

# BENG 187C Bioengineering Design Project: Development. Syllabus Winter 2024

V1.0

## Instructors (we can usually chat right after class; email for individual Zoom meetings)

Alyssa C. Taylor, PhD [atayloramos@ucsd.edu](mailto:atayloramos@ucsd.edu) (I prefer to go by Dr. Taylor, not Dr. Amos or Dr. Taylor Amos)

TA info is posted on Canvas. We have a great TA team to support you! You have the same TAs as last quarter!

**Lecture Location & Time:** Mondays and Wednesdays 10 – 10:50 am, CENTR Room 115

**Peculiar Note:** YOU SHOULD BE REGISTERED FOR THE SAME DESIGN COURSE NUMBER THAT YOU TOOK IN FALL – BENG 1XXA. REGISTER THIS WINTER FOR 1XXB – THE SAME NUMBER JUST THE B VERSION. OTHERWISE YOUR GRADUATION WILL BE IMPACTED. As previously explained, BENG 1XXB (your 3 credit “design project course”) is listed in the UCSD Schedule of Classes with **fictitious meeting times**. This is an artifact of our scheduling system. Each team arranges its own meetings and its meetings with mentors. DO NOT GO TO YOUR 1XXB designated time/place - no instructor/class will be there.

**Overall Summary:** This is the third quarter in a 4-quarter sequence in Bioengineering Design. The lecture courses (BENG 187B and 187C) give organization to the project design experience, through lectures and assignments. These topics include (instructor’s discretion as to which are in BENG 187A/B/C):

1. Course Logistics: notebooks and other reporting requirements
2. Formal Design Overview Procedures
3. Final Proposal: Goals, Methods, Materials, Costs, Timeline, Testing/Evaluation
4. In Process Guidance: Teamwork, Bottlenecks
5. Assessment: Peer Evaluation and Design Progress Reviews
6. Team Involvement
7. Professional Communication Skills
8. Guest lectures speaking to various important topics, from IP Fundamentals to Careers Path in BioE

**Relation of BENG 1XXB to BENG 187C:** most of the activities in BENG 187C are background for bioengineering seniors – a very important part of your education, tangentially related to your senior design project but an important part of your overall undergraduate education. Most importantly there are valuable lessons for your lifetime work in bioengineering or in any other profession. Your instructors – and more importantly, the next generation -- trusts you to conduct yourself with the highest standards of professional and ethical practice.

**Simplistic Summary:** This lecture course gives introduction to several important topics that Biomedical Engineers may face in the workplace.

1. Guest speakers will provide industry, international, and career perspectives.
2. BENG 187C also prepares for the formal reporting requirements of BENG 187D.
3. Topics for 187C include (some topics were in BENG 187A and BENG 187B)
  - i. Ethics, Human Subjects, Animal Subjects
  - ii. FDA, Standards, Invention Disclosure and IP Policy, FDA Design Controls
  - iii. Careers, Industry Preparedness, Graduate Programs
  - iv. Global Health Innovation
  - v. Presentations: Oral, Poster, Web, Video (preparation for work in Spring BENG 187D); Scientific Paper and Proposal Writing.
4. Attendance: we reserve the right to take attendance in class. We will message the mandatory lectures like we did last quarter.
5. Occasional content assignments and individual reflections will be due.
6. Notebooks will be assessed twice this quarter.

7. Each student will practice talking about their project effectively via an Elevator Talk: 2-minute, 1 slide. We hope that this activity will help make you comfortable for the career fair and are excited to hold these talks earlier in the quarter than in prior years.

**The final deliverables this Winter by student teams are the full design report and design review presentation, which showcase your progress in your project and allow you to develop key communication skills.**

**BENG 1XXB:** Enroll in the 3-credit design project course as we have communicated and described above. This represents the principal engineering design activity. You should be meeting as a team with your mentor once per week and more often with your team to work on the project.

**More notes on BENG 1XXB and BENG 187C:** BENG 187C work is directly related to your project (e.g., generating a testing plan) and also helps introduce key topics of engineering design and research and key professional development opportunities (ignite talk, design review), and helps provide a structure for your design documentation. Make sure you are spending time on the actual project (reflected in your 3 credits for 1XXB). In total, you are taking 4 credits related to senior design for Winter which corresponds to ~12 hours a week.

**Lectures and Assignments** (subject to change).

**Please see separate Course Schedule on Canvas for details on Class topics and Assignments**

Last quarter was fast-paced work needed to get your foundation established for senior design. This quarter, we emphasize oral and written communication development and guest speakers to enhance perspective and knowledge.

### **Methods of Evaluation**

The 187 sequence uses “in progress” or “IP” grading scheme. However, we compute individual grades for each of BENG 187ABCD (reported on CANVAS) for use in assigning a single letter grade at the end of 187D in spring quarter for each of the entire sequence (4 units total; all will have the same letter grade). This means that there will be a single final grade that applies to all BENG 187 courses (A,B,C, and D). You will receive this grade after completing BENG 187D in the Spring. We compute grades the individual courses and your scores are on Canvas, so you can track your progress.

### **Grading of BENG 187C: (Details will be on Canvas. Grading scheme is Subject to Change)**

- Assignments (15%): examples include Testing Plan Worksheet. Details will be on CANVAS.
- Final Project Report (25%): This will be graded according to a rubric available on CANVAS.
- Notebook Evaluation (20%): Each student is responsible for maintaining an on-line design notebook throughout the year to document your work on the design project. The design notebook should include notes from class and meetings with the faculty advisors and teammates, notes from research, calculations, data from testing, and sketches. This notebook will contain all your notes and work on the project, but does not include the written assignments that are turned in separately.
  - TA's will grade notebooks two times during the quarter. (10% each check)
- Attendance and Participation (10%): Students are expected to attend lecture and participate in in-class engineering design activities. Your participation is very important for the efficient operation of your team. Various participation points activities will occur during the quarter, for instance submitting a photo essay of your project work. We reserve the right to assess meeting attendance expectations, but do not anticipate needing to do this. Please do not email instructor/TA if you are ill or have another emergency which means you are unable to come to class that particular day. We have 164 students and it is not feasible to track/respond to individual cases of absences. Instead, please utilize the Canvas resources to catch up with material and contact your team. Of course, if you have a lengthy illness or extenuating circumstances we want to hear from you about it so we can help craft a plan for success.

- Team Work (10%): This combines Peer Assessment and our instructional assessment of your teamwork, as noted in the Team Work Expectation handout.
- Design Review (10%): Final design review presentation to the teaching team for the project. Emphasis of assessment is on the technical content.
- Elevator/Ignite Talks(10%): you will sign up to give a 2-min max elevator pitch for your projects.

### **Anticipated Grading Scale**

**A = 90-100%   B = 80-89%   C = 70-79%   D = 60-69%   F = 59%-below**

### **Requirements and Grading for Corresponding BENG 1XXB 3-Credit Course:**

**Project Mentor Evaluation (67%):** This is your project mentor's assessment of the quality of your work. Grades may be different for different team members depending on assessed level of contribution and quality of work. You also need to submit your report to your mentor(s) which will help them grade. Communicate with your mentors before the end of the quarter as to their assessment of your grade, have check-ins!

**Final Design Review (33%):** The BENG 187C instructors evaluate for quality of design content, and evidence of project dedication, alignment with the expected effort for this course, and progress achieved. Also included are assessments of individual team members' contributions.

**Procedurally:** the BENG 187C course instructor informs the Project Mentors of the requirement for BENG 1XXB grade. Mentors then reply with their grade evaluations. No course grade will be entered until the mentor has responded – this may result in delays before a grade is formally entered.

Each component grade is converted to the UCSD letter/number equivalent (A=4; A-=3.7; etc. on a 4 point scale) so the final BENG 1XXB grade can be determined.

UCSD requires grade submission at the end of the Winter quarter. **\*\*We need you to communicate with your mentor throughout this quarter and importantly send them your final report or your preliminary final report. Make sure your mentor has enough material to estimate and judge your final contribution/effort/performance.**

### **You are learning a lot in Senior Design:**

#### **Senior Design Objectives – Grading over the course of the 187A/B/C/D series assesses your ability to:**

- Identify design objectives, functions and specifications
- Compare alternative designs
- Design with an awareness of basic regulatory requirements
- Document the design process and evolution
- Make effective technical presentations in oral and written formats
- Learn to use feedback effectively for design revision
- Work effectively as a team, including effective communication among team members
- Integration of results; making informed decisions about design iterations
- Scheduling and planning
- Work within Constraints
- Research and analyze engineering standards; recognition of their role in your project materials and use of your product

#### **Senior Design Outcomes / Learning Objectives, and corresponding ABET Learning Outcomes.**

1. Apply the stages of the engineering design process to develop innovative and practical solutions to technical problems. Included are scheduling, constraints, alternatives and tradeoffs. **(ABET 1,2,6)**
2. Work effectively in project teams by establishing common goals, equitable workloads, a framework for mutual accountability, strong communication, and a collegial environment. **(ABET 5)**

3. Present various project results in effective written and graphical formats, and through informative oral presentations. Document progress at all stages (**ABET 3**)
4. Evaluate ethical issues in biomedical engineering practice, including understanding FDA regulation and human and animal subject use. (**ABET 4**)
5. Be exposed to, consider, and to implement where possible societal/world problems requiring innovative thinking and entrepreneurship. (**ABET 7,8**)

***ABET Program Outcomes: Engineering graduates must have the ability to -***

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and math.
2. Apply engineering design to produce solutions that meet specific needs with standards and constraints considering public health, safety, welfare, global, cultural, social, environmental, and economic factors.
3. Communicate effectively (written and oral) with a range of audiences.
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment (inclusion of diversity) and establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies (life-long learning).
8. Identify needs for new engineering solutions for society/world and develop innovative thinking to solve bioengineering problems with creativity and entrepreneurship.

## **Policies**

### **Late Work or Missing Assignments**

**No (unexcused\*) late submissions will be accepted. \*Communicate with the teaching team early about any issues with getting work in on time. Many of us face unexpected crises, including myself, so we will be as understanding and flexible as possible.** We have 164 students so just logistics-wise it's not tractable to have late submissions and keep the class moving forward. As a student citizen and developing professional, it is important that you take responsibility for the work and deadlines in this course. Our goal is to keep you on track with your project. Completion of work in a timely fashion provides you with the training you will need to be successful in future endeavors and is vital to your team's success. Thus, the general policy is no late work will be accepted. In fairness to other students, you must make *prior* arrangements if *unavoidable* circumstances mean that you will need to turn in an assignment late. I definitely understand that unforeseeable emergencies can occur, and if this happens please contact the teaching team as soon as possible.

**A note on inclusion:** It is my intention that students from all backgrounds and perspectives will be well-served by this course, and that the diversity that students bring to this class will be viewed as an asset. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, socioeconomic background, family education level, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. Your suggestions are encouraged and appreciated.

**Academic Integrity:** You are all senior undergraduates and professional, so I don't anticipate any problems but...The Shu Chien-Gen Lay Department of Bioengineering adheres to the UCSD Policy on Integrity of Scholarship and we expect all students to honor this policy. 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 of academic integrity violation will be dealt with in accordance with UCSD policy. More information on

UCSD's academic integrity policy can be found at: <https://academicintegrity.ucsd.edu/process/policy.html>. Please be sure that you understand what plagiarism is and how to avoid it. Intentional or not, plagiarism is a violation of the UCSD Policy on Integrity of Scholarship and there are many possible sanctions and disciplinary actions. Talk to the teaching if you have any questions and refer to UC San Diego library guide UCSD Library Guides on finding and citing information: <https://ucsd.libguides.com/CAT2/home>

**Accommodations for Students Due to a Disability:** I am committed to ensuring access to classes, course material, and learning opportunities for students with disabilities. Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD) which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to Faculty (please make arrangements to contact me privately, I am very happy to discuss!) and to the OSD Liaison in the department in advance so that accommodations may be arranged. Contact the OSD for further information: 858.534.4382 (phone), [osd@ucsd.edu](mailto:osd@ucsd.edu) (email), or <http://disabilities.ucsd.edu> (website).

**Religious Accommodation:** See: [EPC Policies on Religious Accommodation, Final Exams, Midterm Exams](#)  
It is the policy of the university to make reasonable efforts to accommodate students having bona fide religious conflicts with scheduled examinations by providing alternative times or methods to take such examinations. If a student anticipates that a scheduled examination will occur at a time at which his or her religious beliefs prohibit participation in the examination, the student must submit to the instructor a statement describing the nature of the religious conflict and specifying the days and times of conflict. In senior design, we do not hold examinations, but I wanted you to have this information.