

## **Title: Basics of Tissue Engineering and Cell Culturing**

**Class Schedule:** Tuesdays & Thursdays 3.00 – 5.50PM

**Number of Credits:** 3

**Course Director Name:** Narine Sarvazyan, PhD

**Textbook:** *Sarvazyan, Narine, ed. Tissue Engineering: Principles, Protocols, and Practical Exercises. Springer Nature, 2020.*

### **SCHEDULE**

#### **PART I. Students learn basic principle & protocols**

<b>WEEK 1</b>	Tuesday	Chapter 1	Intro and Reference Search
	Thursday	Chapter 2	Rat dissection and organ cannulation
<b>WEEK 2</b>	Tuesday	Chapter 3	ECM and Adhesion Molecules
	Thursday	Hands-on training	Collagen prep
<b>WEEK 3</b>	Tuesday	Chapter 4	Isolating Cells from Tissue
	Thursday	Hands-on training	Collagenase based digestion from fresh organs
<b>WEEK 4</b>	Tuesday	Chapter 6	Culturing Cells in 2D and 3D
	Thursday	Hands-on training	Culturing Cells in 2D and 3D
<b>WEEK 5</b>	Tuesday	Chapter 7	Imaging, Staining, and Markers
	Thursday	Hands-on training	Imaging, Staining, and Markers
<b>WEEK 6</b>	Tuesday	Chapter 5	Functional Assays and Toxicity Screening
	Thursday	Hands-on training	Assays: Resazurin, LDH, or MTT
<b>WEEK 7</b>	Tuesday	Chapter 8	Stem Cells and Basics of Immunology
	Thursday	Hands-on training	maybe stem cell differentiation
<b>WEEK 8</b>	Tuesday	Chapter 9	Scaffolds and Tissue Decellularization
	Thursday	Hands-on training	Scaffolds and Tissue Decellularization
<b>WEEK 9</b>	Tuesday	Chapter 10	Casting and 3D Bioprinting
	Thursday	Hands-on training	Casting and 3D Bioprinting
<b>WEEK 10</b>	Tuesday	Chapter 11	Bioreactors

Thursday Hands-on training Bioreactors

**PART II. Students apply learned protocols to create their own tissue constructs**

<b>WEEK 11</b>	Tuesday	Experiments	Engineering Tissue of Choice
	Thursday	Experiments	Engineering Tissue of Choice
<b>WEEK 12</b>	Tuesday	Experiments	Engineering Tissue of Choice
	Thursday	Experiments	Engineering Tissue of Choice
<b>WEEK 13</b>	Tuesday	Experiments	Engineering Tissue of Choice
	Thursday	Experiments	Engineering Tissue of Choice
<b>WEEK 14</b>	Tuesday	Experiments	Engineering Tissue of Choice
	Thursday	Experiments	Engineering Tissue of Choice
<b>WEEK 15</b>	Tuesday	Chapter 12	Pre-Final presentations
	<b>Thursday</b>	<b>EXAM</b>	<b>Final presentations</b>

**Course Description:** Students will work in groups to learn the core principles of tissue engineering. The latter will encompass practical instruction following which students will perform their own experiments to be presented in poster and oral presentation formats.

**Prerequisites: None, Co-Requisites: None**

**More about this course:** This will be a highly interactive hands-on-course. During the first part students will learn the basics of cell culturing, tissue dissection, organ cannulations and other essential protocols and fundamentals of data analysis. Afterwards small teams of 3 students will be performing experiments on their own. The course will require creativity, hard work and team effort.

**Program Goal:** Equip student with skills to design and perform basic tissue engineering experiments.

**Program Student Learning Outcomes.** Students should be able to outline methods to create simple models of different biological tissues and conduct experiments using the existing equipment.

**Course-based Student Learning Outcomes.** In this course, students will be able to exercise their creativity to select target tissue and to identify approaches to create simple models of them.

**Course Structure:** Students will be divided into small groups and attend TA-led demos of various protocols. Home tasks include reading, designing experiments, acquiring data, creating poster and oral presentations.

**Method of Evaluation:** Student learning will be evaluated on the basis of the following weighted components:

**Attendance and class participation:** 20%, Lab and hands-on session performance: 50%, Poster presentation: 15%, Oral presentation: 15%.

**Exams:** The final exam will be in the form of oral and poster presentations evaluated by peers.

**Final Presentations:** Students work in teams of three or four in order to complete an in-depth analysis of a particular problem and present their findings to the class using appropriate media and technology. Teams are expected to meet periodically with the instructor in order to solicit guidance and feedback as they develop their analysis and conclusions. Students will be assessed on the quality of their analysis and presentation. Students are encouraged to attend office hours periodically in order to solicit additional feedback.

**Class attendance and participation:** Students are expected to attend class and demonstrate their understanding of topics by participating in class discussions. Strict on-time arrival and attendance policy will be implemented. Each student will be judged by the members of their small group for the level of their participation. The grade will not be affected if the student submits evidence of a medical or other emergency that made completing team assignment at the scheduled time impossible.

**Make-up Procedures:** Make-up assignment, exam, and quiz will be given at the instructor's discretion. Students must submit convincing evidence of a medical or other emergency that makes completing an assignment or taking an exam or quiz at the scheduled time impossible.

**Communication:** Students will be given access to the course google account where all their data will be stored. Communication with the Course Director and TAs will be by either phone or email.