# Bioengr 266: Wearable Bioelectronics

**Instructor** **Prof. Jun Chen**
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**Class Time** **Monday & Wednesday** 2:00 PM to 3:50 PM Spring Quarter 2021
**Class Location** https://ucla.zoom.us/my/teacherjunchen (Online-Recorded)
Engineering V 4028 (Lab demonstration) If the COVID-19 goes away
**Office Hour** Right after the Wednesday class. Please stay online for questions.
Or contact Dr. Chen to make an appointment
**Prerequisites** None
**Textbooks** Class lecture slides will cover all the required materials for the course and will be fully available in the CCLE system. However, if you want to pursue a further reading, here are three suggested books

1. *Triboelectric Nanogenerators*, Springer 2016, ISBN: 978-3319400389
2. *Piezoelectric Sensors and Actuators*, Springer 2019, ISBN 978-3662575321
3. *Wearable Bioelectronics*, Elsevier 2020, ISBN: 978-0081024072

**Course Description** The practice of human health care may be on the cusp of a revolution, driven by an unprecedented level of personalization enabled by advances in technology, specifically, the transformation of wearable devices from curiosities that provide qualitative information for fitness enthusiasts to sophisticated systems that produce clinical-grade data for physicians.

In this course, the instructor Dr. Chen will introduce the cutting-edge research in the field of wearable bioelectronics. It will address the fundamentals, materials, processes and devices for wearable bioelectronics, showcasing key applications, including device fabrication, manufacturing, and healthcare applications.

**Class Will Help You**

1. Learn the cutting-edge research in the field of Wearable Bioelectronics
2. Learn how to walk yourself quickly to the frontier of an interested topic
3. Learn how to effectively work as a team
4. Improve your scientific presentation skills
5. Improve your scientific writing skills
6. Publish a review paper in a top tier journal

**Who Should Take** Graduate students and senior undergraduates in UCLA Samueli School of Engineering or other related departments. This course is useful to the students who aim to pursue an academic career, and it is also helpful to the students who desire to work in industry/start a startup in the field of biomedical instrumentation.

**Grading**

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|---|---|
| Exam 1 | 20% |
| Exam 2 | 20% |
| Seminar Presentation | 30% |
| Final Report | 30% |

Final grades will be based on the following scale:

| | | | | |
|---|---|---|---|---|
| 100–95 A+ | 86–84 B+ | 76–74 C+ | 66–64 D+ | < 60 F |
| 94–90 A | 83–80 B | 73–70 C | 63–62 D | |
| 89–87 A- | 79–77 B- | 69–67 C- | 61–60 D- | |

**Midterm Exam**

Two exams will be **open-book and in-class**. One will be held on **Apr. 14, 2021**. Another will be held on **May 10, 2021**. **Each exam has a 2-hour duration**. Unexcused absences will count as zero. If you miss a test without either a certified medical excuse or prior instructor approval, but with a reasonable explanation, you **may have one chance** to take a makeup test at a designated time during the final exam week. Tests missed with certified medical excuses or prior instructor approval will be dealt individually.

**Presentation**

3 or 4 students will work as a team to do a literature review in a specific topic they choose in the field of Wearable Bioelectronics. Under Dr. Chen's guidance, each team will be walked to the frontier of the chosen topic. The team will be formed by **Apr. 21, 2021.** The team review topic should be determined by **May 12, 2021.** The final presentation will be evaluated by the students in the class and the instructor.

**Attendance**

Students are expected to attend all the classes. If you anticipate an excused absence on a due date, please contact Dr. Chen to make other arrangements. For more details, please read the UCLA attendance policy for definitions of excused absences.

**Academic Integrity**

Students are expected to adhere to the guidelines for academic integrity outlined in the UCLA Code of Student Conduct. Cases of misconduct will be addressed according to the procedures outlined in the Code. Your signature on any submitted work implies that you have neither given nor received unauthorized aid. For more information, please read https://www.deanofstudents.ucla.edu/studentconductcode

**Student Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. In order to ensure accommodations, students need to contact the CAE within the first two weeks of the term.

**Non-Discrimination Policy**

UCLA provides equality of opportunity in education and employment for all students and employees. Accordingly, UCLA affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or UCLA policy and will not be tolerated.

Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or UCLA policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. UCLA's policies and regulations cover discrimination, harassment, and retaliation. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should report at https://equity.ucla.edu/programs-resources/policy/ or call (310) 825-3935.

**Other Information**

It will be always appreciated if you can send suggestions for the improvement of any aspect of the course to Dr. Chen. By the way, as an associate editor of the top-tier journal *Biosensors and Bioelectronics* (impact factor: 10.257), Dr. Chen could use the journal as a support and guide through each team to develop the **Final Report** into a full review paper after the class. However, this is optional. As a professor, students are the most important part in my career. **I wish you all the success today and always!** Please feel free to let me know whenever I can be of any support to you.

# Bioengr 266: Course Schedule

| WEEK | DATE | TOPICS | Dues |
|---|---|---|---|
| **1** | 03/29/2021 | Introduction to Wearable Bioelectronics- An Overview | |
| | 03/31/2021 | Triboelectric Nanogenerator - Working Principle | |
| **2** | 04/05/2021 | Wearable Triboelectric Nanogenerators for Energy Application | |
| | 04/07/2021 | Wearable Triboelectric Nanogenerators for Sensing & Therapy | |
| **3** | 04/12/2021 | Lab: Wearable Electricity Generation | |
| | 04/14/2021 | **Exam 1: In Class Open Book** | |
| **4** | 04/19/2021 | Piezoelectric Nanogenerators - Working Principle | |
| | 04/21/2021 | Wearable Piezoelectric Nanogenerators- Sensing & Therapy | **Form a Team** |
| **5** | 04/26/2021 | Wearable Piezoelectric Nanogenerators for Energy Application | |
| | 04/28/2021 | Physical Bioelectronics Beyond TENGs & PENGs | |
| **6** | 05/03/2021 | Special Topic: Smart Textiles for Electricity Generation | |
| | 05/05/2021 | Special Topic: Smart Textiles for Personalized Health Care | |
| **7** | 05/10/2021 | **Exam 2: In Class Open Book** | |
| | 05/12/2021 | Wearable Chemical Bioelectronics-Part 1 | **Team Topics** |
| **8** | 05/17/2021 | Wearable Chemical Bioelectronics-Part 2 | |
| | 05/19/2021 | Skills for Scientific Presentation & Writing | |
| **9** | 05/24/2021 | Team Seminar Presentation | |
| | 05/26/2021 | Team Seminar Presentation | |
| **10** | 05/31/2021 | **No Class Memorial Day holiday** | **Draft Report** |
| | 06/02/2021 | Team Seminar Presentation | **Meeting Time** |
| | Final week | Meeting with teams for 30 mins to give constructive comments and suggestions | |
| Quarter Ends | 06/11/2021 | **Final Report Due** | |