ESAP Robotics Syllabus 2025

Course Information

This is an introductory course in robotics with an emphasis on mechatronics, building, and design. The objective of the course is for students to be exposed to robotics and robotics research at the university level while also learning how to construct mechanically, control electronically, and program physical robots. The course will include aspects of mechanical engineering, design and manufacturing, electronics, circuits and systems, and embedded systems programming. The course culminates in the presentation of small robots that the students design, build, and program.

Course Objectives

Students will learn and understand the following:
-How to design 3D parts in a CAD system
-How to program a microcontroller as an embedded system
-How to interface with sensors, servos and motor**s**
-How to integrate sensors actuators and intelligence into a robot

Course Logistics

Student spend 15 days in this class over three weeks. Nominally each day is divided into
-Lecture time (3 hours in the morning),
-Structured lab time (4-5 hours in the afternoon)
-Typically 2-3 hours per night of homework or extended lab work time
Two professors supported by five teaching assistants give a nominal 1:5 teacher-student ratio.
As there is a final project output from this class, the amount of time in the lab becomes large at the end.

Class	**Topics**	**Afternoon Lab Exercise**
1a	Course & Circuits intro	Introduction to lab equipment
1b	More Circuits & ESP32 Intro	Electronics Bootcamp: LEDs and resistors
1c	Microcontrollers & Programming	Blinking with ESP32
1d	Programming & Servo Motors	Servo motor & Solenoid Control
1e	Mechanisms & Design (Solidworks)	DOF, Linkages, attachments, gears, Solidworks, 3D printing, laser cutting
2a	Programming for Inputs	Switch timing and ADC
2b	Design Process, Mechanical ASM, Project Introduction	Concept Review
2c	Prototype Day, Learn by Failing	Prototype & Rotate through instruments
2d	Circuits review & Port expander	Critical function
2e	Events & Services	Minimum Viable Product (MVP)
3a	Project reviews	Tuned product / Play 'Happy birthday'
3b	WiFi - Sensing & timing	Final Project Work
3c	Synchronization	Keeping beat with conductor
3d	Work day	Dress rehearsal
3e	Final Show	Show at 1PM, Graduation after