



University of Puerto Rico  
 Mayagüez Campus  
 College of Engineering  
 Department of Mechanical Engineering  
 M.S./Ph.D. in Mechanical Engineering



## Course Syllabus

<b>1. General Information:</b>	
Alpha-numeric codification: INME 6115 Course Title: Biomaterials Number of credits: 3 Contact Period: Three hours of lecture per week	
<b>2. Course Description:</b>	
English: Study of advanced materials as applied to biomedical systems. Integration of materials science and engineering concepts with biology for the design of successful interfaces between living cells and organic and inorganic materials as well as medical devices.	
Spanish: Estudio de materiales avanzados tal como aplican a sistemas biomédicos. Integración de conceptos de ciencia de materiales e ingeniería con biología en el diseño exitoso de interfaces entre células vivas y materiales orgánicos e inorgánicos, así como también productos médicos.	
<b>3. Pre/Co-requisites and other requirements:</b>	
Pre-requisite: Authorization of the Director of the Department	
<b>4. Course Objectives:</b>	
<ul style="list-style-type: none"> <li>• Recognizing the various classes of biomaterials on the basis of structure and function;</li> <li>• Recognizing various analytical methods based on their use to characterize bulk and surface properties of biomaterials;</li> <li>• Recognizing the molecular and cellular events that follow exposure of materials to bodily fluids and to contact with various tissues of the human body;</li> <li>• Recognizing various biomedical devices based upon function, biomaterial composition, patient risk, and clinical application;</li> <li>• Describing various practical aspects of biomedical device design, fabrication and testing.</li> </ul>	
<b>5. Instructional Strategies:</b>	
<input checked="" type="checkbox"/> conference <input type="checkbox"/> discussion <input type="checkbox"/> computation <input type="checkbox"/> laboratory  <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop  <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring  <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
<b>6. Minimum or Required Resources Available:</b>	
Classroom, projector.	
<b>7. Course time frame and thematic outline</b>	
<b>General Topics</b>	<b>Contact Hours</b>
Review of material science	3

Bulk properties of materials	3
Surface properties and characterization	6
Applications of polymers to biomedical systems	4
Applications of metals to biomedical systems	3
Applications of ceramics to biomedical systems	3
Applications of composites to biomedical systems	4
Biology, biochemistry and host reactions	5
Degradation of materials in the biological environment	5
Application of materials in medicine, biology and artificial organs	5
Introduction to tissue engineering	2
Test	2
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

### 8. Grading System

Quantifiable (S/NS)  Not Quantifiable

### 9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	1	25
<input checked="" type="checkbox"/> Final Exam	1	25
<input checked="" type="checkbox"/> Short Quizzes	6	30
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	20
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
<b>TOTAL:</b>		<b>100%</b>

### 10. Bibliography:

#### Textbook:

Bhat, S.V. 2005. *Biomaterials*. Oxford: Alpha Science International.

#### **Other resources:**

1. Wong, Joyce Y., Bronzino, Joseph D., and Donald R. Peterson. 2012. *Biomaterials*. Florida: CRC Press. <http://dx.doi.org/10.1201/9780849378898>. [Available via MATERIALSnetBASEnetBASE, UPRM General Library Databases]
2. Guelcher, Scott A. 2006. *An Introduction to Biomaterials*. Florida: CRC Press. [Available at the Circulation Collection (R857 .M3 I68 2006), UPRM General Library]
3. Ratner, Buddy D., Hoffman, Allan S., Schoen, Frederick J., and Jack E. Lemons (eds.). 2012. *Biomaterial Science: An Introduction to Materials in Medicine*. 3rd ed. Massachusetts: Academic Press.
4. Enderle, John, and Joseph Bronzino. 2011. *Introduction to Biomedical Engineering*. 3rd ed. Massachusetts: Academic Press.

#### SUGGESTION

5. Narayan, Roger (ed.). 2012. *Materials for Medical Devices* (ASM International. Handbook Vol. 23). Metals Park, Ohio: American Society for Metals. [Available at the Reference Collection (TA459. A5 V.23), UPRM General Library]
6. Electronic resources available through the Library's website:  
<http://www.uprm.edu/library/cre/listdbsp.php?l=1&st=0&topic=77>.

**11. Law 51: The Comprehensive Educational Services Act for People with Disabilities:**

States that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information, contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

**12. Academic Integrity**

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws. —

**13. Certification 06-43 of the Academic Senate**

"The academic guidelines for offering online courses," defines: Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 06-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

**14. Sexual Harassment: Certification 130-2014-2015 states:**

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

*Revised: February, 2019*