Course:

Semester:

Course Format and Credit Hours:

Prerequisites: Instructor:

Schedule: Location: Office Hours:

BMEG 482 – Introduction to Tissue Engineering Spring 2018

3 hr Lecture

3 hr Credits

BMEG 201, BMEG 311

Dr. Robin Hissam, 513 Engineering Sciences building 293-9339; Robin.Hissam@mail.wvu.edu

11-12:15 MW

401 ESB

Wednesday 2:00-3:00, Thursday 2:30-3:30;
by appointment preferred

Course Objectives:

Tissue engineering requires an understanding of the role played by both cells and a scaffold in the function of a tissue. The objective of this course is to introduce biological principles and engineering fundamentals as they pertain to cell behavior and substrate properties. The design and characterization of artificial tissues will be discussed using properties and function of native tissues as a guide.

Expected Learning Outcomes:

Upon successful completion of this course, students will be able to: Identify biological and physical properties of tissues.

Identify key properties that need to be addressed to develop a tissue engineered substrate. Apply biological, chemical, and engineering principles to tissue engineering problems.

Critic and discuss scientific publications.

Communicate scientific ideas through writing and presentation.

Recommended Text:

Palsson, B., Bhatia S., Tissue Engineering, Pearson Prentice Hall, 2004.

van Blitterswijk, C. (ed), Tissue Engineering, Academic Press, 2008, First edition.

Lanza, R., Langer, R., Vacanti, J., Principles of Tissue Engineering, Academic Press, 2007, Third Edition.

Grading:

3 Homework Assignments (10% each) 90 points

White Paper 30 points

Design Project – Oral 65 points

Design Project – Written 100 points

Professionalism 15 points

*Total 300 points*

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| --- | --- | --- |
| Grade Assignment: | 270-300 | A |
|  | 240-269 | B |
|  | 210-239 | C |
|  | 180-209below 180 | D F |

Grading Policy: Late assignments will not be accepted.

Grading appeals in writing only on the day subsequent to when the assignment is returned.

Professionalism: Professionalism encompasses the behavior that would be expected of a person in a formal/professional setting. Attendance, participation, and respect toward all members of class are expected and will be evaluated.

Design Project: A design project will be assigned to small groups to research a tissue engineering application and design a plausible method to take a system from design to implementation. Additionally, they will need to consider the possible side effects of their system and the ethics associated with tissue engineering. The measurable for this design project will be an NSF/NIH style proposal and presentation at the end of the semester.

Homework Assignments: There will be three assignments given over the course of the semester. These assignments will be geared to test your comprehension of concepts presented in class, journal articles, or other publication mechanisms.

White Paper: A white paper with initial ideas for your proposal will be required during the semester. A white paper is a brief summary of the project you will be proposing and includes information gathered on the tissue engineering application, references, and examples of the application.

Policies and Statements: Academic Policies and Syllabus Statements found at [https://tlcommons.wvu.edu/quality matters/syllabus-policies-and-statements](https://tlcommons.wvu.edu/quality%20matters/syllabus-policies-and-statements) will be implemented and followed for this course. Please review this webpage for more information and feel free to ask any questions regarding these statements and policies.

Course Schedule: (subject to change)

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| **Week** | **Topic** | **Homework Due** |
| 1 | Introduction to Tissue EngineeringTissue Organization |  |
| 2 | Tissue DynamicsMorphogenesis |  |
| 3 | Stem CellsCell-Fate Processes | Assignment #1 |
| 4 | Coordination of Cell-Fate ProcessesHigh-Throughput Biological Data |  |
| 5 | Cell and Tissue PropertiesCell and Tissue Culture |  |
| 6 | Gene TransferTime Constants |  |
| 7 | Scaling up for Ex Vivo Cultivation | Assignment #2 |
| 8 | Biomaterial ScaffoldsTailoring Biomaterials |  |
| 9 | Conventional Approaches to TissueDysfunctionHost Integration | Assignment #3 |
| 10 | **Spring Break** |  |
| 11 | Producing Tissue Engineering TherapiesRegeneration |  |
| 12 | Applications of Tissue Engineering:Special Topics | White Paper |
| 13 | Applications of Tissue Engineering:Special Topics |  |
| 14 | Group Presentations | Presentation |
| 15 | Group Presentations |  |
| 16 | Group Presentations |  |
| 17 | Finals Week | Final Proposal |