

# 2025 Cal State LA - STEM Core Summer Making, Academic prep, and Research for Transfer students (SMART) Internship Program



## Topic: 2025 SMART Research Team

Team members: Armando Orozco, Damian Baca, Gustavo Torres, Edwin Diaz

Advisor: Airs Lin

### Introduction

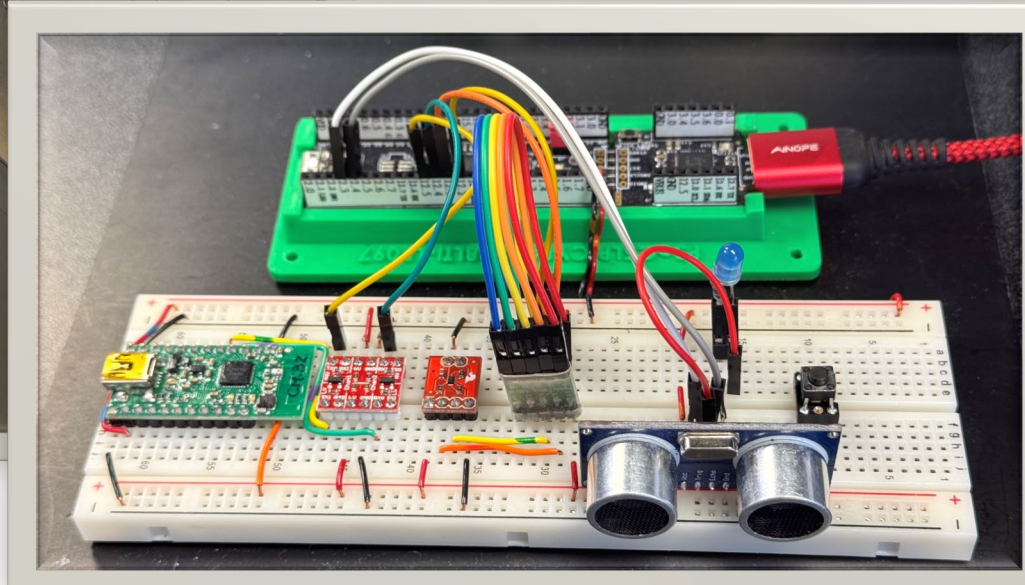
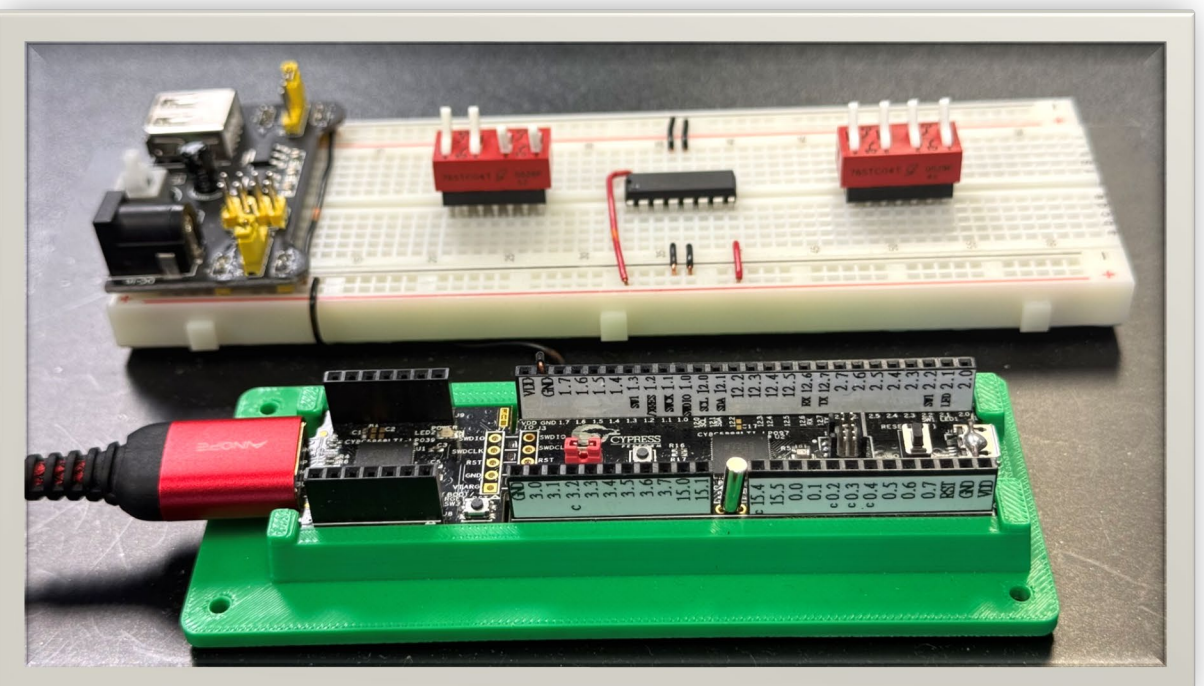
The SMART Internship Program is a hands-on summer training course designed to introduce students to embedded systems development using the Infineon (Cypress) PSoC 5LP microcontroller. Through engaging, project-based learning, students explore the world of embedded C programming using the user-friendly PSoC Creator IDE. The program empowers students to understand and leverage the flexibility and power of the PSoC architecture, including programmable hardware blocks, digital and analog peripherals, and a graphical design interface. Participants gain valuable experience working with real-world components and applications such as LED lighting control, ultrasonic distance sensing, motor control, and UART-based PC communication.

### Key Technologies & Tools Used

- **Microcontroller:** Infineon (Cypress) PSoC 5LP
  - Flexible architecture with UDBs, programmable routing, analog/digital integration
- **Development Platform:** PSoC Creator IDE
  - GUI-based embedded C programming environment
- **Core Modules & Protocols:**
  - **PWM** – LED & motor control
  - **Timer** – signal timing & delay
  - **UART** – serial communication with PC
- **Hands-On Devices:**
  - **Ultrasonic Sensor** – distance detection
  - **Motor Controller** – actuator control
- **Student Projects:**
  - Smart LED lighting
  - Motor speed control
  - Distance sensing
  - Home light automation with UART



Onboard LED Control – Controlling brightness via PWM



Ultrasonic Sensor – Distance Detection

I found the most interesting aspects of this course to be getting familiar with the PSoC Creator, how to make a sensor with my Arduino kit, and how to use the CY8CKIT-059 semiconductor. These hands-on projects helped me better understand embedded systems and microcontroller programming. Working through real-world applications made the learning process much more engaging and meaningful.

Professor Airs Lin was incredibly supportive throughout the course. His clear explanations and willingness to help students grasp complex concepts made a big difference in my experience. I appreciated his practical approach to teaching and how he encouraged problem-solving and creativity in each assignment.

This course has given me a strong foundation in embedded systems, which is essential for a career in computer engineering. Learning to work with tools like PSoC Creator and the CY8CKIT-059 has sharpened my skills in hardware-software integration. Something highly valued in the industry. It also boosted my confidence in building and troubleshooting systems, which will be incredibly useful in future projects and internships.

Gustavo Torres

This summer, our SMART project team was led by Professor Airs Lin. We worked on embedded programming using PSoC 5LP, a programmable system-on-chip that integrates digital and analog components, including CPU and configurable peripherals. We talked about the board layout, and from there we learned about how the microcontroller looks like and all the other components on the board. We then learned how to program it using PSoC Creator. It was different from programming an Arduino, and I liked it because it involved moving the physical blocks of peripherals and symbols rather than all code.

During our experiments, Professor Lin would lecture us about what we are doing in more detail. For example, he taught us the basics of UART, a communication protocol that is used to make devices send data to each other. These lectures were very helpful, and I know I will need them because I am about to start projects involving communication protocols and microcontrollers. Aside from learning embedded programming, I was able to speak with Professor Lin to ask for advice on my individual project of PCB design. He gave tips on PCB design and reviewed my work.

Damian Baca

Being part of the SMART Project was a great experience that helped me understand the basics of the PSoC 5LP microcontroller. Before this, I hadn't worked with Cypress chips, but throughout the project, I learned how to use PSoC Creator to set up components like GPIOs, timers, and other digital features. It was insightful to see how hardware and software come together, and how much control one can have over a system when you are working at a low level. I enjoyed getting hands-on with the board and seeing the results of what I was programming.

Working with my advisor made a big difference. He explained things in a way that made everything more approachable and helped me connect what I was learning to real-world applications. This experience made me more interested in embedded systems, and I can see it having a big impact on my future in computer engineering. It gave me a better idea of what kind of work I want to do, especially projects that combine both hardware and software.

Armando Orozco