 10. Off Campus Experience

| Schedule Type | Minutes Per Mo<br>15 | Meetings Per Week<br>2 | Weeks Offered<br>15 | % of Credit Allocated<br>100 |
|---------------|----------------------|------------------------|---------------------|------------------------------|
| Lecture       |                      |                        |                     |                              |
| Recitation    |                      |                        |                     |                              |
| Presentation  |                      |                        |                     |                              |
| Laboratory    |                      |                        |                     |                              |
| Lab Prep      |                      |                        |                     |                              |
| Studio        |                      |                        |                     |                              |
| Distance      |                      |                        |                     |                              |
| Clinic        |                      |                        |                     |                              |
| Experiential  |                      |                        |                     |                              |
| Research      |                      |                        |                     |                              |
| Ind. Study    |                      |                        |                     |                              |
| Prac/Observ   |                      |                        |                     |                              |

Cross-Listed Courses

RECEIVED

SEP 18 2015

OFFICE OF THE REGISTRAR

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

This course aims to introduce students to Biomaterials concepts: structure, properties, and applications. The class will cover the main classes of materials: metals, ceramics and polymers in the context of their use in medicine as implant materials, drug delivery vehicles, and as tissue engineering scaffolds.

Prerequisites: Junior standing in Engineering or Science. Professor Stanciu.

COURSE LEARNING OUTCOMES: See attached document.

|   |   |   |
|---|---|---|
| Calumet Department Head _____ Date _____          | Calumet School Dean _____ Date _____                | Calumet Undergrad Curriculum Committee _____ Date _____ |
| Fort Wayne Department Head _____ Date _____       | Fort Wayne School Dean _____ Date _____             | Fort Wayne Chancellor _____ Date _____                  |
| Indianapolis Department Head _____ Date _____     | Indianapolis School Dean _____ Date _____           | Undergrad Curriculum Committee _____ Date _____         |
| North Central Department Head _____ Date _____    | North Central School Dean _____ Date _____          | APPROVED 9/17/15  |
| West Lafayette Department Head _____ Date _____   | West Lafayette College School Dean _____ Date _____ | Date Approved by Graduate Council _____                 |
| Graduate Area Committee Convenor _____ Date _____ | Graduate Dean _____ Date _____                      | Graduate Council Secretary _____                        |
|   |   | West Lafayette Registrar _____ Date _____               |

OFFICE OF THE REGISTRAR

*Ujj 9/30/15*

TO: The Faculty of the College of Engineering

From: School of Materials Engineering

RE: Change in Course Number – MSE 52700 Introduction to Biomaterials

The faculty of the School of Materials Engineering has approved the following change in course number. This action is now submitted to the Engineering Faculty with a recommendation for approval.

**MSE 52700 Introduction to Biomaterials**

Sem. 2, Cr. 3

Prerequisites: Junior or higher standing in Engineering or Science

**Description:** This course aims to introduce students to Biomaterials concepts: structure, properties, and applications. The class will cover the main classes of materials: metals, ceramics and polymers in the context of their use in medicine as implant materials, drug delivery vehicles, and as tissue engineering scaffolds.

**Reason:** This class has now been offered seven times as MSE 59700, each Spring Semester 2007-2014, with enrollments starting at around 10 students and increasing up to 60 students from different Schools (Materials Engineering, Biomedical Engineering, Chemical Engineering, Mechanical Engineering, Civil Engineering) . The primary purpose of this course is to develop an foundation of knowledge of biomaterials science principles. The course presents a balanced view of Biomaterials in Medicine by including information on hard and soft tissues, orthopedic ideas, cardiovascular concepts, as well as how metals, ceramics and polymers are currently used in prosthetics, drug delivery and tissue engineering. Thus, the class is providing students with a starting point towards understanding how Materials Engineering can be applied in a new way that encourages thinking towards solving of societal health challenges.

Approved for the faculty of the Schools  
of Engineering by the Engineering  
Curriculum Committee

ECC Minutes 10 Date 2-9-15  
Chairman ECC [Signature]

## Supporting Documentation for New Graduate Course

### Engineering Faculty Document 19-15 MSE 52700 – Introduction to Biomaterials

#### A. Justification of the Course

This introductory Biomaterials course has been taught in MSE (for three years cross-listed in BME) since 2008, and is very popular with students. The class provides a completely different perspective than the traditional MSE curriculum, on less known applications in Medicine of the main classes of materials. The course is presenting concepts related to how metallic materials and ceramics are used in applications such as total hip implants, and how polymeric materials are interesting for drug delivery of anti-cancer drugs. In addition, this course is introducing students to the concepts of biocompatibility, toxicity, and the complement cascade, which are concepts related to how the human body is responding to the presence of biomaterials.

This is requested at the 500 level, due to it being a historically non-traditional learning route for students in MSE. The course attracts both undergraduate and graduate students. Although is a course that attracts upper division undergraduate students in majority, it is requested at the 500 level since it is perceived as the next level towards an understanding of Materials Science from a different perspective than the one traditionally taught in the School Curriculum.

#### B. Learning Outcomes and Method of Evaluation or Assessment

The objective of the course is for the students to become familiar with the main concepts of Biomaterials principles: biocompatibility, structure-property-applications relationships, mechanical response of natural tissues, cellular pathways for tissue-material ingrowth. At the end of the course, all students should understand: what are the requirements for metals and alloys, as well as ceramic materials to be used in load bearing implants (corrosion concepts, stress shielding, mechanical properties, composition), what properties of polymers impact their use in medicine (leaching and swelling, creep and stress relaxation); understand the tissue response to biomaterials: cytotoxicity, carcinogenicity, immune reactions; be able to expand the understanding of materials concepts to drug delivery applications (polymer degradation, encapsulation) and tissue engineering (scaffold porosity, diffusion of nutrients, mechanical properties).

The assessment of student learning outcomes will be performed through three exam throughout the semester, as well as one term paper from recent literature and a student led group presentation on state of the art topics in Biomaterials.

Grading will be performed based on the student performance in the exams, term paper and group presentation. The grading scheme will be:  $\geq 90\%$  A;  $\geq 80\%$  B;  $\geq 70\%$  C;  $\geq 50\%$  D;  $< 50\%$  F

C. Prerequisites

Junior standing in Engineering or Science.

D. Course Instructor

Lia Stanciu, Associate Professor, School of Materials Engineering. Associate Professor (by courtesy) School of Biomedical Engineering.

E. Course Outline

| Topics   | Percent time |
|--|--------------|
| Introductory lecture   | 2%           |
| Hard Tissues   | 10%          |
| Soft Tissues   | 10%          |
| Metals   | 10%          |
| Ceramics   | 10%          |
| Polymers   | 10%          |
| Biomaterials Characterization  | 10%          |
| Protein Absorption/Clotting  | 10%          |
| Inflammatory Response/Foreign Body Response                                      | 10%          |
| Surface Chemistry  | 10%          |
| FDA and Patent Law   | 2%           |
| Current Topics in Biomaterials Research (tissue engineering, drug delivery etc.) | 6%           |

F. Reading List

-Course Notes

- An Introduction to Materials in Medicine, B. Ratner, A. Hoffman, F. Schoen, J. Lemons, Editors, Academic Press, 1996.

G. Library Resources

Purdue University Engineering Library.

## Tests

There will be two tests given over the course of the semester. Their content will be based on lectures and handout material.

## Grading

90% = A, 80% = B, 70% = C, 60% = D

|                   |     |
|-------------------|-----|
| Exam 1            | 30% |
| Exam 2            | 30% |
| Term Paper        | 20% |
| Oral presentation | 20% |

Spring Semester 2009

| Topics   |
|--|
| Introductory lecture   |
| Hard Tissues   |
| Soft Tissues   |
| Metals   |
| Ceramics   |
| Polymers   |
| Biomaterials Characterization  |
| Protein Absorption/Clotting  |
| Inflammatory Response/Foreign Body Response                                      |
| Surface Chemistry  |
| FDA and Patent Law   |
| Current Topics in Biomaterials Research (tissue engineering, drug delivery etc.) |

**Spring 2009 Syllabus**  
**BME58200/MSE 59700-Biomaterials**

**Textbook:** Biomaterials Science: An Introduction to Materials in Medicine, B. Ratner, A. Hoffman, F. Schoen, J. Lemons, Editors, Academic Press, 1996.

**Instructor:** Lia Stanciu  
[lstanciu@purdue.edu](mailto:lstanciu@purdue.edu)

**Teaching Assistant:** Aaron Conovaloff  
[conov@purdue.edu](mailto:conov@purdue.edu)

Office Hours: TBA

**Course Goal**

This course is designed to provide a foundation of knowledge of biomaterial science principles. The course presents a balanced perspective on the evolving discipline of Biomaterials Science by including information on both hard and soft biomaterials. The course will cover materials science background, fundamental biological concepts, and medical/clinical issues, as well as new trends in biomaterials research. The objective of the class is for the student to gain a solid understanding of what biomaterials are, as well as of the modern trends in biomaterials science and its applications in medicine. At the end of the course, all students should be able to understand the terminology used in biomaterials literature, fundamental properties of biomaterials, be able to correlate terms with processes/phenomena and related events. Examples:

- Performance requirements for metals, ceramics and polymers used as biomaterials.
- Biocompatibility.
- Characterization techniques
- Clotting and Thrombosis
- Foreign body response.

**Term Paper**

Each student will be required to prepare a research paper in the area of biomaterials based on a chosen subject from the recent literature in biomaterials (journal articles published past five years).

**Student Presentations**

Students will be required to present their literature research on the subject of their term paper in a 10 minute in-class presentation.

## Supporting Document for a New Graduate Course

**To:** Purdue University Graduate Council

**From:** Faculty Member: Lia Stanciu  
Department: Materials Engineering  
Campus: West Lafayette

**Date:** 08/20/2014

**Subject:** Proposal for New Graduate Course-Documentation  
Required by the Graduate Council to Accompany  
Registrar's Form 40G

For Reviewer's comments only  
(Select One)

Reviewer:

Comments:

**Contact for information if questions arise:** Name: Lia Stanciu  
Phone Number: 7654096367  
E-mail: lstanciu@purdue.edu  
Campus Address: ARMS 2223

Course Subject Abbreviation and Number: MSE527

Course Title: Introduction to Biomaterials

**A. Justification for the Course:**

- Provide a complete and detailed explanation of the need for the course (e. g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing majors and/or concentrations, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.
- Justify the level of the proposed graduate course (50000- or 60000-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.

**B. Learning Outcomes and Method of Evaluation or Assessment:**

- Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.).
- Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.)
- Grading criteria (select from dropdown box); include a statement describing the criteria that will be used to assess students and how the final grade will be determined.

**Criteria**

- Identify the method(s) of instruction (select from dropdown box) and describe how the methods promote the likely success of the desired student learning outcomes.

**Method of Instruction**

**C. Prerequisite(s):**

- List prerequisite courses by subject abbreviation, number, and title.
- List other prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence.

**D. Course Instructor(s):**

- Provide the name, rank, and department/program affiliation of the instructor(s).
- Is the instructor currently a member of the Graduate Faculty?  Yes  No  
(If the answer is no, indicate when it is expected that a request will be submitted.)

**E. Course Outline:**

- Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory or field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course.

**F. Reading List (including course text):**

- A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.
- A secondary reading list or bibliography should include material students may use as background information.

**G. Library Resources**

- Describe the library resources that are currently available or the resources needed to support this proposed course.

**H. Example of a Course Syllabus** (While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the *Graduate School's Policies and Procedures Manual for Administering Graduate Student Programs*. See Appendix K.)

[http://www.gradschool.purdue.edu/downloads/Graduate\\_School\\_Policies\\_and\\_Procedures\\_Manual.pdf](http://www.gradschool.purdue.edu/downloads/Graduate_School_Policies_and_Procedures_Manual.pdf)



## Supporting Documentation for New Graduate Course

### Engineering Faculty Document 19-15 MSE 5270 Introduction to Biomaterials

#### A. Justification of the Course

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D. Course Instructor

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| Polymers   | 10%          |
| Biomaterials Characterization  | 10%          |
| Protein Absorption/Clotting  | 10%          |
| Inflammatory Response/Foreign Body Response                                      | 10%          |
| Surface Chemistry  | 10%          |
| FDA and Patent Law   | 2%           |
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F. Reading List

-Course Notes

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G. Library Resources

Purdue University Engineering Library.

**Spring 2009 Syllabus**  
**BME582/MSE 597M-Biomaterials**

**Textbook:** Biomaterials Science: An Introduction to Materials in Medicine, B. Ratner, A. Hoffman, F. Schoen, J. Lemons, Editors, Academic Press, 1996.

**Instructor:** Lia Stanciu  
[lstanciu@purdue.edu](mailto:lstanciu@purdue.edu)

**Teaching Assistant:** Aaron Conovaloff  
[conov@purdue.edu](mailto:conov@purdue.edu)

Office Hours: TBA

**Course Goal**

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- Clotting and Thrombosis
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**Term Paper**

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## Tests

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## Grading

90% = A, 80% = B, 70% = C, 60% = D

Exam 1                      30%

Exam 2                      30%

Term Paper                20%

Oral presentation        20%

Spring Semester 2009

| Topics   |
|--|
| Introductory lecture   |
| Hard Tissues   |
| Soft Tissues   |
| Metals   |
| Ceramics   |
| Polymers   |
| Biomaterials Characterization  |
| Protein Absorption/Clotting  |
| Inflammatory Response/Foreign Body Response                                      |
| Surface Chemistry  |
| FDA and Patent Law   |
| Current Topics in Biomaterials Research (tissue engineering, drug delivery etc.) |