

4 hours/week, 4 hrs 1x a week
Tissue and Molecular Engineering Lab

Rationale: Increasingly Biomedical Engineering and Tissue Engineering depend on a working knowledge of techniques of modern molecular biology. In this graduate course biomedical engineering students will be given both a theoretical basis and practical hands-on experience to work effectively using modern biology approaches. Once they can work effectively and safely in this environment, they will complete an independent supervised tissue engineering project of their choosing as part of a small team.

Instructors: Prof. Christopher Jacobs,
Prof. Hayden Huang,
TA: TBD

Work load: Most of the work will be done in class. Light pre-lab homework will be given. Handouts for each lab will be given 1 week before labs. Handouts need to be read in advance and protocols prepared. All students must complete the Columbia Biosafety course prior to the start of class

Grading: Course can be taken for a letter grade or credit/no credit. Grades will be assigned based on a lab notebook that each student will maintain individually (25%), midterm exam (25%), and a final team project (50%).

Schedule

- January 23: Introduction and lab tour, measurement, sterile technique, and safety
Huang and Jacobs
- January 30: Cell culture maintenance, feeding, subculture, cell counting, viability
Huang (add date)
- February 6: Molecular Lab 1: Isolation of RNA determination of RNA isolation
quality from agarose gel and fluorometer.
Jacobs
- February 13: Molecular Lab 2: Subcloning and restriction digests – setup, design,
agarose gel. PCR plasmid.
Assignment of project teams.
Huang
- February 20: Molecular lab 3: Real Time RT-PCR, Protein isolation, SDS-PAGE gel,
Western blot transfer
Jacobs
- February 27: Tissue lab 1: Begin cell seeded collagen gel contraction experiment, stain
Western blot, analyze blot

Jacobs

March 6: Tissue lab 2: Analyze results of contraction experiment, cast artificial ligament and begin ligament loading experiment.

Jacobs

March 13: Tissue lab 3: Continue analysis of contraction experiment, conduct mechanical testing of artificial ligaments. Team project proposals due.

Jacobs

March 20: Spring Recess

March 27: Microscopy lab 1: phase contrast, cell tracking, fluorescence microscopy
Huang (drop date)

April 3: Microscopy lab 2: Immunohistochemistry of cells, cytoskeletal staining.
Huang

April 10: Mid-term

April 17: Independent projects

April 24: Independent projects

May 1: Independent projects

May 8: Independent projects

May 15: Independent projects due

Textbook (Required): *At the Bench: a Laboratory Navigator*, Kathy Barker, Cold Spring Harbor Laboratory Press, 1998