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.

Lesson Overview

Lesson 1 – Introduction to Embedded Systems

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

Lesson 2 – Sensors and Actuators

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

Lesson 3 – 3D Design for 3D Printing

- CAD modeling basics.
- Creating enclosures and mechanical adaptations.
- Exporting STL files for printing.

Lesson 4 – Introduction to Electrical Design

- Reading and creating schematics.
- Breadboarding fundamentals.
- Safe wiring practices and power considerations.

Lesson 5 – Advanced Embedded Systems: Wi-Fi Networking

- MicroPython networking stack.
- Setting up Wi-Fi control and data logging.
- Teleoperation and remote monitoring.

Lessons 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