

**BENG186A: Principles of Biomaterials Design  
Spring 2020**

**Instructor:** Professor Ester J. Kwon (ejkwon@ucsd.edu)  
**Office Hours:** Tuesdays 5-6 pm  
Via Zoom – Meeting ID 683-221-704

**Class time and location:** Please see schedule below

**Discussion sections:**

**Teaching assistants will be available on the Canvas discussion board during these times to answer your questions in real time.**

**W 9-9:50 AM – Marianne Madias**  
**W 12-12:50 PM – Lauren Waggoner**  
**W 3-3:50 PM – Emma Zelus**  
**W 4-4:50 PM - Jervaughn Hunter**

**Teaching Assistants:** Lauren Waggoner (lwaggon@eng.ucsd.edu)  
Jervaughn Hunter (jhunter@eng.ucsd.edu)  
Marianne Madias (mmadias@eng.ucsd.edu)  
Emma Zelus (ezelus@eng.ucsd.edu)

**Text:** Biomaterials Science: An Introduction to Materials in medicine  
Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons  
Available online from UCSD library

**Instructor's note**

Dear students,

Welcome to the online version of BENG186A. As measure to prioritize the health and safety of UCSD's students and the community in response to the COVID-19 infection, the Spring 2020 quarter of BENG186A will be conducted online. All class communication will occur through Canvas. In order to maximize flexibility, lecture audio and slides will be posted so students may 'attend' lecture at their convenience. At the same time, interactions are the major benefit of the university classroom so we will facilitate as many interactions as we feasibly can, given technical limitations. Office hours will be held "live" via Zoom during the scheduled class time to ensure there are no schedule conflicts. There may be technical difficulties due to the rapid implementation of the online classroom. If you have concerns or issues, please communicate them to me in a constructive manner.

A major component of this course is a written project in teams of four students. In order to guide you through the writing process, there will be four writing activities scheduled (see syllabus). Your TAs will organize a shared document and online meeting for each group to complete their writing assignment during the scheduled class time. Although it is highly recommended that at least some members be present during the real-time instruction in order to receive feedback, groups may arrange their own time to work on the assignment and submit the document by the end of the week for full credit if there are schedule conflicts. Real time TA assistance will not be available outside of the scheduled times. For more guidance, please see the project handouts.

Considering that access to the internet may be difficult for some of you, the only two times your online presence is required is during the exam times.

Prof. Ester J. Kwon

## Course Objectives

At the end of this course you should be able to:

- Describe what a biomaterial is.
- List the major classes of biomaterials and their applications.
- Know major methods for the characterization of biomaterials.
- Be able to provide a rational justification for recommendation of the best material for an application.
- List different strategies to modify and/or design biomaterials.
- Explain how biomaterials interact with the “host”.
- Understand basic principles of federal regulation, intellectual property protection, and economics of biomaterials implementation.
- Read, understand, and analyze scientific publications pertaining to the field of biomaterials and have a broad understanding of biomaterials research.
- Learn how to write an effective proposal.

## Canvas.ucsd.edu

Canvas (canvas.ucsd.edu) will be used as the main source of class resources and communication. In order to facilitate fair access to information for all students, all questions related to class material must be asked via Canvas. Log into Canvas to do the following:

- Download lecture notes and recordings
- Take weekly quizzes
- Get access to syllabus, reading, and assignments
- Check exam dates and due dates
- Receive general course announcements
- Writing instruction
- Turn in assignments

Course related questions will only be answered on Canvas discussion board to ensure fair access to information. Teaching assistants will be available on the Canvas discussion board during the discussion times posted. Keep all posts professional and related to the course.

Please direct personal matters to Prof. Kwon by email.

## Class Policies

The following policies help ensure that the class is run fairly and efficiently.

- Post all non-personal questions on Canvas
- Grading: If there is a grade discrepancy, submit the original assignment along with a written request for a re-grade within one week from the date the assignment is returned. If re-grading is desired, then the entire assignment or project is subject to re-grading.
- The exam may not be missed without prior instructor approval.

## Integrity of Scholarship

Academic dishonesty will not be tolerated. This applies to quizzes, exams, and the project. All quizzes and exams will be the sole work of individual students. Projects will be completed in groups of up to 4 students and no content will be taken directly from any source, including past projects.

The Department of Bioengineering adheres to the UCSD Policy on Integrity of Scholarship. An excerpt of this Policy states that "*Students are expected to complete the course in compliance with the instructor's standards. No student shall engage in any activity that involves attempting to receive a grade by means other than honest effort...*" Any suspected incident will be dealt with in accordance with UCSD policy, which includes reporting the misconduct to the Dean. More information on UCSD's academic dishonesty policy can be found at: <http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2>

### **Guidelines for the online classroom**

When using video meetings, use headphones to reduce audio feedback.

Keep your microphone on mute unless you are actively speaking to minimize noise so everyone can hear.

Keep all posts online professional and related to the course.

Be mindful of your background and your screen during video calls so you do not share anything you don't want to.

### **Course Evaluation**

10% Weekly Quizzes

25% Midterm exam (Blue)

25% Final exam (Blue)

10% Writing assignments (Yellow)

10% Proposal drafts (Green)

20% Final proposal (Green)

## Class Schedule

Week	Date	Lectures	Reading	Due Date (Submit 5 PM PST via Canvas)	Real time activity (5-6:30 PM PST)
1	3/31	Syllabus, course overview, introduction			
	4/2	Material Properties	I.1.1-I.1.3		
2	4/7	Metals, Ceramics	I.2.3-I.2.4	Submit project groups	Dr. Kwon OH
	4/9	Polymers	1.2.2		Background & Significance
3	4/14	Hydrogels and Natural Materials	I.2.5, 1.2.7		Dr. Kwon OH
	4/16	Degradation of Biomaterials			Specific Aims
4	4/21	Surface and Biological Interactions	II.4		Dr. Kwon OH
	4/23	Structures of Biomaterials	I.1.5, II.1.2, I.2.12	B&S	
5	4/28	Cell Interactions			Dr. Kwon OH
	4/30	Inflammation and Wound healing	I.2.14-16		Review Session
6	5/5	Midterm (Week 1-4 of material)	II.1.3		Midterm
	5/7	Immune response	II.2.2	Specific Aims	Research Design and Methods
	5/12	Proposal workshop	II.2.3-4		Proposal workshop/Dr. Kwon OH
	5/14	Proposal workshop	II.2.5-8, II.4.5		Proposal workshop
8	5/19	Potential Problems in Biomaterial Implantation			Dr. Kwon OH
	5/21	Sterilization and Biomaterials Testing	III.1.2,		Human & Animal Subjects
9	5/26	FDA and Biomaterials	III.2.9		Dr. Kwon OH
	5/28	Applications: Drug delivery systems	II.5.16		
10	6/2	Applications: Tissue Engineering	II.6		Dr. Kwon OH
	6/4	Final proposal due		Full proposal due	Review Session
	6/11	Final exam			

## **Access Guide**

**Your guide on how to access everything you need for the course**

### **Weekly lectures**

Recorded video and lecture slides will be available at the start of each week.

Access lecture notes on Canvas via the “Files” link in the menu.

Access video files on Canvas via the “” link in the menu.

### **Weekly quizzes**

Weekly quizzes cover that week’s lecture material. Take your quiz every week before Friday 11:59 PM.

Access quizzes on Canvas via the “Quizzes” link in the menu.

### **Exams**

Exams will be administered during the scheduled times (see schedule).

Exams will be posted onto Canvas.

Access your exam on Canvas via the “Files” link in the menu.

Connect via Zoom during the exam to be proctored. You must have your camera on you and be at your desk the full exam period.

Access Zoom on Canvas via the “Zoom” link in the menu.

Submit your exam via Canvas via the “Assignments” link in the menu.

### **Writing assignments**

Writing assignments will be real-time when possible. Sign onto the Google Doc link sent by your TA during the time noted on the Syllabus. Sign on to Zoom to receive verbal feedback from your TA.

Access your Google Doc via the e-mail link sent by your TAs.

Access Zoom on Canvas via the “Zoom” link in the menu.

### **Proposal draft and final proposal**

All instructions for the proposal drafts and final proposal can be found in the handouts.

Access handouts on Canvas via the “Files” link in the menu.

Turn in your proposal draft and final proposal on Canvas via the “Assignments” link in the menu.

### **Dr. Kwon’s Office Hours**

Every Tuesday 5-6 pm PST via Zoom.

Access Zoom on Canvas via the “Zoom” link in the menu.