Department: **Electronics & Communication Engineering**

Multi-Disciplinary Course – MDC Practical 1 / 2 For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: **Electronics & Communication Engineering**	Offered to: **Computer Engineering, Computer Science and Engineering, Information Technology, Electrical Engineering, Mechanical Engineering, Civil Engineering**	
Semester – I / II		
Course Code	Course Title	Course Credit and Hours
23UGEC102	**Tinkering Lab**	**1 Credit - 2 hrs/wk(P)**

Course Description:

The Tinkering Lab Experience is a dynamic, project-based course that provides students with the opportunity to unleash their creativity, cultivate problem-solving abilities, and gain hands-on experience with a wide range of tools, technologies, and materials including Microcontroller Development Board, Sensors and Actuators. This course takes place in a fully equipped Tinkering Lab, where students explore the realms of design, engineering, and innovation, developing practical skills while bringing their ideas to life.

Course Purpose:

The purpose of this lab is to provide a physical environment where students can engage themselves in hands-on, creative, and open-ended learning experiences and can get confidence in developing prototypes of the real-time problems. The experiments within this lab are designed to foster innovation, problem-solving skills, and a do-it-yourself (DIY) mindset.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	**CO Statement**	**Blooms taxonomy Level (K_1 to K_6)**
CO_1	Understanding of the fundamental principles of automation, including microcontroller, development boards, sensors, actuators, embedded systems, logic building and feedback mechanisms.	K2
CO_2	Apply the fundamental principles to illustrate the real world problems	K3
CO_3	Select, Interface, Integrate, and troubleshoot different sensors and actuators with the development board.	K4
CO_4	Identify the real world problem and design solution	K6
CO_5	Think creatively and find innovative solutions to automation challenges.	K6

Experiments:

S. N.	Experiments	Hrs.
1	**Introduction to the Tinkering Lab** Revision of the concepts of passive components, understanding and experiencing working with Breadboard, Power supply and Multimeter.	**2**
2	**Voltage Divider Circuit** To understand and verify the concept of Voltage Divider Circuit	**2**
3	**Voltage Divider Circuit** To design customized (according to roll number) output voltage values using Voltage Divider Circuit	
4	**Light Dependent Resistor (LDR)** • To understand the working principle of the LDR • To design a circuit using LDR and Voltage Divider Circuit. • To observe the change in the voltage value with the change in the light intensity	**2**
5	**Arduino Uno Board** • To understand the pin diagram and specification of the Arduino Uno board. • To understand embedded C Programing	**2**
6	**Blinking of Internal Light Emitting Diode (LED) of Arduino Uno Board** To write an embedded c program to blink internal LED connected to pin 13 of Uno board for customized (according to roll number) amount of time.	
7	**Interfacing LED with Arduino Uno Board** • To understand the concept of how resistor helps in limiting the current and is needed while interfacing LED • To understand the concept and identify the need of negative logic while interfacing current drawing components or device with sophisticated boards • To interface external LED with the Uno board and to write an embedded c program to blink external LED for customized (according to roll number) amount of time.	**2**
8	**Interfacing voltage divider circuit including LDR with Arduino Uno Board** To write an embedded c program to observe the change in the numerical value in the serial monitor based on the change in the light intensity.	**2**
9	**Interfacing voltage divider circuit including LDR with Arduino Uno Board** To write an embedded c program to turn the external LED on when the amount of light is lower than the acceptable value	**2**
10	**Interfacing PIR Sensor with Arduino Uno Board** • To understand the working principle of PIR Sensor for human motion detection • To write an embedded c program to turn the external LED on when the human motion is detected.	**2**

S. N.	Experiments	Hrs.
11	**Interfacing PIR Sensor, LDR and Voltage Divider Circuit with Arduino Uno Board** To write an embedded c program to turn the external LED on when the amount of light is lower than the acceptable value and human motion is detected	**2**
12	**Interfacing PIR Sensor, LDR, Voltage Divider Circuit and Relay Module with Arduino Uno Board** To understand the concept of Relay as an electromechanical switch. To write an embedded c program to turn the AC Bulb on when the amount of light is lower than the acceptable value and human motion is detected	**2**
13	**Interfacing Ultrasonic Sensor with Arduino Uno Board** • To understand the working principle of Ultrasonic Sensor for object distance measurement • To write an embedded c program to turn the external LED / AC Bulb on when the distance of the object is less than the acceptable amount.	**2**
14	**Interfacing IR Sensor with Arduino Uno Board** • To understand the working principle of IR Sensor for object detection • To write an embedded c program to turn the external LED / AC Bulb on when the object is detected.	**2**
15	**Interfacing Servo Motor with Arduino Uno Board** • To understand the working principle of Servo motor • To write an embedded c program to rotate servo motor from 0 degree to 180 degree with a customized (according to roll number) time delay between two positions	**2**
16	**Interfacing Servo Motor and IR Sensor with Arduino Uno Board** To write an embedded c program to rotate servo motor to customized (according to roll number) degree when the object is detected.	**2**
17	**Interfacing DHT-11 Temperature and Humidity Sensor with Arduino Uno Board** • To understand the working principle of DHT-11 Sensor • To write an embedded c program to turn AC on when the temperature goes above acceptable amount • To write an embedded c program to turn heater on when the temperature goes below acceptable amount	**2**

Reference books:

1. "Practical Electronics for Inventors" by Paul Scherz and Simon Monk
2. "Sensors and Actuators: Engineering System Instrumentation" by Clarence W. de Silva
3. "Exploring Arduino: Tools and Techniques for Engineering Wizardry" by Jeremy Blum

Important Webpages:

1. https://www.arduino.cc/
2. https://www.instructables.com/Arduino-Projects/
3. https://www.electronicshub.org/different-types-sensors/
4. https://www.electronicsforu.com/arduino-projects-ideas

Pedagogic tools:

- Chalk and Talk
- Power point presentation
- Experiments Demonstration
- Programming
- Design, Implement and Troubleshooting

Methods of Assessment & Tools:
Components of CIA: 100 marks

Sr. No.	Component	Content	Criteria	Marks	Sub Total
1	Experiment File and Records in Hardcopy	All Experiments	As per the given deadline	**10** (Averaging Marks of all experiments out of 10)	**10**
2	Video file Submission of all experiments	All Experiments	Google Classroom / Pen drive	**10** (Averaging Marks of all experiments out of 10)	**10**
3	Semester End Internal Practical Examination	Any of the Experiments		**30**	**30**
4	Design and Implementation of prototype of a project solving real time problem	1. Project 2. Presentation 3. Video Presentation 4. 30 seconds short video presentation	In Group – (Maximum Group Size 2)	**1.** Project - **30** 2. Presentation - **10** 3. Video Presentation - **5** 4. 30 seconds short video presentation - **5**	**50**
Grand Total					**100**