

BENG 294C - Engler [SP23]

## BE 294C - Clinical Bioengineering - Spring 2023

Mentor Meeting Times: MWF 8 – 11AM but **will be** variable based on what you work out with your physician mentor

Instructor: Dr. Adam J Engler

Email: [aengler@ucsd.edu](mailto:aengler@ucsd.edu) (<mailto:aengler@ucsd.edu>)

Office and Hours: Zoom, Wednesdays 3-4pm

### Course Objectives

MS-Med students will be exposed to and develop a basic understanding of the clinical practices within UC San Diego's Health System. This course is intended as a capstone experiential learning course that will require students to identify and understand problems in clinical medicine from in person experiences with clinical faculty, grand rounds, and other asynchronous course content. From these interactions and materials, students will identify problems with diagnostics, clinical practice, and/or treatment, and use engineering principles to design solutions. In regularly scheduled group discussions, the class discuss weekly experiences and how engineering tools could be applied to solve these problems in the practice of medicine. In this context, students will act as *engineering consultants* by identifying a problem in the physician mentor's clinical practices, proposing engineering-based solution(s), and working towards a solution if possible.

### Classroom Instruction

Prior to the course, students will attend lectures by the instructor to introduce the class and mentoring process. Hospital orientation will also be provided at the beginning of the first week of class during finals week of the winter quarter.

### Internship

During the internships, students will establish a relationship with their physician mentors. Together you will decide on how to best interact to identify a problem during the course of the mentor's clinical practice. Regardless of how the students/mentor interact (observing rounds, shadowing, one-on-one discussions, etc.) students should spend a total of ~9 hours per week on the internship. Students

discussions, etc.), students should spend a total of ~9 hours per week on the internship. Students must remain actively engaged with their physician mentor over the course of the 3 3-week internships in the clinic and in surgery.

## **Course Evaluation**

### **1. Weekly Discussions (25%)**

The practice of medicine is highly variable, so no two rotations will be alike, even with the same mentor. During the course of the quarter, MS-Med students will meet weekly on Fridays from 10-11am with Dr. Engler for a group discussion of how the week's rotations went for each team. At this time, the class will help each team identify a common problem they identified that week, which the team could then develop into a more in-depth solution for their essays or final project. Credit for this portion of the grade is based on participation in the discussion.

### **2. Problem Identification Essays (25%)**

After the discussions, MS-Med students must twice turn in short, 3- to 4-page essay describing the problems discussed from a particular week (focus on the economics, social responsibility, current events, etc. involving healthcare and technology). Papers must cite scientific literature to justify the position taken and outline what a possible solution would be. Technical drawings of the solution are not required but encouraged. These essays will be due after the first and second rotations.

### **3. Final Presentation (50%)**

Students will give a 30-minute presentation describing their capstone engineering-based solution to a problem identified during from the physician interactions. Presentations will be made during the final exam time slot. The presentation must include how their problem was identified, the proposed solution, and progress made towards the solution, if any. Accompanying this presentation will be a detailed, 10-page report providing an in-depth literature review, motivation for the solution, technical drawings of the solution, and an analysis of the proposed solution's ability to address the unmet problem in clinical medicine.

## **Course Summary:**


**Date**

**Details**

**Due**

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Mon Apr 3, 2023

 [BENG 294C - Orientation  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=878946&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=878946&include_contexts=course_46998)

8:30am to 9:30am

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Wed Apr 5, 2023

 [Clinical Bioengineering Office  
Hours  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=878958&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=878958&include_contexts=course_46998)

3pm to 4pm

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Fri Apr 7, 2023

 [BENG 294C Discussion  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=872957&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=872957&include_contexts=course_46998)

10am to 11am

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Wed Apr 12, 2023

 [Clinical Bioengineering Office  
Hours  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=878959&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=878959&include_contexts=course_46998)

3pm to 4pm

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Fri Apr 14, 2023

 [BENG 294C Discussion  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=872958&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=872958&include_contexts=course_46998)

10am to 11am

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Wed Apr 19, 2023

 [Clinical Bioengineering Office  
Hours  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=878960&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=878960&include_contexts=course_46998)

3pm to 4pm

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Fri Apr 21, 2023

 [BENG 294C Discussion  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=872959&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=872959&include_contexts=course_46998)

10am to 11am

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Wed Apr 26, 2023

 [Clinical Bioengineering Office  
Hours  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=878961&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=878961&include_contexts=course_46998)

3pm to 4pm

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Fri Apr 28, 2023

 [BENG 294C Discussion  
\(https://canvas.ucsd.edu/calendar?  
event\\_id=872960&include\\_contexts=course\\_46998\)](https://canvas.ucsd.edu/calendar?event_id=872960&include_contexts=course_46998)

10am to 11am


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 [Essay 1  
\(https://canvas.ucsd.edu/courses/46998/assignments/613027\)](https://canvas.ucsd.edu/courses/46998/assignments/613027) due by 11:59pm

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Wed May 3, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=878962&amp;include_contexts=course_46998">Clinical Bioengineering Office Hours</a> <a href="https://canvas.ucsd.edu/calendar?event_id=878962&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=878962&amp;include_contexts=course_46998)</a>	3pm to 4pm
Fri May 5, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=872961&amp;include_contexts=course_46998">BENG 294C Discussion</a> <a href="https://canvas.ucsd.edu/calendar?event_id=872961&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=872961&amp;include_contexts=course_46998)</a>	10am to 11am
Wed May 10, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=878963&amp;include_contexts=course_46998">Clinical Bioengineering Office Hours</a> <a href="https://canvas.ucsd.edu/calendar?event_id=878963&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=878963&amp;include_contexts=course_46998)</a>	3pm to 4pm
Fri May 12, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=872962&amp;include_contexts=course_46998">BENG 294C Discussion</a> <a href="https://canvas.ucsd.edu/calendar?event_id=872962&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=872962&amp;include_contexts=course_46998)</a>	10am to 11am
Wed May 17, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=878964&amp;include_contexts=course_46998">Clinical Bioengineering Office Hours</a> <a href="https://canvas.ucsd.edu/calendar?event_id=878964&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=878964&amp;include_contexts=course_46998)</a>	3pm to 4pm
Fri May 19, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=872963&amp;include_contexts=course_46998">BENG 294C Discussion</a> <a href="https://canvas.ucsd.edu/calendar?event_id=872963&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=872963&amp;include_contexts=course_46998)</a>	10am to 11am
	 <a href="https://canvas.ucsd.edu/courses/46998/assignments/613029">Essay 2</a> <a href="https://canvas.ucsd.edu/courses/46998/assignments/613029">(https://canvas.ucsd.edu/courses/46998/assignments/613029)</a>	due by 11:59pm
Wed May 24, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=878965&amp;include_contexts=course_46998">Clinical Bioengineering Office Hours</a> <a href="https://canvas.ucsd.edu/calendar?event_id=878965&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=878965&amp;include_contexts=course_46998)</a>	3pm to 4pm
Fri May 26, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=872964&amp;include_contexts=course_46998">BENG 294C Discussion</a> <a href="https://canvas.ucsd.edu/calendar?event_id=872964&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=872964&amp;include_contexts=course_46998)</a>	10am to 11am
Wed May 31, 2023	 <a href="https://canvas.ucsd.edu/calendar?event_id=878966&amp;include_contexts=course_46998">Clinical Bioengineering Office Hours</a> <a href="https://canvas.ucsd.edu/calendar?event_id=878966&amp;include_contexts=course_46998">(https://canvas.ucsd.edu/calendar?event_id=878966&amp;include_contexts=course_46998)</a>	3pm to 4pm


Fri Jun 2, 2023

 [BENG 294C Discussion](https://canvas.ucsd.edu/calendar?event_id=872965&include_contexts=course_46998)  
([https://canvas.ucsd.edu/calendar?  
event\\_id=872965&include\\_contexts=course\\_46998](https://canvas.ucsd.edu/calendar?event_id=872965&include_contexts=course_46998))

10am to 11am

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Wed Jun 7, 2023

 [Clinical Bioengineering Office Hours](https://canvas.ucsd.edu/calendar?event_id=878967&include_contexts=course_46998)  
([https://canvas.ucsd.edu/calendar?  
event\\_id=878967&include\\_contexts=course\\_46998](https://canvas.ucsd.edu/calendar?event_id=878967&include_contexts=course_46998))

3pm to 4pm

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Fri Jun 9, 2023

 [BENG 294C Discussion](https://canvas.ucsd.edu/calendar?event_id=872966&include_contexts=course_46998)  
([https://canvas.ucsd.edu/calendar?  
event\\_id=872966&include\\_contexts=course\\_46998](https://canvas.ucsd.edu/calendar?event_id=872966&include_contexts=course_46998))

10am to 11am

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Thu Jun 15, 2023

 [BENG 294C - Final Presentations](https://canvas.ucsd.edu/calendar?event_id=878990&include_contexts=course_46998)  
([https://canvas.ucsd.edu/calendar?  
event\\_id=878990&include\\_contexts=course\\_46998](https://canvas.ucsd.edu/calendar?event_id=878990&include_contexts=course_46998))

8am to 11am

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Fri Jun 16, 2023

 [Final Project Report](https://canvas.ucsd.edu/courses/46998/assignments/613033)  
(<https://canvas.ucsd.edu/courses/46998/assignments/613033>)

due by 5pm

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 [Final Project Slides](https://canvas.ucsd.edu/courses/46998/assignments/613032)  
(<https://canvas.ucsd.edu/courses/46998/assignments/613032>)

due by 5pm

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 [Discussion](https://canvas.ucsd.edu/courses/46998/assignments/655513)  
(<https://canvas.ucsd.edu/courses/46998/assignments/655513>)

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