

# BME 180C BME Engineering Design

## Spring 2023

### 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.

### BME 180C Instructors

Prof. Michelle Khine, 3422 Engineering Hall, [mkhine@uci.edu](mailto:mkhine@uci.edu) (<mailto:mkhine@uci.edu>)

Prof. Christine King, 3410 Engineering Hall, [kingce@uci.edu](mailto:kingce@uci.edu) (<mailto:kingce@uci.edu>)  
(<mailto:kingce@uci.edu>) Dr. King's Office Hours: Tuesdays 12-1pm in EH 3410 *\*please knock, my door may be closed*

### Teaching Assistants

Yasaman (Yassi) Fatapour, [yfatapou@uci.edu](mailto:yfatapou@uci.edu) (<mailto:yfatapou@uci.edu>)

Tai Le, [tail3@uci.edu](mailto:tail3@uci.edu) (<mailto:tail3@uci.edu>)

**TA Office Hours:** By appointment via E-mail

### Professor King Office Hours and Fabrication Lab

Fabrication Testing Lab Location: Engineering Tower (ET) Room 436

Open Lab Times:

Tuesday 9-11:30am and 3:30-5pm

Thursday 9-11am and 3:30-5pm

Friday 9am-11:30am

Electrophysiology Testing Lab Location: Multipurpose Science and Technology (MSTB) Room 214

Open Lab Times: By Appointment Only

**ET and MSTB Labs Coordinator:** Dr. King, [kingce@uci.edu](mailto:kingce@uci.edu) (<mailto:kingce@uci.edu>) or message me directly on Discord (faster communication): Dr. King#1440

## Lectures

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

Location: Rowland Hall Room 101

## Prerequisites

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

**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

<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126387">Website</a> <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126387">(<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126387">https://canvas.eee.uci.edu/courses/53646/assignments/1126387</a>)</a>	10%
<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126382">Final Presentation (UROP or NVC)</a> <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126382">(<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126382">https://canvas.eee.uci.edu/courses/53646/assignments/1126382</a>)</a>	20%
<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">Spring Poster</a> <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">(<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">https://canvas.eee.uci.edu/courses/53646/assignments/1126381</a>)</a>	10%
<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">Final Report</a> <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">(<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381">https://canvas.eee.uci.edu/courses/53646/assignments/1126381</a>)</a>	35%
<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126386">Peer Evaluation</a> <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126386">(<a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126386">https://canvas.eee.uci.edu/courses/53646/assignments/1126386</a>)</a>	5%

	:	
<b>Attendance</b> ( <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126380">https://canvas.eee.uci.edu/courses/53646/assignments/1126380</a> )	:	20%
<b>Bonus Course Survey</b> ( <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126385">https://canvas.eee.uci.edu/courses/53646/assignments/1126385</a> )	:	2%
<b>TOTAL:</b>		<b>102%</b>

## 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.


## 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	<i>Industry Track:</i> develop research components of the project, UROP proposal <i>Entrepreneurial Track:</i> develop market study, first-draft business plan







Winter	focus on the implementation of the chosen solution and redesign to a more detailed design with considerations of standards. Mid-course adjustment may be needed, depending on the findings	<i>Industry Track:</i> continue research tasks as part of the project development <i>Entrepreneurial Track:</i> continue business plan as part of the project development
Spring	<b>pursue final testing, validation, and revision of the design solution followed by complete documentation</b>	<b><i>Industry Track:</i> present at UROP engineering design competition</b> <b><i>Entrepreneurial Track:</i> present at NVC business plan competition</b>

## Course Schedule

<https://canvas.eee.uci.edu/courses/11781/files?preview=4350718>

Week #	Date	Day	Lecture
1	4/4	Tue	<p><a href="https://canvas.eee.uci.edu/courses/53646/files/22170933?wrap=1">Introduction to the Quarter: Deliverables and Expectations</a> (<a href="https://canvas.eee.uci.edu/courses/53646/files/22170933/download?download_frd=1">https://canvas.eee.uci.edu/courses/53646/files/22170933/download?download_frd=1</a>)</p> <p>Lecturers: Dr. Christine King, Dr. Michelle Khine</p>
1	4/6	Thu	<p><a href="https://canvas.eee.uci.edu/courses/53646/files/22280444?wrap=1">Website Authoring</a> (<a href="https://canvas.eee.uci.edu/courses/53646/files/22280444/download?download_frd=1">https://canvas.eee.uci.edu/courses/53646/files/22280444/download?download_frd=1</a>)</p> <p>Lecturer: Dr. Christine King</p>
2	4/11	Tue	<p>Team Assessments #1 <a href="#">Schedule Here</a> </p> <p>(<a href="https://calendly.com/kingce/bme-180-team-assessments-1">https://calendly.com/kingce/bme-180-team-assessments-1</a>)</p>

2	4/13	Thu	Team Assessments #1 <a href="#">Schedule Here</a>  ( <a href="https://calendly.com/kingce/bme-180-team-assessments-1">https://calendly.com/kingce/bme-180-team-assessments-1</a> )
3	4/18	Tue	Team Assessments #1 <a href="#">Schedule Here</a>  ( <a href="https://calendly.com/kingce/bme-180-team-assessments-1">https://calendly.com/kingce/bme-180-team-assessments-1</a> )
3	4/20	Thu	Team Assessments #1 <a href="#">Schedule Here</a>  ( <a href="https://calendly.com/kingce/bme-180-team-assessments-1">https://calendly.com/kingce/bme-180-team-assessments-1</a> )
4	4/25	Tue	Team Leaders Meeting – Project Team Leads Only
4	4/27	Thu	<a href="#">Ethical and Global Considerations in Design</a> ( <a href="https://canvas.eee.uci.edu/courses/53646/files/22171725?wrap=1">https://canvas.eee.uci.edu/courses/53646/files/22171725?wrap=1</a> )  ( <a href="https://canvas.eee.uci.edu/courses/53646/files/22171725/download?download_frd=1">https://canvas.eee.uci.edu/courses/53646/files/22171725/download?download_frd=1</a> )  Lecturer: Dr. Christine King, Dr. Michelle Khine
5	5/2	Tue	Ethical Challenges in Health Technology Implementation, Nadine Alfari, Manager of Research Programs, Children's Hospital of Orange County
5	5/4	Thu	Prototyping and Testing Your Project - Practical Considerations Lecturer: Dr. Christine King
6	5/9	Tue	Team Assessments #2 – <b>Pitch and Demo Practice</b> ( <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1135452">https://canvas.eee.uci.edu/courses/53646/assignments/1135452</a> ), <a href="#">Schedule Here</a>  ( <a href="https://calendly.com/kingce/bme-180-pitch-and-demo-practice">https://calendly.com/kingce/bme-180-pitch-and-demo-practice</a> )
6	5/11	Thu	Team Assessments #2 – <b>Pitch and Demo Practice</b> ( <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1135452">https://canvas.eee.uci.edu/courses/53646/assignments/1135452</a> ), <a href="#">Schedule Here</a>  ( <a href="https://calendly.com/kingce/bme-180-pitch-and-demo-practice">https://calendly.com/kingce/bme-180-pitch-and-demo-practice</a> )
6	5/12	Fri	<b><a href="#">New Venture Competition</a></b> ( <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126382">https://canvas.eee.uci.edu/courses/53646/assignments/1126382</a> ) Semi-

			<i>Finals Presentations May 12</i>
7	5/16	Tue	<p>Team Assessments #2 – <b>Pitch and Demo Practice</b>  <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1135452"> (https://canvas.eee.uci.edu/courses/53646/assignments/1135452)</a> ,  <b>Schedule Here</b>  <a href="https://calendly.com/kingce/bme-180-pitch-and-demo-practice"> (https://calendly.com/kingce/bme-180-pitch-and-demo-practice)</a></p> <p><b>Team Webpages Live at 5pm</b>  <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126387"> (https://canvas.eee.uci.edu/courses/53646/assignments/1126387)</a></p>
7	5/18	Thu	<p>Team Assessments #2 – <b>Pitch and Demo Practice</b>  <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1135452"> (https://canvas.eee.uci.edu/courses/53646/assignments/1135452)</a> .  <b>Schedule Here</b>  <a href="https://calendly.com/kingce/bme-180-pitch-and-demo-practice"> (https://calendly.com/kingce/bme-180-pitch-and-demo-practice)</a></p>
7	5/19	Fri	<p><b>UROP Symposium</b>  <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126382"> (https://canvas.eee.uci.edu/courses/53646/assignments/1126382)</a></p>
8	5/23	Tue	<p>Team Assessments #3, <b>Schedule Here</b>   <a href="https://calendly.com/kingce/bme-180-team-assessments-3"> (https://calendly.com/kingce/bme-180-team-assessments-3)</a></p>
8	5/25	Thu	<p>Team Assessments #3, <b>Schedule Here</b>   <a href="https://calendly.com/kingce/bme-180-team-assessments-3"> (https://calendly.com/kingce/bme-180-team-assessments-3)</a></p>
9	5/30	Tue	<p>Team Assessments #3, <b>Schedule Here</b>   <a href="https://calendly.com/kingce/bme-180-team-assessments-3"> (https://calendly.com/kingce/bme-180-team-assessments-3)</a></p>
9	6/1	Thu	<p>Team Assessments #3, <b>Schedule Here</b>   <a href="https://calendly.com/kingce/bme-180-team-assessments-3"> (https://calendly.com/kingce/bme-180-team-assessments-3)</a></p> <p><b>Final Symposium Poster</b>  <a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126381"> (https://canvas.eee.uci.edu/courses/53646/assignments/1126381)</a> due  2pm for printing</p>
10	6/6	Tue	<p>4 – 7pm: <i>Final Symposium and Awards Ceremony at the Cove</i>  Judges TBD</p>
10	6/8	Thu	CLASS CANCELED

Final	6/15	Thu	<p><b><u><a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126383">Final Report</a></u></b></p> <p><b><u><a href="https://canvas.eee.uci.edu/courses/53646/assignments/1126383">Peer Evaluation</a></u></b></p>
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## [Resources for Fabrication and Assignments](https://canvas.eee.uci.edu/courses/53646/pages/resources)

<https://canvas.eee.uci.edu/courses/53646/pages/resources>

## 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?wrap=1> ↓

[https://canvas.eee.uci.edu/courses/20058/files/7209758/download?download\\_frd=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/53646/files/22050484?wrap=1) (<https://canvas.eee.uci.edu/courses/53646/files/22050484?wrap=1>) ↓

[https://canvas.eee.uci.edu/courses/53646/files/22050484/download?download\\_frd=1](https://canvas.eee.uci.edu/courses/53646/files/22050484/download?download_frd=1)

## Optional Business Competitions

### James Dyson Award 2022

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>)


You can also find more information at:

[https://urldefense.com/v3/\\_\\_http://www.jamesdysonaward.org\\_\\_;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-\\_EoIQBWL-CR-4tEParCqS\\_-vHFY6uJoOqzGNkLg7MMqluiq5X00\\$](https://urldefense.com/v3/__http://www.jamesdysonaward.org__;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-_EoIQBWL-CR-4tEParCqS_-vHFY6uJoOqzGNkLg7MMqluiq5X00$) 

([https://urldefense.com/v3/\\_\\_http://www.jamesdysonaward.org\\_\\_;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-\\_EoIQBWL-CR-4tEParCqS\\_-vHFY6uJoOqzGNkLg7MMqluiq5X00\\$](https://urldefense.com/v3/__http://www.jamesdysonaward.org__;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-_EoIQBWL-CR-4tEParCqS_-vHFY6uJoOqzGNkLg7MMqluiq5X00$))

BlueBox entry into the award and other past winner's entries: 

([https://urldefense.com/v3/\\_\\_https://www.jamesdysonaward.org/en-us/past-winners/\\_\\_;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-\\_EoIQBWL-CR-4tEParCqS\\_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5\\$](https://urldefense.com/v3/__https://www.jamesdysonaward.org/en-us/past-winners/__;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-_EoIQBWL-CR-4tEParCqS_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5$))

[https://urldefense.com/v3/\\_\\_https://www.jamesdysonaward.org/en-us/past-winners/\\_\\_;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-\\_EoIQBWL-CR-4tEParCqS\\_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5\\$](https://urldefense.com/v3/__https://www.jamesdysonaward.org/en-us/past-winners/__;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-_EoIQBWL-CR-4tEParCqS_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5$) 

([https://urldefense.com/v3/\\_\\_https://www.jamesdysonaward.org/en-us/past-winners/\\_\\_;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-\\_EoIQBWL-CR-4tEParCqS\\_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5\\$](https://urldefense.com/v3/__https://www.jamesdysonaward.org/en-us/past-winners/__;!!CzAuKJ42GuquVTTmVmPViYEvSg!LJgufqMZW5oKhyOIBSfehFovS2yQozj2f-TZ-_EoIQBWL-CR-4tEParCqS_-vHFY6uJoOqzGNkLg7MMqlsCYvyt5$))

## 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) ↗  
 ([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/) ↗ (<https://venturewell.org/aspire/>)  
[BMEidea](https://venturewell.org/bmeidea/) ↗ (<https://venturewell.org/bmeidea/>)  
[Cleantech University Prize](https://venturewell.org/cleantech-university-prize-cleantech/) ↗ (<https://venturewell.org/cleantech-university-prize-cleantech/>)  
[DEBUT](https://venturewell.org/debut/) ↗ (<https://venturewell.org/debut/>)  
[E-Teams Grants](https://venturewell.org/student-grants/) ↗ (<https://venturewell.org/student-grants/>)  
[Inventing Green Toolkits](https://venturewell.org/inventing-green-toolkits/) ↗ (<https://venturewell.org/inventing-green-toolkits/>)  
[NSF I-Corps](https://venturewell.org/i-corps/) ↗ (<https://venturewell.org/i-corps/>)

### **Other Competitions and Resources:**

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

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

## **Job Opportunities**

TBA

## 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>).