



Cover page

Project title: SynLab Academic Year: Fall 2025 / 2026
Group Members: Ghassan Qasrawi – 12111991 Department Name: Computer engineering
Adel Qadi - 12112188

Project Type Hardware
Supervisor Name: Dr. Raed Qadi & Dr. Manar Qamhieh

Format:

- Single space, Times New Roman.
- 12 pt,
- Maximum 1 page.

Abstract Body:

Items must be provided in the Abstract:

- Why do you think this project is important? Please explain the significance of this Project in brief.
- In your point of view what are the important aspects that should be covered in the project?
- Objective(s): In your view, please explain the main objectives of the project.
- Methodology: Give a brief outline of the application development process.
- Had this project been done before? Are there any similar applications available today?
- **Note:** Please deliver this abstract early to ensure that your Project has been approved by the department's projects committee. **Registration will not be done without this approval.**



Project's Abstract:

SynLab project introduces a modular, IOT based electronic laboratory platform that merges several important digital and analog instruments into a single connected ecosystem. The system incorporates modules like a PIC programmer, IC tester, oscilloscope, waveform generator and many others, each is equipped with an ESP32 microcontroller for wireless connectivity and synchronization via a centralized software interface.

This project is significantly important because traditional electronics laboratories rely on bulky, expensive and standalone equipment, which restricts interconnectivity, accessibility and clearness, SynLab handles these challenges by implementing a networked and scalable smart lab which enables students and educators to execute experiments more efficiently and effectively. It bridges the gap between modern IOT technologies and physical hardware tools which makes laboratory experience more engaging and remotely accessible.

Main objectives of SynLab include designing and implementing an integrated digital laboratory system with several smart instruments, developing an IOT based communication framework that connects all modules in the system, building a software platform to allow users control, visualize and record data from all modules at real time, and providing a powerful extendable lab solution for developers and engineering students.

The project will be developed through an iterative modular approach where each device and module will contain a small microcontroller with an independent ESP32-based node connected which will communicate with each other via a central hub containing a main microcontroller to coordinate operations and data flow. For the software side, a Flutter based web interface, and mobile application will connect with the central hub module to manage devices and enable users to implement different operations on each module.

Although similar ideas exist - such as USB-based IC testers or PIC programmers - but few systems provide a complete integrated and functional laboratory environment with IOT modular connectivity. SynLab combines multiple devices and laboratory instruments to provide a flexible, effective and efficient educational environment.