

## **FACULTY MENTOR**

Morris, Karcher

## **PROJECT TITLE**

Design & Development of Wearable Device to Measure a Surgeon's Ergonomic Performance

## **PROJECT DESCRIPTION**

The primary goal of this research project is to design and develop an ergonomic measurement system that objectively captures neck motion through wearable technology and analyzes motion data to improve a surgeon's ergonomic performance. This project is intended to address the growing need of surgeons to assess their ergonomic performance throughout a long and straining surgery so that they may adjust their posture, environment and habits accordingly. Emphasis will be made on design/manufacturing of wearable (silicone/3D printed) neck attachment, PCB design/manufacturing for microcontrollers and sensors, motion data analysis, and kinematic modeling of the cervical spine. Students will work with an interdisciplinary team.

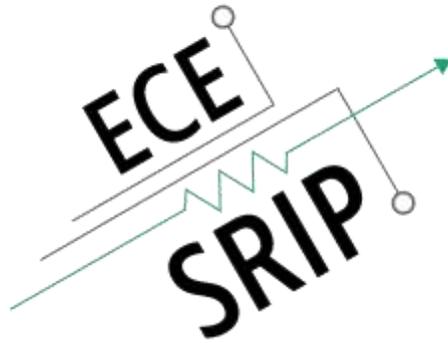
This project can accommodate both remote and in-person students

## **INTERNS NEEDED**

2

## **PREREQUISITES**

Completed ECE 5 and interest in PCB design & assembly, SolidWorks/CAD, Arduino C, MATLAB Data Analysis and/or medical device technologies.



## **FACULTY MENTOR**

Morris, Karcher

## **PROJECT TITLE**

Mixing Circuits and Python for Education

## **PROJECT DESCRIPTION**

"Many engineers and computer scientists can recall when they first learned to program... communicating with a command line and being excited about seeing “hello world” pop up on their screens. Arduino has been a game-changer for students first learning embedded programming in C because it allows for a fascinating, yet simple, interaction between software and hardware with one of the best support communities. Now, blinking an LED, playing music on a piezo buzzer, or operating motors to control a robot are only a few lines of code away.

The Python programming language has been increasingly relevant in academia and industry. CircuitPython provides a platform to mix learning Python and circuits similar to the Arduino platform. Our team will aim to develop educational tools to advance Python programming using CircuitPython to program microcontrollers. We will find innovative and sustainable ways to deploy our educational technology at all class levels/backgrounds and across all fields so that students can experience the many important/fun aspects of ECE!"

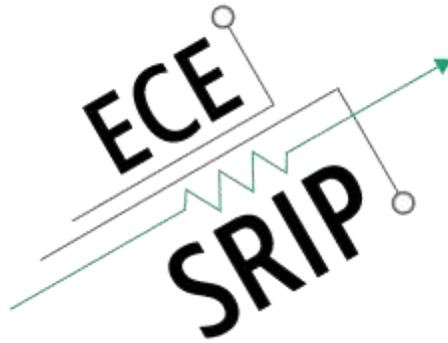
This project can accommodate both remote and in-person students

## **INTERNS NEEDED**

2

## **PREREQUISITES**

Completed ECE 5 and interested in educational technologies, Python, creating engaging tutorials/learning activities, working with new sensors/actuators, teaching and/or building/testing mini-projects.



## **FACULTY MENTOR**

Morris, Karcher

## **PROJECT TITLE**

Educational Technologies in ECE 5

## **PROJECT DESCRIPTION**

"ECE 5 is an introductory ECE course aiming to stimulate incoming students' interest in the various fields within ECE from a hands-on, project-based approach that changes every quarter. In this project, we plan to develop significant and creative additions to the technical workshops and labs of the course.

Potential technical projects include creating or improving:

- Communication lab with the addition of wireless microcontrollers (bluetooth/ Wi-Fi)
- Digital signal processing challenges using MATLAB
- Data Analysis, Linear Algebra, and Machine Learning with Python
- Line Following Robot Additions (i.e., wireless with GUI interface, SLAM)
- Optics and power engineering labs

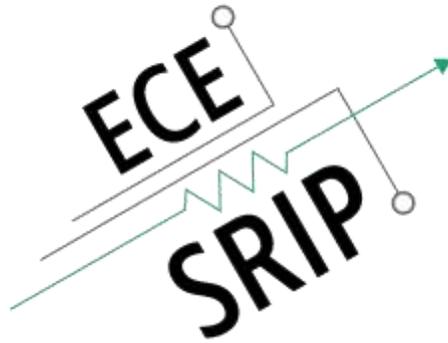
This project can accommodate both remote and in-person students

## **INTERNS NEEDED**

2

## **PREREQUISITES**

Completed ECE 5 and interested in improving ECE 5, project development, hands-on curriculum, teaching, and/or educational technologies



## **FACULTY MENTOR**

Morris, Karcher

## **PROJECT TITLE**

Bringing ECE 5 Curriculum to High School

## **PROJECT DESCRIPTION**

"Very few high school students have the opportunity to know what ECE has to offer. AP Calculus, AP Computer Science and AP Physics... but there is not yet an AP ECE! This project aims to transplant ECE 5 into the high school arena to share this wonderful world of circuits, signals, programming, controls, soldering, filtering, etc. Our aim is to launch an ECE 5 course at a high school in San Diego by Fall 2021.

ECE 5 content, including labs, workshops, and lectures, will predominantly remain equivalent to the ECE 5 curriculum at UCSD. High Schools allow for ~70 in-class hours for each course per semester (a 20 hour total increase compared with ECE 5 at UCSD). This extra contact time will allow for significant creative additions that can cater to the aspiring high school student engineer. "

This project can accommodate both remote and in-person students

## **INTERNS NEEDED**

2

## **PREREQUISITES**

Completed ECE 5 and interested in teaching, hands-on curriculum, teaching at a high school level, developing a high school engineering community/culture, and/or ECE educational technologies.