



Tissue Engineering

BENG 5890 Tissue Engineering

MWF: 2:30-3:20 ENGR 206

Starting 1/25 → M: 2 hours in lab (1:30-3:30 or 2:30-4:30)

W: 2:30-3:20 ENGR 206

Credits: 3

Instructor: Dr. Elizabeth Vargis
(ENGR 402M, 797-0618, vargis@usu.edu or through Canvas)

Graduate Assistant: Farhad Farjood

Office hours: Tuesday 10-11am, Wednesday 3:30-4:30pm, or by appointment

Textbook: (none) Reading material available through Canvas

Other Materials: Small lab book, Safety glasses

References: Tissue Engineering (Palsson and Bhatia, 2003)
Principles of Tissue Engineering (Lanza, et al., 2007)

Prerequisites: BENG 2330 or permission of instructor;
Admission to Professional Engineering Program

Introduction to fundamentals of tissue engineering. Investigation of engineering design strategies for artificial organs, as well as treatments for disease disorders of nerves, blood vessels, bones, cartilage, skin, and liver.

Who should take this course: Senior biomedical engineering students wanting to gain deeper knowledge of one area of biomedical research and engineering, understand concepts in tissue engineering design and participate in research and design projects in BE.

IDEA Learning Objectives

3. Learning to apply course material (to improve thinking, problem solving, and decisions)
11. Learning to analyze and critically evaluate ideas, arguments, and points of view

ABET Outcomes

- b. Ability to design and conduct experiments, analyze and interpret data.

e. Ability to identify, formulate, and solve engineering problems.

Grading

- Attendance and participation (10%)
 - Arriving on time, contributing to class discussion, being a good citizen
- Assignments (20%)
- Lab (25%)
 - Participation, lab notebook, data analysis
- Group Project (20%)
- Quizzes (unannounced) (5%)
- Exams (2) (20%)

Grading (generally fits following pattern) **A** 100-94%, **A-** to 90%, **B+** to 87%, **B** to 83%, **B-** to 80%, **C+** to 75%, **C** to 70%, **C-** to 65%, **D** to 50%, **F** below 50%

Course policies: Laptops may be used to take notes, read course material, search for topics, etc. pertaining to class (no emailing, chatting, disrupting the class, etc.). Treat the instructor / invited speakers / student presenters as you would want to be treated if you were lecturing.

Assignments: Due via Canvas by 11:59pm a week after assigned, unless noted otherwise.

Late Policy: Late work creates difficulties in grading and a strict policy must be enforced. I am not insensitive to your personal problems, but I must insist that you rise above them. When an instructor grants an extension to one student, it is unfair to the other students who would have benefited from special treatment.

All assignments are due at 11:59pm on the date specified. However, each student is entitled to one personal emergency. Thus, you are allowed to turn in ONE assignment up to one week late without penalty or explanation. When the personal emergency excuse has been used, late work is accepted with a penalty of 10% off *per day*.

Ethical conduct / Cheating policy: Students are expected to abide by the rules of conduct expected of all university students. Homework and lab reports must reflect individual effort; however, students are encouraged to form study groups and work as teams. Failure to properly cite sources is plagiarism. *Be certain to properly cite primary literature (refereed journal articles) for materials such as graphs, pictures, tables, videos used for presentations or papers.* Do not cut and paste material from the Internet for your lab reports and assignments.

All forms of cheating are absolutely prohibited. Anyone caught cheating will receive negative points equal in magnitude to the possible points on the assignment or test. Repeat offenses will result in an automatic F for the class.

Add policy: The last day to add this class is February 1, 2016. Attending this class beyond that date, without being officially registered, will not be approved by the Dean's Office.

Students must be officially registered for this course. No assignments or tests of any kind will be graded for students whose names do not appear on the class list

Drop policy: February 1, 2016 is the last day to drop without notation on transcript. March 24, 2016 is the last day to withdraw with W on transcript.

Disabilities: If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center, preferably during the first week of the course. Any requests for special considerations relating to attendance, pedagogy, taking of examinations, etc. must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative formats, e.g. large print, audio, diskette, or Braille.

Tentative Course Schedule (subject to change—check Canvas Calendar)

| Date | Lecture | Assignment | Lab |
|-------------|---|--|---|
| 1/11 | Course Introduction | Homework 1 | |
| 1/13 | Cell and Tissue culture | | |
| 1/15 | Recent TE news Tissue maintenance and repair | | |
| 1/18 | <i>MLK Day – no class</i> | | |
| 1/20 | Stem cells | Homework 2 | |
| 1/22 | Stem cells | | |
| 1/25 | | | 1. Cell culture technique / Media preparation |
| 1/27 | Cell differentiation / signaling | Homework 3 | |
| 2/1 | | | 2: Cell culture |
| 2/3 | Cell migration | Homework 4: Project concept | |
| 2/8 | | | 3. Trypsinization |
| 2/10 | Cell and Tissue engineering | Homework 5 | |
| 2/15 | <i>President's Day</i> | | |
| 2/16 | <i>Monday Schedule</i> | | 4. Cryopreservation |
| 2/17 | Cell and Tissue characterization | Homework 6 | |
| 2/22 | | | 5. Cell Staining |
| 2/24 | Cell and Tissue characterization | | |
| 2/29 | | | 6. Substrate Testing |
| 3/2 | Analysis of cell growth Exam 1? | Homework 7: Project proposal and experimental plan | |
| 3/7 | Spring Break | | |

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|------|---|--|---------------------|
| 3/9 | | | |
| 3/14 | | | 7. Students' choice |
| 3/16 | Analysis of cell growth Exam 1? | | |
| 3/21 | | | Group Project |
| 3/23 | ECM: properties, components, synthesis and degradation of cell growth | | |
| 3/28 | | | Group Project |
| 3/30 | Biomaterials and Polymers | | |
| 4/4 | | | Group Project |
| 4/6 | Drug delivery | | |
| 4/11 | | | Group Project |
| 4/13 | Clinical implementation 1 | | |
| 4/18 | | | Group Project |
| 4/20 | Clinical implementation 2 | | |
| 4/25 | Group Presentations | | |
| 4/27 | Class wrap up or Exam 2? | | |