BME 4450/6450 – Tissue Engineering and Regenerative Medicine

Course Description

Principles and underlying strategies for employing selected cells, biomaterial scaffolds, soluble regulators or their genes, and mechanical loading and culture conditions, for the regeneration of tissues and organs. Methods for fabricating tissue-engineered products and devices under development and currently in clinical use.

Undergraduate/Graduate level - 3 credit hours.

*Homework and exams are specific for the graduate students. In them concepts are explored at a deeper level than for undergraduates.

Course Learning Objectives

Students enrolled in this course will learn:

- how to apply tissue engineering principles to the solution of medical problems requiring the regeneration of tissue
- how to apply the methods for the fabrication of tissue-engineered products.
- They will have exercised this knowledge in a Term Report requiring them to select certain cells, scaffolds, cytokines, and culture conditions individually or in combination to address a specific clinical problem.

Course Learning Outcomes

Upon successful completion of this course, students can:

- apply tissue engineering principles to the solution of medical problems requiring the regeneration of tissue
- apply the methods for the fabrication of tissue-engineered products.
- exercise this knowledge in a Term Report requiring them to select certain cells, scaffolds, cytokines, and culture conditions individually or in combination to address a specific clinical problem.

Tentative Weekly Schedule

Week 1	Course Overview; Principles of Tissue Engineering
Week 2	The Basis of Growth and Differentiation(CELL); The Basis of Growth and Differentiation (ECM)
Week 3	Stem Cells as Building Blocks; in Vito/Vivo Control of Tissue Development
Week 4	Biomaterials in Tissue Engineering
Week 5	Transplantation of Engineered Cells and Tissues; Review
Week 6	MIDTERM #1; Cardiovascular System
Week 7	BMES; Breast Tissue Engineering
Week 8	Musculoskeletal System Tissue Engineering
Week 9	Skin Tissue Engineering; Nervous System Tissue Engineering

Week 10	Kidney and Genitourinary System Tissue Engineering; Gastrointestinal System Tissue Engineering
Week 11	Bloodborne Pathogen Training; Lab--Aseptic Techniques
Week 12	Lab--Thawing/Culturing/Freezing Cells; Lab--Counting cells using trypan blue
Week 13	Lab--Dead/live assay; Lab--Extracting collagen from rat-tail/Collagen gel scaffold
Week 14	Clinicl Experience and Regulation; Review; Midterm #2
Week 15	Final Exam