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Course Syllabus
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BIOM/MECH 525 – Cell and Tissue Engineering

Spring 2018

Department of Mechanical Engineering/School of Biomedical Engineering

Colorado State University

Class location: Tuesdays/Thursdays – 9.30am to 10.45am – Scott Bioengineering Room 231

Professor: Dr. Ketul C. Popat

E-mail: Use Canvas email feature to send message

Phone: 970-491-1468

Office: 312 Scott Bioengineering

Office hours: Please contact Dr. Popat by email to setup office hours.

Course Description:

This course is designed to familiarize current and future researchers with tissue engineering concepts and current practice. Topics covered include: tissue morphogenesis and homeostasis, stem cells, cell signaling, cell nutrition, cryopreservation, biomaterials, tissue engineering scaffolds, biocompatibility and ethics.

Course Prerequisites:

BC 351 Principles of Biochemistry OR

BMS 300 Principles of Human Physiology OR

BMS 500 Mammalian Physiology I OR

BZ 310 Cell Biology OR

NB 501 Cellular and Molecular Neurophysiology

Note: Please contact Dr. Popat if you have any questions about the prerequisites or if you do not meet the required prerequisites.

Course Goals:

Upon the completion of this course, you should be able to:

- Understand the paradigms of tissue engineering and regenerative medicine.
- Develop a more complete understanding of cell biology, development and tissue repair.
- Improve knowledge of mechanical and chemical properties of biomaterials.
- Develop an understanding of current challenges in the field of tissue engineering.

Required Text:

“Tissue Engineering”, Edited by: Clemens van Blitterswijk, Jan de Boer. ISBN: 9780123708694

Other Supplemental Reading Materials:

- “Principles of Tissue Engineering”, Edited by: Robert Lanza, Robert Langer, Joseph Vacanti. ISBN: 978-0123706157
- “Tissue Engineering”, Bernhard O. Palsson, Sangeeta N. Bhatia. ISBN: 978-0130416964

Grading:

As a student enrolled in this course, one of your responsibilities is to submit course work by the due dates announced in the class. With that said, I take my role as your instructor very seriously, and, in fact, I care about how well you do in this course and that you have a satisfying, rewarding experience.

To that end, it is my commitment to you to respond individually to the work you submit in this class and to return your work in a timely manner. Assignments and quizzes will be returned within 7 days. (If, however, due to unforeseeable circumstances, the grading of your work takes longer than the times I have listed here, I will keep you informed of my progress and make every effort to return your work with feedback as soon as I can.)

Homework (4 homework, each 5%): 20%

Quizzes at home (10 quizzes, each 1%): 10%

Exams (2 exams, each 25%): 50%

Project: 20%

TOTAL: 100%

Final course grades will be assigned according to the "gap system". The final grade distribution for all students will be plotted and cut-offs for grades will be determined based on breaks in the distribution.

Academic Integrity Policy

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog, the **Graduate and Professional Bulletin** **(http://graduateschool.colostate.edu/current-students/bulletin.aspx)** , and the **Student Conduct Code** **(https://resolutioncenter.colostate.edu/conduct-code/)** .

CSU Honor Pledge

Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course. While you will not be required to affirm the honor pledge, you will be asked to affirm the following statement at the start of your graded activities, assignments, and exam:

"I have not given, received, or used any unauthorized assistance."

Further information about Academic Integrity is available at CSU's **Practicing Academic Integrity** **(http://learning.colostate.edu/integrity/index.cfm)**

Tentative Class Schedule:

Date	Topics
16th January	Class introduction, Chapter 1: Tissue Engineering: An Introduction
18th January	Chapter 2: Stem Cells
23rd January	Chapter 2: Stem Cells (continued)
25th January	Chapter 3: Tissue Formation during Embryogenesis
30th January	Chapter 3: Tissue Formation during Embryogenesis (continued)
1st February	Chapter 4: Cellular Signaling
6th February	Chapter 4: Cellular Signaling (continued)
8th February	Chapter 5: Extracellular Matrix as a Bioscaffold for Tissue Engineering

13th February	Chapter 6: Degradation of Biomaterials
15th February	Chapter 7: Cell Material Interactions
20th February	Chapter 7: Cell Material Interactions (continued)
22nd February	Chapter 8: Materiomics: A Toolkit for Developing New Biomaterials
27th February	Chapter 9: Microfabrication Technology in Tissue Engineering
1st March	Chapter 10: Scaffold Design and Fabrication
6th March	Chapter 11: Controlled Release Strategies in Tissue Engineering
8th March	Exam 1
13th March	Spring Break
15th March	Spring Break
20th March	Chapter 12: Bioreactors: Enabling Technologies for Research and Manufacturing
22nd March	Chapter 13: Clinical Grade Production of Mesenchymal Stromal Cells
27th March	Chapter 14: Vascularization, Survival, and Functionality of Tissue-Engineered Constructs
29th March	Chapter 15: Skin Engineering and Keratinocyte Stem Cell Therapy
3rd April	Chapter 16: Cartilage and Bone Regeneration
5th April	Chapter 17: Tissue Engineering of Nervous System
10th April	Chapter 18: Principles of Cardiovascular Tissue Engineering
12th April	Chapter 19: Tissue Engineering of Organ Systems Chapter 20: Organs-on-a-Chip
17th April	Chapter 21: Product and Process Design: Toward Industrial TE Manufacturing

	Chapter 22: Clinical Translation
19th April	Exam 2
24th April	Project Presentations
26th April	Project Presentations
1st May	Project Presentations
3rd May	Project Presentations

Course Summary:

Date	Details	
Sun Jan 21, 2018	Introduce yourself to the class (https://colostate.instructure.com/courses/61605/assignments/635065)	due by 11:59pm
Sun Jan 28, 2018	Form your groups (https://colostate.instructure.com/courses/61605/assignments/635056)	due by 11:59pm
	Quiz 1 (https://colostate.instructure.com/courses/61605/assignments/675345)	due by 11:59pm
Sun Feb 11, 2018	Quiz 2 (https://colostate.instructure.com/courses/61605/assignments/681773)	due by 11:59pm
Sun Feb 18, 2018	Homework 1 (https://colostate.instructure.com/courses/61605/assignments/635062)	due by 11:59pm
	Submit your abstract (https://colostate.instructure.com/courses/61605/assignments/635057)	due by 11:59pm
Thu Mar 8, 2018	Exam 1 (https://colostate.instructure.com/courses/61605/assignments/635053)	due by 10:45am
Sun Mar 18, 2018	Homework 2 (https://colostate.instructure.com/courses/61605/assignments/635061)	due by 11:59pm
Sun Apr 8, 2018	Homework 4 (https://colostate.instructure.com/courses/61605/assignments/635064)	due by 11:59pm
Thu Apr 19, 2018	Exam 2 (https://colostate.instructure.com/courses/61605/assignments/635055)	due by 10:45am

Date	Details	
Sun Apr 22, 2018	Submit your project report (https://colostate.instructure.com/courses/61605/assignments/635059)	due by 11:59pm
Tue Apr 24, 2018	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 3)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 2)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 1)	due by 8:30am
Thu Apr 26, 2018	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 6)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 5)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 4)	due by 8:30am
Sun Apr 29, 2018	Homework 3 (https://colostate.instructure.com/courses/61605/assignments/635063)	due by 11:59pm
Tue May 1, 2018	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 9)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 8)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 7)	due by 8:30am
Thu May 3, 2018	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 12)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 11)	due by 8:30am
	Submit your project presentation (https://colostate.instructure.com/courses/61605/assignments/635058) (Project Group 10)	due by 8:30am

Date	Details	
Fri May 4, 2018	Rate other projects (https://colostate.instructure.com/courses/61605/assignments/635060)	due by 11:59pm