University of Wisconsin - Madison College of Engineering [EGR] Last Offered: 2013 Fall [1142] Direct Link to this Syllabus:

http://aefis.engr.wisc.edu/index.cfm/page/CourseAdmin.ViewABET?coursecatalogid=423&pdf=True

- 1. B M E 510, Introduction to Tissue Engineering
- 2. Credits: 3.00 Contact Hours: 2.5
 3. Textbook and Materials: None
 - a. Other Supplemental Materials: Current literature articles and handouts.
- 4. Specific Course Information:
 - a. **Brief description of the content of the course (Course Catalog Description):** Overview of tissue engineering, including discussion of cell sources, cell-material interactions, tailoring biomaterials, methods of culture and characterization of engineering tissues, ethical issues, concluding with case studies of specific types of tissue engineering. Optional laboratory exercises offered throughout semester.
 - b. Pre-requisites or Co-requisites: BME 430 or equiv, or cons inst
 - c. This is a Selected Elective course.
- 5. Specific Goals for the Course:
 - a. Course Outcomes:
 - 1. identify the experimental assay that is appropriate to characterize a particular cellular behavior.
 - describe how to tailor mechanical properties, cell-material interactions, growth factor/gene delivery, and bioreactor conditions to match the needs of a biological system.
 - 3. critically evaluate tissue engineering approaches.
 - 4. assess a biological system and develop a tissue engineering strategy.

b. ABET Student Learning Outcomes:

- (a) Ability to apply mathematics, science and engineering principles.
- (c) Ability to design a system, component, or process to meet desired needs.
- (d) Ability to function on multidisciplinary teams.
- (e) Ability to identify, formulate and solve engineering problems.
- (f) Understanding of professional and ethical responsibility.
- (g) Ability to communicate effectively.
- (h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- (i) Recognition of the need for and an ability to engage in life-long learning.
- (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- c. **Program Specific Student Outcomes :** (1) Understanding of biology and physiology as related to biomedical engineering needs.
 - (2) Ability to apply knowledge of advanced mathematics (including differential equations and statistics), sciences, and engineering to solve problems at the interface of engineering and biology and to model biological systems
- 6. Brief List of Topics to be Covered: Tissue engineering refers to the generation of biological

substitutes to restore, maintain or improve tissue function. Toward this end, tools and knowledge from several disciplines might be applied including but not limited to basic biological sciences (molecular, cellular, and tissue anatomy and physiology), engineering (transport phenomena, materials science, mechanical characterization) and biotechnology (cell culture, gene transfer, 'omics). This course is intended to organize this long list of specialized knowledge in order to provide both undergraduate and graduate students with a clear and succinct introduction to the processes and issues involved in creating engineered tissues. Lectures on fundamental issues in tissue engineering will be supplemented with critical analyses of relevant publications in the field.