



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



Course Syllabus

1. General Information: Alpha-numeric codification: INME 6135 Course Title: Tissue Engineering Number of credits: 3 Contact Period: Three hours of lecture per week
2. Course Description: English: Study of tissue engineering applied to biomedical systems. Review of quantitative cell and tissue biology, cell and tissue characterization, engineering methods and design, and clinical implementation. Discussion of cells and their behavior, followed by the effect of external stimuli on cells. The properties of the extracellular matrix will be studied. Specific cases of vascular tissue engineering, cartilage tissue engineering and bone engineering will be studied. The implications of using stem cell for tissue engineering will be discussed. Spanish: Estudio de la ingeniería de tejidos aplicado a sistemas biomedicos. Repaso cuantitativo de biología de células y tejido, caracterización de células y tejido, diseño y métodos de ingeniería, y el uso clínico. Discusión de células y su comportamiento, seguido por el efecto de estímulo externo sobre las células. Las propiedades de la matriz extra-celular, casos específicos de ingeniería de tejido vascular, ingeniería de piel, ingeniería de cartílago e ingeniería de tejido oseo serán estudiados. Las implicaciones del uso de células madres serán discutidas.
3. Pre/Co-requisites and other requirements: Pre-requisite: Authorization of the Director of the Department
4. Course Objectives: <ul style="list-style-type: none">• Recognizing cell types and describe their expected behavior;• Describe tissue organization, tissue dynamics, morphogenesis, stem cells, cellular fate processes, and their coordination;• Understanding cell and tissue characterization;• Implementing engineering methods and design;• Describing the response of cells to external stimuli;• Recognizing clinical implementation;• Applying the concepts of tissue engineering to various cases of biological tissues.
5. Instructional Strategies: <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:

6. Minimum or Required Resources Available:

Classroom, projector.

7. Course time frame and thematic outline

General Topics	Contact Hours
Introduction to cells and their structure	3
Cell cytoskeleton, integrin and cell migration	3
Extracellular matrix	3
Engineering of the extracellular matrix	3
Vascular tissue engineering	6
Skin tissue engineering	6
Cartilage tissue engineering	6
Bone tissue engineering	6
Engineering stem cells	3
Presentations	3
Exams	3
Total hours: (equivalent to contact period)	45

8. Grading System Quantifiable (S/NS) Not Quantifiable**9. Evaluation Strategies**

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	3	75
<input type="checkbox"/> Final Exam		
<input type="checkbox"/> Short Quizzes		
<input checked="" type="checkbox"/> Oral Reports	1	20
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Attendance		5
TOTAL:		100%

10. Bibliography:**Textbook:**

Lanza, Robert, Langer, Robert, and Joseph P. Vacanti, eds. 2013. *Principles of Tissue Engineering*. 4th ed. Massachusetts: Academic Press.

Other resources:

1. Fisher, John P., Mikos, Antonios G., Bronzino, Joseph D., and Donald R. Peterson. 2012. *Tissue Engineering: Principles and Practices*. Florida: CRC Press.
<http://dx.doi.org/10.1201/b13978>. [Available via MATERIALSnetBASEnetBASE, UPRM General Library Databases]
2. Wang, Xiadou, Nyman, Jeffrey S., Reyes, Michael, Dong, Xuanliang, Leng, Huijie, K.A. Athanasiou (eds.). 2010. *Fundamental Biomechanics in Bone Tissue Engineering*. Colorado: Morgan and Claypool.
<http://dx.doi.org/10.2200/S00246ED1V01Y200912TIS004>. [Available via Morgan and Claypool (Tissue Engineering), UPRM General Library Databases]

3. Obradovi, Bojana. 2012. *Cell and Tissue Engineering*. New York: Springer.
<http://dx.doi.org/10.1007/978-3-642-21913-9>. [Available via Springer eBooks, UPRM General Library Databases]
4. Ramalingam, Murugan, Vallittu, Pekka, Ripamonti, Ugo, and Wan-Ju Li. 2012. *Tissue Engineering and Regenerative Medicine: A Nano Approach*. Florida: CRC Press.
<http://dx.doi.org/10.1201/b13049>. [Available via MATERIALSnetBASEnetBASE, UPRM General Library Databases]
5. Enderle, John, and Joseph Bronzino. 2011. *Introduction to Biomedical Engineering*. 3rd ed. Massachusetts: Academic Press.
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