Syllabus
Certificate Course on Web IoT Using Arduino
Course Code: CSCC04

Overview

        This certificate course provides participants with comprehensive training in the field of Internet of Things (IoT) using Arduino microcontrollers. Through a combination of theoretical lectures and hands-on practical sessions, participants will learn to design, develop, and deploy IoT solutions using Arduino boards, sensors, actuators, and communication modules. By the end of the course, participants will be equipped with the necessary skills to create innovative IoT projects and applications.

Prerequisites:

- Basic understanding of programming concepts, preferably in C/C++
- Familiarity with fundamental electronics principles

Course Objectives:

- Understand the concepts and principles of the Internet of Things (IoT)
- Gain proficiency in programming Arduino microcontrollers using the Arduino IDE
- Learn to interface various sensors and actuators with Arduino boards
- Acquire knowledge of networking protocols for IoT communication
- Develop hands-on skills for building IoT projects from conception to deployment
- Explore real-world applications of IoT and cloud integration

Course Content:

Week 1-2: Introduction to IoT

- Understanding the Internet of Things (IoT) and its significance
- Overview of Arduino microcontrollers and their role in IoT projects
- Setting up the Arduino Integrated Development Environment (IDE)
- Connecting and configuring Arduino boards

Week 3-4: Arduino Programming Basics

- Introduction to the Arduino programming language (based on C/C++)
- Syntax, variables, data types, and operators in Arduino
- Control structures: if-else statements, loops
- Working with functions and libraries in Arduino

Week 5-6: Sensor Interfacing

- Overview of sensors commonly used in IoT projects (e.g., temperature, humidity, motion)
- Interfacing sensors with Arduino boards
- Analog and digital sensor data acquisition
- Calibration techniques for accurate sensor readings

Week 7-8: Actuator Control

- Introduction to actuators (e.g., LEDs, motors, servos)
- Interfacing actuators with Arduino boards
- Controlling actuators based on sensor input
- Pulse Width Modulation (PWM) for analog output control

Week 9-10: Networking and Communication

- Overview of networking protocols for IoT communication (e.g., Wi-Fi, Bluetooth, MQTT)
- Setting up Wi-Fi communication with Arduino using ESP8266 or ESP32
- Introduction to the MQTT protocol and its implementation
- Transmitting and receiving data between IoT devices and servers

Week 11-12: IoT Applications and Project Development

- Real-world IoT applications and case studies
- Project development: Conceptualization, design, implementation using Arduino
- Integration with cloud platforms for data logging and visualization (e.g., ThingSpeak, AWS IoT)
- Project presentations, evaluation, and feedback sessions

Assessment

- Students will be assessed on their performance in the following areas:
  - Attendance and participation
  - Midterm exam
  - Final exam
  - IoT projects

Grading

- Attendance and participation: 10%
- Midterm exam: 20%
- Final exam: 30%
- Web design projects: 40%

Reference Books

- Designing with Web Standards by Jeffrey Zeldman and Ethan Marcotte.
- Don't Make Me Think by Steve Krug.
- HTML and CSS: Design and Build Websites by Jon Duckett.
- Web Design for Beginners book by Chris Coyier