

Course Syllabus

Name of the Course	Introduction to Arduino and IoT	Name of the Instructor	Binayak Tiwari
Course Code	UNLV-ITEST-001	Cellphone	
Department	Electrical & Computer Engineering	E-mail	Binayak.Tiwari@unlv.edu

Objectives	The main goal of this course is to introduce the concept of Internet of Things (IoT) and basic knowledge needed to program Arduino, collect data from sensors, transmit data through various communication modules, and visualize the results on a cloud server and a mobile APP.
Summary	The course instruction starts by introducing fundamentals on the components like breadboard, microcontrollers, and development boards followed by the hands-on experiments. The course also includes simulation on the online platform, moving on further, the course includes introduction to sensors, IoT, communication modules and finally the data visualization and mobile app interfacing. All the lectures will include a hands-on lab, quiz and assignment for the student's active participation. The course will include a 1-2 hr lecture and 4-5 hr hands on laboratory session for each module. The course will conclude with developing an IoT data acquisition system with a visual interface. The commonly used sensors, communication modules, Arduino used in the workshop will be provided.

Topics and Schedule

Module	Topic	Hours	Method of Instruction	Class Materials & Assignments
1	Introduction to Arduino, Understanding the programming, Basics on components	8	Lecture, Programming, Hands-on	Lecture, Wiring on breadboard and LED/Pushbuttons, Quizzes & Assignments
2	Online simulation using TinkerCad, Arduino IDE, Understanding and Programming Sensors	6	Lecture, Programming, Hands-on	Software Installation, Interfacing sensors and interpreting results, experiments with LDR,

				buzzer, ultrasonic and temperature-humidity sensor, Quizzes & Assignments
3	Interface sensors using ESP32, Introduction to IoT, Communication modules -Bluetooth, WiFi (optional)	8	Lecture, Programming, Hands-on	Programming ESP32 using Arduino IDE, experiments with Bluetooth, experiments with WiFi (optional), Assignments
4	Sensor visualization in Arduino IDE & ThingsSpeak (optional), mobile app interface, Introduction to LoRa communication (optional)	8	Lecture, Programming, Hands-on	Data visualization in cloud using Thingspeak, working with mobile app - Blynk, Assignments
5	IoT-based engineering project (team-based)		Lecture, Programming, Demo	Development of the project

Note:

- Introduction to LoRa communication in module 3 is optional.
- Data visualization in cloud using ThingSpeak needs a successful completion of WiFi communication from Module 3.
- Mobile app interface using Blynk needs a successful completion of Bluetooth communication from Module 3.


Software Used:






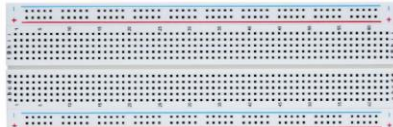


- Arduino IDE for Windows 7 or Up/Linux/Mac OS X 10.10 or newer, downloadable from <https://www.arduino.cc/en/software>

Hardware Used:

Arduino development kit including Arduino Uno board, sensor kit, communication modules (ESP32/LoRa module), breadboard, wires & cables, LEDs, and resistors

Arduino Training Kit

Item	Quantity	Image
Arduino Uno board (UNO R3 ATmega16U2)	1	

<p>Sensor-set: push button, buzzer (active & passive), LDR, flame sensor, ultrasonic, temperature & humidity</p>	<p>1</p>	
<p>ESP32 board (ESP32-WROOM-32D)</p>	<p>1</p>	
<p>USB cable (connecting Arduino board to computer)</p>	<p>1</p>	
<p>Micro USB cable (connecting ESP32 board to computer)</p>	<p>1</p>	
<p>Bag of 8 LEDs and 8 resistors</p>	<p>1</p>	
<p>Breadboard</p>	<p>1</p>	
<p>Jump wires (male to male)</p>	<p>15</p>	
<p>Jump wires (male to female)</p>	<p>10</p>	
<p>Jump wires (female to female)</p>	<p>5</p>	