BME 180C BME Engineering Design
MSE 189C Senior Design Projects
Spring 2022

Course Descriptions

BME 180C – Design strategies, techniques, tools, and protocols commonly encountered in biomedical engineering; clinical experience at the UCI Medical Center and Beckman Laser Institute; industrial design experience in group projects with local biomedical companies; ethics, economic analysis, marketing, and FDA product approval. Materials fee.

MSE 189C – Group supervised senior design projects that deal with materials selection in engineering design and that involve ethics, safety, design, failure modes, new products, and patents. Materials fee.

BME 180C Instructors

Prof. William Tang, 3113 Natural Sciences II, **wctang@uci.edu (mailto:wctang@uci.edu)**
Prof. Christine King, 3410 Engineering Hall, **kingce@uci.edu (mailto:kingce@uci.edu)**

MSE 189C Instructor

Dr. Chris Hoo, 621 Engineering Tower, **cmhoo@uci.edu (mailto:cmhoo@uci.edu)**

Teaching Assistants

Yasaman (Yassi) Fatapour, **yfatapou@uci.edu (mailto:yfatapou@uci.edu)**

Joanne Ly, **joannl6@uci.edu (mailto:joannl6@uci.edu)**

Jie Shen, **shenj8@uci.edu (mailto:shenj8@uci.edu)**

TA Office Hours: By appointment via E-mail

Professor King Office Hours and Fabrication Lab

Location: Multipurpose Science and Technology Building (MSTB) room 214

Open Lab/Office Hour Times:

Mondays 3:00pm-4:30pm

Tuesday 2:00pm-5:00pm

Wednesdays 3:00pm-4:00pm

Thursdays 2:00pm-5:00pm

Fridays 2:00pm-3:30pm

Lectures

Tuesdays, Thursdays 5:30PM to 6:50PM **(https://uci.zoom.us/j/96187630959)**

Location: Parkview Classroom Building (PCB) room 1100
Live Stream Zoom Link (*for excused absences only*): **https://uci.zoom.us/j/98527311038 (https://uci.zoom.us/j/98527311038)**

A Note on Zoom:

This class is will be streamed over Zoom for those who have prior excused absences. As the instructor, I will be recording this session. I have disabled the recording feature for others so that no one else will be able to record this session. I will be posting this session to the course's website. If you have privacy concerns and do not wish to appear in the recording, you may turn video off (click "stop video") so that Zoom does not record you. If, when you disable live video, you also want to use a profile image (other than a picture of you) instead of your name, please let me know which image you will be using so that I know who you are during the session. If you would like to ask a question, you may do so privately through the Zoom chat by addressing your chat question to me only (and not to "everyone"), or you may contact me by another private method. If you have questions or concerns about this, please contact me.

Prerequisites

BME 180A/B/C must be taken in the same academic year. Senior standing only.
CBEMS 189A/B/C must be taken in the same academic year.

Required Text: None

Reference Texts

Paul Yock, Stefanos Zenios, and Josh Makower, eds., *Biodesign: The Process of Innovating Medical Technologies, 2nd Ed.*, Cambridge University Press, 2015.

Clive L Dym, Patrick Little, and Elizabeth Orwin, *Engineering Design: A Project-Based Introduction, 4th Ed.,* Wiley, 2014.

Grading Policy

Website (https://canvas.eee.uci.edu/courses/45577/assignments/939984):	15%
Final Presentation (UROP or NVC) (https://canvas.eee.uci.edu/courses/45577/assignments/939986):	20%
Spring Poster (https://canvas.eee.uci.edu/courses/45577/assignments/939985):	10%
Final Report (https://canvas.eee.uci.edu/courses/45577/assignments/939985):	35%
Peer Evaluation (https://canvas.eee.uci.edu/courses/45577/assignments/939990):	10%
Attendance (https://canvas.eee.uci.edu/courses/45577/assignments/939988):	10%
Bonus Course Survey (https://canvas.eee.uci.edu/courses/45577/assignments/939989):	2%
TOTAL:	**102%**

Course Learning Outcomes

BME 180A-B-C – Upon completing the course, students will be able to:

1. Demonstrate leadership and teamwork skills in a project team environment.
2. List and define the various steps in bringing a biomedical product from concept to market.
3. Identify the realistic constraints of the team project.
4. Identify and assess challenges in each of the steps.
5. Articulate the impacts of the project in a global, economic, environmental and societal context.

6. Design and conduct experiments to verify team projects requirements.
7. Use knowledge in mathematics, statistics, biological sciences, physical sciences, and engineering to solve the problems at the interface of engineering and biology whenever required.
8. Use the appropriate computer tools to design, model, simulate, and/or operate, the team projects.
9. Apply engineering principles and practices to meet the challenges.
10. Demonstrate oral communication skills in presenting team projects.
11. Establish initial contacts with major local BME companies.
12. Demonstrate knowledge of contemporary issues related to biomedical engineering.

MSE 189A-B-C – Upon completing the course, students will be able to:

1. Apply knowledge of mathematics, science, and engineering.
2. Design and conduct experiments as well as to analyze and interpret data.
3. Process and select a material to meet desired needs.
4. Function on multi-disciplinary teams.
5. Identify, formulate, and solve engineering problems using techniques, and modern engineering tools essential for engineering practice.
6. Understand professional and ethical responsibility.
7. Communicate effectively both orally and in writing.
8. Understand the impact of engineering solutions in a global and societal context.
9. Recognize the need for life-long learning.
10. An ability to understand contemporary issues influencing the society and the materials profession.
11. Apply and integrate knowledge from each of the four primary elements of Materials Science and Engineering (structure, properties, processing and performance) to solve problems related to materials selection and design.

Overall Program Schedule

Quarter	Activities Performed	Track Expectations
Fall	focus on team formation, project definition and planning, addressing clinical need, FDA and technical documentation, initial experimentation on possible design solutions, decision on chosen design	*Industry Track:* develop research components of the project, UROP proposal *Entrepreneurial Track:* develop market study, first-draft business plan
Winter	focus on the implementation of the chosen solution and redesign to a more detailed	*Industry Track:* continue research tasks as part of the project development

	design with considerations of standards. Mid-course adjustment may be needed, depending on the findings	*Entrepreneurial Track:* continue business plan as part of the project development
Spring	**pursue final testing, validation, and revision of the design solution followed by complete documentation**	***Industry Track:*** **present at UROP engineering design competition** ***Entrepreneurial Track:*** **present at NVC business plan competition**

Course Schedule

Week #	Date	Day	Lecture
1	3/29	Tue	**Introduction to the Quarter: Deliverables and Expectations (https://canvas.eee.uci.edu/courses/45577/files/18397648?wrap=1)** ↓ **(https://canvas.eee.uci.edu/courses/45577/files/18397648/download?download_frd=1)** Lecturers: Dr. Christine King, Dr. William Tang, Dr. Chris Hoo
1	3/31	Thu	**Website Authoring (https://canvas.eee.uci.edu/courses/45577/files/18416644?wrap=1) (https://canvas.eee.uci.edu/courses/45577/files/18416644/download?download_frd=1)** Lecturer: Christine King
2	4/4	Mon	*Abstract Due: UROP Symposium Abstract Due to UROP Website:* ***https://uciurop.inforeadу4.com/#competitionDetail/1866830 (https://uciurop.infoready4.com/#competitionDetail/1866830)*** **https://cpb-us-w2.wpmucdn.com/wp.ovptl.uci.edu/dist/e/3/files/2021/01/2022-Ab (https://cpb-us-w2.wpmucdn.com/wp.ovptl.uci.edu/dist/e/3/files/2021/01/2022-Abstract-G**
2	4/5	Tue	Team Assessments #1 **Schedule here (https://docs.google.com/spreadsheets/d/1bdVtzfINIxmlByRtQioY7quae3a9lu9lxDFVLLh**
2	4/7	Thu	Team Assessments #1 **Schedule here**

			(https://docs.google.com/spreadsheets/d/1bdVtzfINIxmlByRtQioY7quae3a9lu9lxDFVLLh
3	4/12	Tue	Team Assessments #1 **Schedule here** **(https://docs.google.com/spreadsheets/d/1bdVtzfINIxmlByRtQioY7quae3a9lu9lxDFVLLh**
3	4/14	Thu	Team Assessments #1 **Schedule here** **(https://docs.google.com/spreadsheets/d/1bdVtzfINIxmlByRtQioY7quae3a9lu9lxDFVLLh**
4	4/19	Tue	Fundraising and Projects Beyond Senior Design: James Dyson Award Lecturers: The Blue Box, James Dyson Engineer
4	4/21	Thu	Ethical and Global Considerations in Design Lecturers: Dr. Christine King, Dr. William Tang, Dr. Chris Hoo
5	4/26	Tue	Team Assessments #2 – Lab Walkthroughs
5	4/28	Thu	Team Assessments #2 – Lab Walkthroughs
6	5/3	Tue	Team Assessments #2 – Lab Walkthroughs
6	5/5	Thu	Team Assessments #2 – Lab Walkthroughs
7	5/10	Tue	Commercialization and Pitching: Advice for New Startups Lecturer: Dr. Richard Sudek, Tech Coast Angels ***ON ZOOM ONLY:* **https://uci.zoom.us/j/98527311038** **(https://uci.zoom.us/j/9852** ***Team Webpages Live at 5pm*** **(https://canvas.eee.uci.edu/courses/45577/assignments**
7	5/12	Thu	Team Leaders Meeting – Project Team Leads Only
7	5/13	Fri	*New Venture Competition Finals Fri 5/13*

			Location: TBA
8	5/17	Tue	Team Assessments #3
8	5/19	Thu	Team Assessments #3
8	5/21	Sat	*UROP Symposium Sat 5/21* *Location: UCI Student Center, Time: 8:00am - 5:00pm* ***Final Presentations due to Canvas 5/21 11:59pm*** **(https://canvas.eee.uci.edu/courses/45577/assignments/939986)**
9	5/24	Tue	*Team Assessments #3*
9	5/26	Thu	Team Assessments #3
10	5/31	Tue	*4 – 7pm: Final Symposium and Awards Ceremony* *Location: The Cove at Beall Applied Innovation*
10	6/2	Thu	CLASS CANCELED ***Final Spring Design Review Poster (https://canvas.eee.uci.edu/courses/45577/assigr*** *2pm to Canvas Assignment - NOTE: DATE TBA*
10	6/3	Fri	*2pm – 3:30pm: Spring Design Review – Poster Exhibition*
Final	6/10	Fri	***Final Report (https://canvas.eee.uci.edu/courses/45577/assignments/939987)*** *due at 11* *Assignment* ***Team Peer Evaluations* (https://canvas.eee.uci.edu/courses/45577/assignments/93999**

(https://canvas.eee.uci.edu/courses/11781/files?preview=4350718)

Prototyping and Fabrication Locations

Prototyping and Fabrication Spaces: Fabworks, RapidTech, Applied Innovation

FabWorks Location:

2302 Calit2 Building

RapidTech Location:

444 Engineering Tower

Contact: Ben Dolan, **dolanb@uci.edu (mailto:dolanb@uci.edu)**

FabWorks Website: **http://manufacturing.uci.edu/index.php/fabworks-2/ (http://manufacturing.uci.edu/index.php/fabworks-2/)**

RapidTech Website: **http://manufacturing.uci.edu/index.php/rapidtech/ (http://manufacturing.uci.edu/index.php/rapidtech/)**

Machine Shop Location:

137 Engineering Tower

Machine Shop Website: **https://manufacturing.uci.edu/index.php/facilities/machineshop/ (https://manufacturing.uci.edu/index.php/facilities/machineshop/)**

Contact: Tyler Schuldt, **tschuldt@uci.edu (mailto:tschuldt@uci.edu)**

Materials Testing Space: Engineering Tower

Contact: Jie Shen (TA), Dr. Chris Hoo, **cmhoo@uci.edu (mailto:cmhoo@uci.edu)**

Electrical/PCB Design Space: CalPlug

Contact: Dr. Mike Klopfer, **mklopfer@uci.edu (mailto:mklopfer@uci.edu)**

Website: **http://www.calit2.uci.edu/calit2-building/itemdetail.aspx?cguid=da1b9907-942d-4eed-bd3b-8bc8a78bcf2e (http://www.calit2.uci.edu/calit2-building/itemdetail.aspx?cguid=da1b9907-942d-4eed-bd3b-8bc8a78bcf2e)**

Need Clinical Data? (e.g. images, physiological data):

Center for Artificial Intelligence in Diagnostic Medicine

4500 Calit2 Building

Contact: Dr. Peter Chang

Email: **caidmadmin@hs.uci.edu (mailto:caidmadmin@hs.uci.edu)**

Business and Research Library Resources:

UCI Libraries Innovation and Entrepreneurship Librarian: Sara Heimann, **sheimann@uci.edu (mailto:sheimann@uci.edu)**

Website: **https://guides.lib.uci.edu/entrepreneurship (https://guides.lib.uci.edu/entrepreneurship)**

UCI Research Librarian for Applied Sciences and Engineering: Julia Gelfand, **jgelfand@uci.edu (mailto:jgelfand@uci.edu)**

Website: **https://guides.lib.uci.edu/engr_biomed (https://guides.lib.uci.edu/engr_biomed)**

Want Advice on Your Business Plan or Pitch Deck?:

Contact: Daniel Hahn

Email: **Daniel.hahn@medtronic.com (mailto:Daniel.hahn@medtronic.com)** (NOTE: by appointment only)

Contact: Fabio Gratton

Email: **fabio@alchemyfactory.co (mailto:fabio@alchemyfactory.co)**

Purchase Request Form and Instructions

(http://engineering.uci.edu/faculty-staff/purchasing-reimbursement/purchasing-requests)

Please use the below template and instructions to submit purchase requests:

Step 1): Fill out the below form for EACH vendor:

Purchase Request Template Form (https://canvas.eee.uci.edu/courses/42663/files/18199849?wrap=1)
(https://canvas.eee.uci.edu/courses/42663/files/18199849/download?download_frd=1)

Save the above form as "ARuth_Vendor Name_MM.DD.YYYY_Requestor Name"

for example: "ARuth_McMasterCarr_03.10.2022_Christine King"

Always use the above template file and rename the file appropriately as described above.

Step 2) Email your Purchase Request Form (separated by vendor) to **bioengineundergrad@gmail.com (mailto:bioengineundergrad@gmail.com)** with the following Title/Subject Line (insert name/group/etc appropriately):

"PO Request, BME 180, Group #"

BME Offices Address: 3120 Natural Sciences II, BME Offices, UC Irvine, Irvine, CA 92697

Step 3) Keep track of your purchases for your final report. You have $2,000 as a budget for the entire project. You can use this starting 9/23/2021.

Step 4) Expect a 1-2 week lead time to receive your order. If you want to check on your order and when it was placed, please email **bioengineundergrad@gmail.com (mailto:bioengineundergrad@gmail.com)**

For more information on purchasing and reimbursement, please see:

http://engineering.uci.edu/faculty-staff/purchasing-reimbursement/purchasing-requests (http://engineering.uci.edu/faculty-staff/purchasing-reimbursement/purchasing-requests)

Projects Expectations

BME180-CBEMS189 Senior Design Roles and Expectations.pdf (https://canvas.eee.uci.edu/courses/20058/files/7209758/download?wrap=1) 
(https://canvas.eee.uci.edu/courses/20058/files/7209758/download?download_frd=1)

Project Team Assignment

(https://canvas.eee.uci.edu/courses/20058/files/7328528/download?wrap=1)

Project and Team List (https://canvas.eee.uci.edu/courses/42663/files/17005367?wrap=1)
(https://canvas.eee.uci.edu/courses/42663/files/17005367/download?download_frd=1)

Optional Business Competitions

James Dyson Award 2022 - UCI Info Session and Q&A 4/19 in Class

James Dyson is on the hunt for bright minds with fresh ideas across the globe. If you have an invention that solves a problem, we want to hear about it.

The James Dyson Award is an international design award that celebrates, encourages and inspires the next generation of design engineers. It's open to current and recent design engineering students, and is run by the James Dyson Foundation, James Dyson's charitable trust, as part of its mission to get young people excited about design engineering.

In this session you'll hear first-hand about the James Dyson Award, how to enter, what makes a good entry and what's in it for you. Your idea could win $40,000.

- Overview of Dyson's design process
- Tips for what makes a winning entry
- Meet Judit Giró Benet, UCI MECPS alumna, Winner of the 2020 James Dyson International Award for her invention, The Blue Box
- Q+A with a Dyson engineer

http://www.jamesdysonaward.org (http://www.jamesdysonaward.org/)

Video - 2020 International Winner - The Blue Box:
https://www.youtube.com/watch?v=PDyE0bWdrow (https://www.youtube.com/watch?v=PDyE0bWdrow)

(https://www.youtube.com/watch?v=PDyE0bWdrow)

Article - James Dyson Award 2020 Global winners announced:
https://www.dyson.com/newsroom/overview/features/november-2020/james-dyson-award-winners-2020 (https://www.dyson.com/newsroom/overview/features/november-2020/james-dyson-award-winners-2020)

ANSI Competitions (Standards):

https://www.ansi.org/news_publications/news_story?menuid=7&articleid=713eb799-ab8b-403b-9d36-2b53dc98109c&utm_campaign=OO_EML_20September-21-2020-whatsnew_BG&utm_medium=email&utm_source=whatsnew
(https://www.ansi.org/news_publications/news_story?menuid=7&articleid=713eb799-ab8b-403b-9d36-2b53dc98109c&utm_campaign=OO_EML_20September-21-2020-whatsnew_BG&utm_medium=email&utm_source=whatsnew)

VentureWell Competitions and Resources:
ASPIRE (https://venturewell.org/aspire/)
BMEidea (https://venturewell.org/bmeidea/)
Cleantech University Prize (https://venturewell.org/cleantech-university-prize-cleantech/)
DEBUT (https://venturewell.org/debut/)
E-Teams Grants (https://venturewell.org/student-grants/)
Inventing Green Toolkits (https://venturewell.org/inventing-green-toolkits/)
NSF I-Corps (https://venturewell.org/i-corps/)

Other Competitions and Resources:

ACC InVenture Prize (http://accinventure.gatech.edu/)
Baylor New Venture Competition (https://www.baylor.edu/business/newventurecompetition/)
Collegiate Inventors Competition (http://www.invent.org/challenge/)
James Dyson Award (https://www.jamesdysonaward.org/)
MIT Clean Energy Prize (http://cep.mit.edu/)
MIT Water Innovation Prize (http://www.mitwaterinnovation.org/)
Rabobank-MIT Food and Agribusiness Innovation Prize (http://food-ag.squarespace.com/innovation-prize/)
Rice Business Plan Competition (https://rbpc.rice.edu/)
Westly Prize (https://westly.org/westly-prize/)
Pitch Launch Grow (https://www.universitylabpartners.org/our-events/pitch-launch-grow-2021)
https://ucinnovationchallenge.org/ (https://ucinnovationchallenge.org/)

(https://canvas.eee.uci.edu/courses/11781/files?preview=4350718)

Job Opportunities

1 Job Openings at Stealth Startup Company in San Diego

1859, Inc. is a stealth mode start-up developing a pico-scale high throughput screening (HTS) platform that enables the testing of millions of small molecule potential medicines in a single day and at an exponentially lower cost point compared to conventional HTS. They are looking to hire 2 research associate-level people to perform screening campaigns on their droplet microfluidic discovery platform. Additionally, new hires would help on-board assays onto the platform, ensuring that they are compatible and appropriate for screens. All levels (BS, MS, PhD) welcome to apply.

See attached **job description** (https://canvas.eee.uci.edu/courses/42663/files/17271959?wrap=1) (https://canvas.eee.uci.edu/courses/42663/files/17271959/download?download_frd=1) . If interested, contact:

Dr. Alex Price

Director of Screening

1859, Inc.

San Diego, California

Email: **alex@eighteenfiftynine.com** (mailto:alex@eighteenfiftynine.com)

Any questions about this company? Feel free to contact company co-founder, Dr. Brian Paegel at UCI: **bpaegel@uci.edu** (mailto:bpaegel@uci.edu)

2 Job Opportunity at Abbvie:

https://abbvie.taleo.net/careersection/2/jobdetail.ftl?job=2203767
(https://abbvie.taleo.net/careersection/2/jobdetail.ftl?job=2203767)

3 Job Opportunities at Confluent Medical Technologies:

https://workforcenow.adp.com/mascsr/default/mdf/recruitment/recruitment.html?cid=d8e0f2b1-1076-4711-bca5-9898618af359&ccId=19000101_000001&type=MP&lang=en_US
(https://workforcenow.adp.com/mascsr/default/mdf/recruitment/recruitment.html?cid=d8e0f2b1-1076-4711-bca5-9898618af359&ccId=19000101_000001&type=MP&lang=en_US)

Join Us on Social Media!

BioENGINE LinkedIn: **https://www.linkedin.com/groups/13533228/**
(https://www.linkedin.com/groups/13533228/)

BioENGINE Instagram: @bioengine

BME Discord Channel: **https://discord.gg/y37NkV5f** **(https://discord.gg/y37NkV5f)**