

Mechatronics Lab

Mechanical Engineering – Tel Aviv University
Arduino Uno & Alvik Platform

Course Objectives

- Understand embedded systems fundamentals.
 - Program sensors, actuators, and wireless communication.
 - Design simple electronics and 3D-printed adaptations.
 - Develop and compete with an autonomous robot.
-

Labs Sessions Overview

Lab 1 – Introduction to Embedded Systems

- What is an embedded system?
 - Arduino Uno & Alvik platform overview.
 - First programs: Blink LED on Uno, Alvik MicroPython basics.
-

Lab 2 – Sensors and Actuators

- Sensors: distance, color, IMU, line-following.
 - Actuators: LEDs, motors, servos.
 - Hands-on exercises with Alvik and Sidekick Kit components.
-

Lab 3 – 3D Design for 3D Printing

- FDM-oriented CAD modelling in SOLIDWORKS.
 - Design & print a servo-driven Alvik loader prototype.
 - Verify fit, clearance and centre-of-mass; plan rapid re-iterations
-

Lab 4 – Introduction to Electrical Design

- Decode & draw schematics using SparkFun examples.
 - Capture a circuit in KiCad/EasyEDA and preview the PCB flow.
 - Apply safe wiring: logic-level matching, power rails and breadboard discipline
-

Lab 5 – Advanced Embedded Systems: Wi-Fi Networking

- [MicroPython networking stack](#).
 - [Setting up Wi-Fi control and data logging](#).
 - [Teleoperation and remote monitoring](#).
-

Labs 6–10 – Sumo Competition Preparation

- [Motion control and PID tuning](#).
 - [Sensor integration for autonomous behavior](#).
 - [Custom 3D-printed parts and additional actuators](#).
 - [Teleoperation practice, logging, and strategy](#).
 - [Final Sumo robot competition and project presentations](#).
-

Deliverables

- [Lab reports with diagrams and reflections](#).
 - [Mini project \(schematic, block diagram, 3D design\)](#).
 - [Final robot demonstration and presentation](#).
-

Resources

- [Arduino Uno Docs](#)
- [Sidekick Kit Tutorials](#)
- [Alvik Documentation](#)
- [MicroPython Examples](#)