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BIOM 4906: Tissue Engineering (Syllabus)

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University of Memphis

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UM BIOM 4906
TISSUE ENGINEERING
Spring 2022

Instructors: Gary L. Bowlin, Ph.D.
Phone: 678-2670

Office Hours: T & Th 9-10 AM, Room ET119D
Email: glbowlin@memphis.edu

Class: 3 credit hours

Meeting: Mon. & Wed. 12:40 pm – 2:05 pm

Class Location: ET 233

Catalog description: To study the design, development, and implantation of tissue engineered components. Analysis of the basis for cell growth and differentiation, control of tissue development (in vivo & in vitro), models for tissue engineering, and transplantation of engineered cells and tissues. The emphasis of these analyses will be focused on the cardiovascular system (blood vessels and cardiac prostheses), musculoskeletal system (Bone, cartilage, and tendons), and skin.

Prerequisites: BIOM 4730, BIOM 3110 or BIOL 3730 or permission by instructor.

Class meeting: Solely in person course due to discussion nature of lecture, very few PowerPoint presentations.

Textbook:

Course Text (Not required): Tissue Engineering by Bernhard O. Palsson & Sangeeta N. Bhatia, Prentice Hall; 1st edition (July 28, 2003): ISBN: 0130416967

Supplemental Materials: Various Book Chapters and Journal Articles (Class handouts)

Course Objectives:

After completion of the course, students should be able to:

- Describe the basic principles involved in Tissue Engineering products.
- Detail their approach to Tissue Engineering a tissue or organ of their selecting.
- Detail historical approaches to Tissue Engineering products.
- Understand the factors related to biomaterials, template architecture, polymer processing, cell/developmental biology, and the role of bioreactors in Tissue Engineered products.
- Finally, be able apply tissue engineering principles to the solution of clinical problems requiring tissue regeneration of tissue buy use of tissue-engineered products.

Possible Topics Covered:

- Anatomy and Physiology review
- Basis of cell growth and differentiation
- In vitro control of tissue development
- In vivo synthesis of tissues and organs
- Models for tissue engineering
- Biomaterials in tissue engineering (polymers used)
- Polymer processing for tissue templates/scaffolds
- Transplantation of engineered cells and tissues
- Cardiovascular tissue engineering (blood vessel and cardiac muscle)
- Musculoskeletal system (bone, cartilage, and tendon)
- Skin tissue engineering

Grading:

Final course grades will be determined as follows:

Attendance/Quizzes	10%
Homework/Projects	20%
First Exam	20%
Second Exam	25%
<u>Last Exam</u>	<u>25%</u>
TOTAL	100%

Last exam will be the last day of class as well as the last design report due.

All occurrences of academic misconduct will be dealt with in accordance with guidelines and procedures outlined in the Academic Misconduct Policy, which may be accessed on the University website.

Syllabus Changes

The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on the course home page news items.

COVID-19 Health and Safety Policy - Masks and Social Distancing

Do not come to campus if you are experiencing symptoms, are in isolation or quarantine due to positive test results or exposure, pending test results, or have reason to believe you have come in contact with the virus.

Daily symptom monitoring and self-reporting of positive test results are required.

Student Health

Students who are experiencing symptoms such as sneezing, coughing or a higher than normal temperature should inform instructors by email so they can be excused from class and should

stay home. Students should contact their health care provider or the Student Health Center at <https://www.memphis.edu/health/>. Students who have a positive COVID-19 test should contact the Dean of Students at deanofstudents@memphis.edu.

Student Resources

Students who need additional resources can contact the Dean of Students Office at <https://www.memphis.edu/deanofstudents/crisis/index.php>.

Project: Assigned teams (see below) will work on the tissue/organ of choice to explore in detail a tissue engineering solution for a clinical problem/disease. The project will be divided into multiple parts;

1. Tissue/organ physiology – what are you trying to replace in form and function.
2. Cellular components of tissue/organ
3. ECM and tissue/organ basic subunit
4. Stem cells in the tissue/organ or used in tissue engineering the product
5. Template designs used for particular tissue/organ
6. Tissue engineering attempts (historical perspective)
7. Bioreactors designed for this application
8. Your design approach to creating this tissue/organ (Final design project)

Assigned Topic for Homework Assignments and Your Design Approach

Colon (H)	Skeletal Muscle	Breast Tissue	Cornea	Ear Cartilage (H)
Dustie Flowers	Arman Dela Cruz	Elizabeth Scheiderer	Umiko Jones	Dalton Reed
Alden Jackson Pierce	Tommy Doan	Emma Summerhill	Harrison Nguyen	Georgia Hill
Niresha Wanigasekara	Michael Doan	Olivia Tutor	Onafowokan Toluwanimi	
		Shelby Allen		

Cardiac Muscle (H)				
Lauren Carter				
Andrea Esparza				

Allen, Shelby L. new add to class