

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

**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 <sub>1</sub> to K <sub>6</sub> )
CO <sub>1</sub>	Understanding of the fundamental principles of automation, including microcontroller, development boards, sensors, actuators, embedded systems, logic building and feedback mechanisms.	K2
CO <sub>2</sub>	Apply the fundamental principles to illustrate the real world problems	K3
CO <sub>3</sub>	Select, Interface, Integrate, and troubleshoot different sensors and actuators with the development board.	K4
CO <sub>4</sub>	Identify the real world problem and design solution	K6
CO <sub>5</sub>	Think creatively and find innovative solutions to automation challenges.	K6

## Experiments:

S. N.	Experiments	Hrs.
1	<b>Introduction to the Tinkering Lab</b> Revision of the concepts of passive components, understanding and experiencing working with Breadboard, Power supply and Multimeter.	2
2	<b>Voltage Divider Circuit</b> To understand and verify the concept of Voltage Divider Circuit	2
3	<b>Voltage Divider Circuit</b> To design customized (according to roll number) output voltage values using Voltage Divider Circuit	
4	<b>Light Dependent Resistor (LDR)</b> <ul style="list-style-type: none"> <li>To understand the working principle of the LDR</li> <li>To design a circuit using LDR and Voltage Divider Circuit.</li> <li>To observe the change in the voltage value with the change in the light intensity</li> </ul>	2
5	<b>Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the pin diagram and specification of the Arduino Uno board.</li> <li>To understand embedded C Programming</li> </ul>	2
6	<b>Blinking of Internal Light Emitting Diode (LED) of Arduino Uno Board</b> 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	<b>Interfacing LED with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the concept of how resistor helps in limiting the current and is needed while interfacing LED</li> <li>To understand the concept and identify the need of negative logic while interfacing current drawing components or device with sophisticated boards</li> <li>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.</li> </ul>	2
8	<b>Interfacing voltage divider circuit including LDR with Arduino Uno Board</b> 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	<b>Interfacing voltage divider circuit including LDR with Arduino Uno Board</b> 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	<b>Interfacing PIR Sensor with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the working principle of PIR Sensor for human motion detection</li> <li>To write an embedded c program to turn the external LED on when the human motion is detected.</li> </ul>	2

S. N.	Experiments	Hrs.
11	<b>Interfacing PIR Sensor, LDR and Voltage Divider Circuit with Arduino Uno Board</b> 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	<b>Interfacing PIR Sensor, LDR, Voltage Divider Circuit and Relay Module with Arduino Uno Board</b> 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	<b>Interfacing Ultrasonic Sensor with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the working principle of Ultrasonic Sensor for object distance measurement</li> <li>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.</li> </ul>	2
14	<b>Interfacing IR Sensor with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the working principle of IR Sensor for object detection</li> <li>To write an embedded c program to turn the external LED / AC Bulb on when the object is detected.</li> </ul>	2
15	<b>Interfacing Servo Motor with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the working principle of Servo motor</li> <li>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</li> </ul>	2
16	<b>Interfacing Servo Motor and IR Sensor with Arduino Uno Board</b> To write an embedded c program to rotate servo motor to customized (according to roll number) degree when the object is detected.	2
17	<b>Interfacing DHT-11 Temperature and Humidity Sensor with Arduino Uno Board</b> <ul style="list-style-type: none"> <li>To understand the working principle of DHT-11 Sensor</li> <li>To write an embedded c program to turn AC on when the temperature goes above acceptable amount</li> <li>To write an embedded c program to turn heater on when the temperature goes below acceptable amount</li> </ul>	2
18	<b>Project</b> To Design and implement a prototype model of real time problem	-

#### 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
<b>Grand Total</b>					<b>100</b>