|  |  |
| --- | --- |
| **Semester** | SEMESTER 2 |
| **Course Code and Course Title** | MCA LE241 – Internet of Things Lab |
| **Faculty In charge** | Prof Flavia Gonsalves |

**1) Course Objectives**

|  |  |  |
| --- | --- | --- |
| Cognitive | What do you want students to know? | Arduino UNO board configuration, electronic components and sensor |
| Affective | What do you want students to think / care about? | Interface and connect components with Arduino UNO |
| Behavioural | What do you want students to be able to do? | Create smart IoT applications using Arduino |

**2) Course Outcomes and Module wise Mapping**

|  |  |  |
| --- | --- | --- |
| **CO No** | **Course Outcome Statement** | **Unit/Module** |
| CO 1 | Identify basic electronic components and interface them with Arduino, programmed for applications using Arduino | 1,2 |
| CO 2 | Experiment with various electronic I/O devices and sensors with Arduino | 2,3,4,5 |
| CO 3 | Demonstrate IoT application with Cloud | 3,4,6 |
| CO 4 | Build IoT application using Arduino | 1,2,3,4,5,6,7 |

**3) Teaching and Examination Scheme**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Contact Hours Per Week** | **Credits Assigned** | **TERM WORK** | **End Semester Examination (PRACTICAL+VIVA)** | **Total Marks** |
| 2 | 1 | 50 | 50 | 100 |

**4)** **Office Hours (Faculty will be available in office for solving students’ query)**

|  |  |  |
| --- | --- | --- |
| **Day** | **Time** | **Venue** |
| Monday | 1.00 pm to 2.00 pm | E7 classroom |
| Tuesday | 1.00 pm to 2.00 pm | E7 classroom |
| Wednesday | 1.00 pm to 2.00 pm | E7 classroom |
| Thursday | 1.00 pm to 2.00 pm | E7 classroom |
| Friday | 4.00 pm to 5.00 pm | E7 classroom |
| Saturday | 2.00 pm to 3.00 pm | E7 classroom |

**5) Syllabus: Module Wise Teaching Hours and % Weightage in University Question Paper**

|  |  |  |
| --- | --- | --- |
| **Module No** | **Module Title / Brief contents** | **Teaching Hours** |
| 1 | Introduction to basic Components | 4 |
| 2 | Complex Components | 4 |
| 3 | Analog I/ | 4 |
| 4 | Sensors | 6 |
| 5 | Motors | 2 |
| 6 | Iot with Cloud | 2 |
| 7 | Mini Project using Arduino | 4 |
| **Total Hours:** | | **26** |

**6) Prerequisite Courses**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Name of the Course** | **Semester / Year** | **Topic/s** |
| 1 | Web Technology | Semester 1 | Node js |
| 2 | C++ | Graduation | Programming |

**7) Relevance to Future courses**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Name of the Course** | **Semester / Year** | **Topic/s** |
| 1 | Mini Project | 2 | Arduino,Sensors, Motors, Cloud |
| 2 | Internship | 4 | Arduino programming with Cloud |

**8) Real Life Application Mapping – Mention Application from Day to Day Life**

|  |  |
| --- | --- |
| **No** | **Real Life Application Mapping with Syllabus** |
| 1 | Smart Watches |
| 2 | Smart Appliances |
| 3 | Smart Building |
| 4 | Smart Traffic |

**9) Past University Results and Target**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Passing Percentage** | **Average Marks** | **Highest Marks** |
| **Target** | **100** |  |  |

**10) Learning Resources**

**a) Reference Books**

|  |  |  |
| --- | --- | --- |
| **No** | **Reference Name** | **Module** |
| 1 | Make: Learn electronics with Arduino, Jodi Culkin and Eric Hagan, Maker Media | 1 |
| 2 | Programming Arduino: Getting started with sketches, Simon Monk , TMH | 2,6 |
| 3 | Getting Started with Arduino: A Beginners Guide, Brad Kendal, | 2,3,4,6 |
| 4 | Make: Getting Started with Sensors, KimmoKarvinen, TeroKarvinen, Makermedia | 4 |
| 5 | The Internet of Things in the Cloud:A Middleware Perspectiv,By Honbo Zhou | **5** |
| 6 | Rethinking the Internet of Things A Scalable Approach to Connecting Everything, Francis daCosta, Apress | **6** |

**b) Research Papers**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Research Paper** | **Link** | **Module** |
| 1 | Home Automation using Arduino | https://www.ijraset.com/research-paper/home-automation-using-arduino | ALL |
| 2 | Smart Stick For the Blind Using Arduino | https://www.researchgate.net/publication/343186221\_Smart\_Stick\_For\_the\_Blind\_Using\_Arduino | All |
| 3 | Smart Parking System based on IOT | https://www.researchgate.net/publication/341870728\_Smart\_Parking\_System\_based\_on\_IOT | All |
| 4 | Real Time Health Monitoring System Using Arduino with Cloud Technology | https://www.researchgate.net/publication/353926351\_Real\_Time\_Health\_Monitoring\_System\_Using\_Arduino\_with\_Cloud\_Technology | 1,4,5,6 |

**c) Web Links for Online Notes/YouTube/NPTEL Video**

|  |  |
| --- | --- |
| **No** | **Reference Name** |
| 1 | https://www.javatpoint.com/arduino-coding-basics |
| 2 | http://www.tinkercad.com |
| 3 | https://www.arduino.cc/ |
| 4 | https://www.makerspaces.com/15-simple-arduino-uno-breadboard-projects/ |
| 5 | https://thingspeak.com/ |
| 6 | https://www.instructables.com/ |

**d)** **Recommended MOOC Courses (FREE)**

|  |  |  |
| --- | --- | --- |
| **No** | **Course Offered By** | **Course Link** |
| 1 | Arduino Programming | https://onlinecourses.swayam2.ac.in/aic20\_sp04/preview |
| 2 | Arduino Online | coursera.org |

**e)** **Study Material Distributed among Students**

|  |  |
| --- | --- |
| **No** | **Type** |
| 1 | Online Designs in TinkerCad Classroom |
| 2 | LAB Handouts |
| 3 | CAMU |

**11) Consolidated Course Lesson Plan**

**a)** **Semester Duration**

|  |  |  |  |
| --- | --- | --- | --- |
| From Date | To Date | Total weeks | Total Hrs. as per TT |
| 13-01-2025 | 30-04-2025 | 15 | 30 |

**b) Teaching Methodology**

1) Demonstrations

2) Hands on sessions

3) Practical Assignments

4) Chalk Talk

**c) Session Outline**

|  |  |  |  |
| --- | --- | --- | --- |
| Content | Hrs | Actual Date of Completion | |
| Batch 1 | Batch 2 |
| **Module 1 : Introduction to Basic Components** | | | |
| LEDs Switches, resistors, Push Buttons, Slider Switches, etc and familiarization with Arduino | 1 |  |  |
| Interfacing LEDs Switches, resistors, Push Buttons, Slider Switches, RGB, Buzzers etc with Arduino | 3 |  | |
| **Module 2 : Complex Components** | | | |
| Interfacing 7 segment display with Arduino | 2 |  | |
| Interfacing LCD with Arduino | 2 |  | |
| **Module 3 : Analog I/O** | | | |
| Interfacing LED’s, Potentiometer and Photoresistor, Serial Monitor, PWM pins | 2 |  | |
| **Module 4 : Sensors** | | | |
| Temperature Sensor, Soil Moisture, Gas Sensor, | 2 |  | |
| PIR, Ultrasonic sensors | 2 |  | |
| IR Remote and 4x4 keypad | 2 |  | |
| **Module 5 : Motors** | | | |
| Servo Motor, DC Motor | 2 |  | |
| **Module 6 : IoT in Cloud** | | | |
| Interfacing Arduino with cloud | 2 |  | |
| **Module 7 : Mini Project using Arduino Sensors etc** | | | |
| Home Automation, Smart Farming , etc.. | 4 |  | |

**12) Content beyond Syllabus**

|  |  |  |
| --- | --- | --- |
| **No** | **Topic / Description** | **Hours** |
| 1 | Using Arduino UNO microcontroller and sensors | 2 |
| 2 | Real life problem using Arduino/ Raspberry PI | 2 |

**13) Activity Based Learning - Activities**

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Description** |
| 1 | **Identify the Components** | **Hardware components will be given and student has name the component and state its use** |
|  |  |  |

**13) Assignments (Practical List)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No | Assignment | CO | Marks | Assignment date |
| 1 | Program to blink Arduino onboard LED and To interface external LED with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds. | 1 | 10 |  |
| 2 | To interface 5 LED’s with Arduino and write a program to blink 6 LEDs, one at a time, in a back and forth formation. | 1 | 10 |  |
| 3 | To interface Push button and slide switch with Arduino and write a program to turn ON LED when push button is pressed. | 1 | 10 |  |
| 4 | To interface Push button, Speaker/buzzer with Arduino and write a program to turn ON LED and generate a note or tone when push button is pressed. | 1 | 10 |  |
| 5 | To interface 2 Push buttons, a Speaker with Arduino and write a program to turn ON LED and generate a 2 different notes on two button keyboard. | 1 | 10 |  |
| 6 | To interface Seven Segment Display (SSD) with Arduino and write a program to print numbers and alphabets on SSD. | 2 | 10 |  |
| 7 | To interface LCD, push button, potentiometer with Arduino and write a program to display message on LCD when push button is pressed. | 2 | 10 |  |
| 8 | To interface LCD, push button, potentiometer with Arduino and write a program to display the no. of times (count) the push button is pressed on LCD. | 2 | 10 |  |
| 9 | To interface LED’s, potentiometer with Arduino and write a program to turn on or off more of the LEDs by turning the potentiometer knob. | 3 | 10 |  |
| 10 | To interface LED, Photo resistor (LDR) with Arduino and write a program to increase and decrease the brightness of the LED based on the amount of light present | 3 | 10 |  |
| 11 | To interface LED’s with Arduino and write a program to show the fading effect on LED’s. | 3 | 10 |  |
| 12 | To interface TMP 36 sensor with Arduino and write a program to display temperature data on serial monitor. | 4 | 10 |  |
| 13 | To interface PIR/ Ultrasonic sensor with Arduino and write a program to turn on and off LED depending on motion detection/sound detection. | 4 | 10 |  |
| 14 | To interface IR Remote with Arduino and write a program to start fan/bulb using IR remote | 4 | 10 |  |
| 15 | To interface Soil Moisture sensor Gas Sensor with Arduino | 4 | 10 |  |
| 16 | To demonstrate keypad using Arduino | 4 | 10 |  |
| 17 | To interface servo motor/DC motor with Arduino and write a program to sweep a servo back and forth through its full range of motion/ to control a DC motor. | 5 | 10 |  |
| 18 | To interface Temperature sensor with Arduino and write a program to send sensor data to the cloud using ThingSpeak/ AWS and receive notification. | 6 | 10 |  |
| 19 | To interface LDR sensor with Arduino and write a program to send sensor data to the cloud using ThingSpeak/ AWS and receive notification | 6 | 10 |  |
| 20 | To build a mini project based on interfacing any combination of sensors with Arduino and cloud. | 7 | 10 |  |

**14) Internal Assessment Details**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No** | **Assessment Type** | **Date** | **COS** | **Pattern** | **Marks** |
| 1 | PRACTICAL ASSIGNMENTS | Every week | ALL COS | One or Two questions / experiments | 20 |
| 2 | Mini project | Last week | All COS | Demo | 20 |
| 3 | Attendance |  |  |  | 10 |

**15) Guest Lectures**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Topic** | **Resource Person** | **Planned Date** |
| 1 | IoT Application in Arduino | Mr Sandesh Akre | 3rd week of March |

**Faculty In charge Course Coordinator**

**Date: Principal**