

Tissue Engineering
Fischell Department of Bioengineering
University of Maryland

Syllabus

Course	Tissue Engineering (BIOE411 & ENCH468T) Advanced Tissue Engineering (BIOE611 & ENCH648T)
Course Location	Glenn L. Martin Hall, Room 1104
Course Hours	2:00 pm – 4:30 pm, Wednesdays
Course Description	A review of the fundamental principles involved in the design of engineered tissues and organs. Both biological and engineering fundamentals will be considered. A project will emphasize the application of these fundamentals to the development of engineered tissues.
Instructor	Dr. John P. Fisher Office: Jeong H. Kim Engineering Building, Room 3238 Email: jpfisher@umd.edu Office Hours: 1:00 – 2:00 pm, Wednesdays or by appointment
Teaching Assistant	None
Online Support	All pertinent information may be accessed on the course website found here: http://www.bioe.umd.edu/~jpfisher/index_files/pcourses2.htm .
Required Text Book	Tissue Engineering Editors: Fisher, Mikos, Bronzinio, and Peterson Publisher: CRC Press ISBN: 9781439874004
Suggested Texts	Tissue Engineering Author: Saltzman Publisher: Oxford University Press ISBN: 019514130X Textbook of Medical Physiology, Twelfth Edition Author: Guyton and Hall Publisher: Saunders Publishing ISBN: 1416045740
Honor Code	The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.studenthonorcouncil.umd.edu .
Disabled Students	In accordance with University of Maryland policies, the instructor requests that students with disabilities inform the instructor of their needs at the beginning of the semester.

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Lecture Policy	Course lectures will mostly follow the text, with additions from other relevant sources. Lectures will be both written on the board and presented with powerpoint slides. PDF files containing powerpoint slides will be posted on the course website. <i>No electronic devices, such as recording devices and computers, are allowed in class.</i>
Attendance Policy & Assignment Submission	Lecture attendance is highly encouraged. Attendance is determined by a student's presence in class at 2:00 pm; arrival after 2:00 pm will be considered an absence. Assignments are due at 2:00 pm on the indicated date. No assignment will be accepted thereafter.
Course Organization	<i>The course is organized into an undergraduate (BIOE411 & ENCH468T) and graduate (BIOE611 & ENCH648T) level. Those enrolled in the undergraduate level will be organized into groups of 2 to 3 students, and will complete all assignments, except the exam, as a group. Similarly, those enrolled in the graduate level will be organized into groups of 2 and will complete all assignments, except the exam, as a group.</i>

Course Schedule

Date	Lecture Topic	Text Chapter	Literature Handout	Group Presentation	Assign Due
January 23	Introduction	1	L1		
January 30	Natural Biomaterials	4	L2		
February 6	Synthetic Biomaterials	5	L3	3	Project 1
February 13	Signals	6, 7	L4	1	
February 20	Pluripotent Stem Cells	8	L5	8	Project 2
February 27	Mesenchymal Stem Cells	10	L6	2	
March 6	Cell Encapsulation	20	L7	9	
March 13	Bioreactors	22	L8	5	Project 3
March 20	Spring Break				
March 27	Mechanics	14	L9	4	
April 3	Vascularization	24	L10	10	
April 10	Bone Engineering	27	L11	6	
April 17	Cartilage Engineering	30	L12	11	Project 4
April 24	Vascular Engineering	35	L13	7	Exam
May 1	Project Presentations				Project 5
May 8	Project Presentations				Project 5

Course Grading	Presentation	100 pts
	Project	200 pts
	Exam	200 pts
	Total	500 pts

The scale for the final letter grade is the following: > 90% A, 89% - 80% B, 79% - 70% C, 69% - 60% D, and < 60% F. In addition, +/- will be assigned for scores in the top/bottom of each range, respectively.

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Exams A take home exam will be distributed on April 17th and must be submitted by 2:00pm on April 24th. The exam will be open book, open notes and must be completed individually.

Presentation Each group will present recent scientific literature to the class. Each group will present the pre-assigned literature handout, along with other scientific work of their own selection that is relevant to the discussion, in a 60 min presentation. Be prepared to answer questions. The presentation schedule is defined in our course schedule (please see above). A pdf version of the presentation, along with any other material, must also be distributed to the class using Canvas by noon of the day of the presentation.

Group Project Each group will also write a research proposal during the course of the semester. The research proposal is meant to provide the motivation and research plan needed to develop an engineered tissue. Further details will be discussed in class. A series of assignments developing this research proposal are detailed below. Additional details include 1.5 line spacing, 11 point Arial font, 0.75 inch margins on all sides, bold type for major section headings, and any widely accepted reference style.

Assignment 1: Project Background (Due February 6)

Write a review of the relevant literature surrounding your field of interest within tissue engineering (5 pages). Include a description of the clinical problem, current strategies for treatment, and currently investigated tissue engineering strategies for treatment.

Assignment 2: Project Aims (Due February 20)

Propose a tissue engineering problem for investigation (1 page). Write an introductory paragraph, objective, as well as a description of the clinical problem and tissue of interest. State a global hypothesis and then three aims with three supporting hypotheses.

Assignment 3: Research Design (Due March 13)

Propose a method to develop your engineered tissue (6 pages). For each of the three aims you have developed, outline the necessary experiments to examine your proposed hypothesis; suggest alternatives and definitions for success.

Assignment 4: Engineered Tissue Proposal (Due April 17)

Develop a fully considered tissue engineering proposal (12 pages). Include an abstract, a statement of specific aims, a background section, and a research design and methods section. Address concerns raised in the earlier versions of each component of the project. Also include cited references, which are not included in the page limit.

Assignment 5: Engineered Tissue Presentation (Due May 1)

Present your proposal (20 minutes). Succinctly communicate the key points of your written proposal in a powerpoint based presentation. Include an introduction, background, statement of specific aims, and a research design.