BMED 4833 – Special Topics - Tissue Engineering
Summer 2021
Lectures/recitations: M, Tu, W, Th, TBD
Location: TBD

Instructor: Prof. Michael E. Davis
michael.davis@bme.emory.edu

Teaching Assistant:

Web Page: Access through Canvas using GT id and password.

Office Hrs: by prior set up of appointment via e-mail

Textbook (recommended but not required):
Tissue Engineering, Bernhard O. Palsson, Sangeeta N. Bhatia, Pearson Prentice Hall, Inc., Upper Saddle River, NJ, (2004).
Tissue Engineering Principles For The Design Of Replacement Organs and Tissues, W. Mark Saltzman, Oxford University Press, Inc., Oxford, England, (2004).
Tissue Engineering, Clemens van Blitterswijk (editor), Academic Press, London, UK (2008).
Principles of Regenerative Medicine, Anthony Atala, Robert Lanza, James Thomson, Robert Nerem (editors), Academic Press, London, UK (2008).

Readings: Required readings of review and scientific articles will be provided on T-square

Pre-requisite: BMED 3600

Honor Code: Students are expected to abide by the Honor Code (www.honor.gatech.edu). The objective of the honor code is "to prevent any students from gaining unfair advantage over other students through academic misconduct". Any violations will be prosecuted through the Dean of Students.

Grading:

Projects	40%	(10% each)
In-class presentations/journal club	25%	
Final Project	35%	

Exams: There will be one cumulative final project. Everyone must turn it in by 12:00pm on Friday July 28th.

Weekly projects: The group will work together to submit a written project each week. The projects are intended to give a wide variety of ways to show learning in the topic assigned. Projects will range from editorials, to paper comparisons, to design issues. In addition to the written project, each team will lead an "informal" discussion of their project in a round-table format to the other groups. The presentation will be 10 minutes with 5-10 minutes for discussion and Q&A.

Paper discussion: Each group will be assigned 1-2 papers to read following the lecture. The papers are to serve as a background to assist in the generation of project ideas. All students in each group are responsible for reading the papers and participating in the discussion. Students should be prepared to use the white board to lead the discussion.

Project: The cumulative project will be decided in the first 2 weeks of the class, allowing the students input on the direction they would like to go.

Purpose: The overall objective of this course is to present the engineering, biological and basic science aspects of tissue engineering through presentation and discussion of current research topics in tissue engineering. Topics to be covered include cells for repair, biomaterials for tissue engineering, functional tissue engineering and bioreactors, host acceptance and integration of tissue engineered constructs into recipients, and new horizons for pediatric tissue engineering.

Objectives: Specifically at the end of the course students will be able to:

1. Identify the engineering and biological issues relevant to tissue engineering.
2. Analyze tissue engineering approaches and current issues with reference to key tissue engineering literature.
3. Evaluate of the critical issues and choices needed in developing a tissue engineered construct.
4. Evaluate critical issues in tissue engineering with reference to current literature examples.

Topical Outline and Schedule

Week 1: Motivation for Tissue Engineering
Cells for Repair
- Cell sources, Cell issues
- Stem Cells
- Autologous vs. Allogeneic
- Genetically engineered cells

Week 2: Biomaterial Scaffolds for Tissue Engineering
- Biodegradable polymers
- Acellular matricies
- Scaffold design
- Naturally-derived materials

Week 3: Bioreactors and Functional Tissue Engineering
- Bioreactor types
- Tissue-specific bioreactors
- Assessment of tissue functionality

Week 4: Integration into Living Systems - Vascularization and Host Resposne
- Neovascularization issues
- Biomaterial-based strategies for vascularization
- Cell delivery for vascularization
- Functional assessment of extent of vascularization
- Host response of tissue engineered structures

Week 5: Pediatric Tissue Engineering

- Challenges in pediatric tissue engineering
- New horizons for pediatric engineering (genome editing, etc)
- Regulatory issues for pediatric testing