

## Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.**

College: CITE \_\_\_\_\_

Dept/Division: Engineering \_\_\_\_\_

Alpha Designator/Number: ME/628 \_\_\_\_\_

 Graded     CR/NC

Contact Person: Dr. Asad A. Salem \_\_\_\_\_

Phone: 304-696-3207 \_\_\_\_\_

### NEW COURSE DATA:

New Course Title: Applied Biomaterials \_\_\_\_\_

Alpha Designator/Number:

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Title Abbreviation:

A	P	P	L	I	E	D		B	I	O	M	A	T	E	R	I	A	L	S				
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(Limit of 25 characters and spaces)

Course Catalog Description:  
(Limit of 30 words)

Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

Co-requisite(s): \_\_\_\_\_

First Term to be Offered: Spring 2016 \_\_\_\_\_

Prerequisite(s): Graduate Status \_\_\_\_\_

Credit Hours: 3 \_\_\_\_\_

Course(s) being deleted in place of this addition (*must submit course deletion form*): \_\_\_\_\_

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____	Date _____
Registrar _____	Date _____
College Curriculum Chair _____	Date _____
Graduate Council Chair _____	Date _____

## Request for Graduate Course Addition - Page 2

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College: CITE

Department/Division: Engineering

Alpha Designator/Number: ME/628

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Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

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1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Dr. Iyad Hijazi

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "**Not Applicable**" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another department(s), identify it/them by name. Enter "**Not Applicable**" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "**Not Applicable**" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "**Not Applicable**" if not applicable.

Not Applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Please refer to the attached syllabus

7. COURSE OUTLINE (May be submitted as a separate document)

Please refer to the attached syllabus

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

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### 10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Mid-Term 20%

Project 20%

Final Exam 20%

Homework, quizzes, attendance 40%

### 11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

None

### 12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909
- Biomaterials: The Intersection of Biology and Materials Science, A.G. Mikos J.S. Temenoff, Pearson International Edition, first edition, 2008 , ISBN-13: 978-0132350440

## Request for Graduate Course Addition - Page 5

Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:  
Course Number and Title:  
Catalog Description:  
Prerequisites:  
First Term Offered:  
Credit Hours:

Department: Weisberg Division of Engineering

Course Number and Title: ME 628 Applied Biomaterials

Catalog Description: Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

Prerequisites: Graduate Status

First Term Offered: Spring 2016

Credit Hours: 3

## ME 628 – Applied Biomaterials

College of Information Technology & Engineering  
Weisberg Division of Engineering and Computer Science

<b>Course Title/Number</b>	Applied Biomaterials-ME 628
<b>Semester/Year</b>	
<b>Days/Time</b>	
<b>Location</b>	
<b>Instructor</b>	
<b>Office</b>	
<b>Phone</b>	
<b>E-Mail</b>	
<b>Office/Hours</b>	
<b>University Policies</b>	<p>By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to <a href="http://www.marshall.edu/academic-affairs">www.marshall.edu/academic-affairs</a> and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to <a href="http://www.marshall.edu/academic-affairs/?page_id=802">http://www.marshall.edu/academic-affairs/?page_id=802</a></p> <p>Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment</p>

### Course Description: From Catalog

Covers the knowledge needed to select and design biomaterials used in medical devices with emphasis on metallic, ceramic, polymeric, and composite biomaterials. Explains the difference between materials science and materials engineering.

### Required Text: Additional Reading and Other Materials

- **Introduction to Biomaterials, Basic Theory with Engineering Applications, C. M. Agrawal, Cambridge University Press, 2013, ISBN-13: 978-0521116909**
- **Biomaterials: The Intersection of Biology and Materials Science, A.G. Mikos J.S. Temenoff, Pearson International Edition, first edition, 2008 , ISBN-13: 978-0132350440**

## Course Objectives:

- Describe biological systems, biological environment, and biological testing techniques
- Learn different technics for characterization of biomaterials
- Understand bioceramics, composite biomaterials, common polymeric biomaterials, and natural biomaterials.

## Course Requirements / Due Dates

Prerequisites: Graduate status

## Grade Policy:

<b>Exams</b>	<b>40%</b>
<b>Projects</b>	<b>20%</b>
<b>Homework</b>	<b>30%</b>
<b>Quizzes</b>	<b>5%</b>
<b>Attendance</b>	<b>5%</b>

## Attendance Policy

Students are expected to attend all class sessions. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

## Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course	ABET Outcome (letter) & Level (number)
Describe Biological systems, The biological environment, and Biological testing techniques	Homework assignment And projects	Homework, Quiz, Tests and projects	a,e,k
Describe different technics for Characterization of biomaterials	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k
Discuss bioceramics, Composite biomaterials, Common polymeric biomaterials, and natural biomaterials.	Homework assignment and projects	Homework, Quiz, Tests and projects	a,e,k
Explain cell–biomaterial interactions	Homework assignment	Homework, Quiz, Tests and projects	a,e,k

	<b>And projects</b>		
<b>Describe Medical applications of biomaterials</b>	<b>Homework assignment and Projects</b>	<b>Homework, Quiz, Tests and projects</b>	<b>a,d,k</b>

**Course Schedule:**

<b>No of Weeks</b>	<b>Topic</b>
<b>1</b>	<b>Introduction, Types of bonds in materials, Types of materials, Impact of biomaterials and Future of biomaterials</b>
<b>2-3</b>	<b>Basic properties of materials, Mechanical properties, Electrochemical properties, And Surface properties</b>
<b>4</b>	<b>Biological systems, The biological environment, Genetic regulation and control systems, Biological testing techniques</b>
<b>5-6</b>	<b>Characterization of biomaterials, Infrared spectroscopy, X-ray photoelectron spectroscopy, Secondary ion mass spectrometry, Atomic force microscopy, etc..</b>
<b>7</b>	<b>Metals: structure and properties, Titanium and its alloys, Stainless steel, Cobalt–chromium alloys, Nitinol, Tantalum, etc..</b>
<b>8</b>	<b>Polymers, Molecular structure of polymers, Types of polymerization, Physical states of polymers, Common polymeric biomaterials, Hydrogels, and Nanopolymers</b>
<b>9</b>	<b>Ceramics, General properties, Classifications, and Bioceramics, Nanoceramics</b>
<b>10</b>	<b>Composite biomaterials.</b>
<b>11</b>	<b>Natural biomaterials, Collagen, Elastin, Silk, Chitosan , etc..</b>
<b>12</b>	<b>Cell–biomaterial interactions</b>
<b>13-14</b>	<b>Medical applications, Cardiovascular assist devices, Cardiovascular stents, Dental restoration, Dental implants, Orthopedic implants, etc.</b>

**Prepared by Dr. Iyad Hijazi**