Program : **Diploma in Electronics/ Electronics and Communication/ Biomedical Engineering / Mechatronics**	
Course Code : **2049**	Course Title: **Electronics Tinkering Workshop**
Semester : **2**	Credits: **No Credit**
Course Category: **Engineering Science**	
Periods per week: **3 (L:0, T:0, P:3)**	Periods per semester: **45**

Course Objectives:

- To create the skill that is required to develop simple hobby projects using electronic components, Arduino, Raspberry pi, and compatibles which does not envisage prior knowledge of C or Python, instead, students are exposed to the real-time learning experience which helps students to better understand programming languages.

General Instructions:

Tinkering is about creating interest among students in making. Electronics Tinkering Workshop begins with soldering practice. Since the safety of the student is of prime consideration, usage of fume extractors and proper soldering iron stand, etc are recommended. A necessary antistatic workbench for ESD safety shall be provided. Faculty shall ensure proper usage of soldering tools to ensure the quality of soldering and safety of components.

Course outcomes CO3 and CO4 are set to familiarize Arduino and Raspberry pi through a real-time learning experience. The course is an attempt to kindle interest among students in coding through the live experience. The majority of the course contents encourage self-learning and learning through experience. The course does not envisage prior knowledge in any programming language. The faculty need not attempt to teach students C or python programming and most of the codes are available in the example library of the IDE or can be downloaded from GitHub. It is only required to make necessary modifications to suit the code for matching with the problem statement. The students may be instructed to follow coding standards as followed in the example library. This shall include the insertion of proper comments, acknowledgment of copyright, etc.

Course Prerequisites:

Topic	Course code	Course name	Semester
Basic concepts of computer programming.		Introduction to IT systems Lab	1

Tools and Equipment:

1. Antistatic soldering workbench.
2. Arduino, Arduino shields and compatibles.
3. Raspberry Pi, Raspberry Pi Hat and compatibles.
4. Computer systems for Arduino IDE.

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Construct simple models and hobby circuits by soldering techniques.	9	Applying
CO2	Apply soldering skill to dismantle/rework simple electronic circuits.	9	Applying
CO3	Develop simple interfacing applications using Arduino.	15	Applying
CO4	Develop simple interfacing applications using Raspberry Pi.	9	Applying
	Lab Exam	3	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3				3		
CO2	3						
CO3	3			3			
CO4	3			3			

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Construct simple models and hobby circuits by soldering techniques.**		
M1.01	Identify tools and consumables used for soldering and de-soldering of “through hole” PCBs – soldering iron of different wattage,	0.75	Applying

	temperature-controlled soldering station, soldering iron stand, fume extractor, solder of various grade, flux, nipper, wire stripper, needle node plier, tweezer, de-soldering pump, de-soldering station, single layer, multi-layer, through hole and SMD PCBs, etc.		
M1.02	Identify tools used to perform soldering and de-soldering of SMD PCBs – soldering station, electronic rework station etc.	0.75	Applying
M1.03	Familiarize safety precautions in handling soldering tools – personal safety, safety of components and PCBs, ESD safety.	0.75	Applying
M1.04	Model 2x2 mesh by soldering single strand copper wire. (Perform tinning before soldering)	0.75	Applying
M1.05	Model 2x2x2 mesh polygonal cube by soldering single strand copper wire. (Perform tinning before soldering)	1.5	Applying
M1.06	Construct hobby circuits using knock down electronic kits containing pre-fabricated PCBs– LED bulbs, LED running displays, serial lights, Xmas lights, power supply. (Assemble any one hobby electronic PCB. The list shown is only indicative)	1.5	Applying
M1.07	Construct hobby circuits using general purpose PCB (dot board). (Assemble any one simple hobby electronic circuit)	3	Applying
CO2	**Apply soldering skill acquired to dismantle/rework simple electronic circuits.**		
M2.01	Utilize soldering skills to de-solder preassembled “through hole” PCBs.	3	Applying
M2.02	Apply soldering skills to join single and multi-strand wires. (use proper tinning and HS sleeve for insulation)	1.5	Applying
M2.03	Utilize various cable crimp terminals to fix cables. (Use proper crimping tools and sleeves)	1.5	Applying
M2.04	Utilize various cable tags for labeling cables.	1.5	Applying
M2.05	Choose proper techniques for straight and branch joining of electric wires.	1.5	Applying
	Lab Exam I	1.5	

CO3	**Develop simple interfacing applications using Arduino.**		
M3.01	Familiarize Arduino UNO, Arduino IDE	1.5	Understanding
M3.02	Blink LED connected to P13 at 1 sec interval. Interface relay module with port and switch relay on and off at different intervals.	1.5	Applying
M3.03	Connect PIR sensor (motion sensor) to port and switch relay connected to port on detecting motion.	1.5	Applying
M3.04	Familiarize DC motor control shield and control DC motor for forward movement, reverse movement and stop.	1.5	Applying
M3.05	Use wheeled robot kit (containing two geared DC motors, caster wheel, Arduino uno, motor driver shield, 9V battery and line sensor) to make line follower robot.	3	Applying
M3.06	Familiarize blue tooth module (HC 05 or HC 06) to switch relay connected to port using smart phone.	1.5	Applying
M3.07	Use wheeled robot kit and blue tooth module to control robot using smart phone.	1.5	Applying
M3.08	Use LCD shield and display your name and class number.	1.5	Applying
M3.09	Implement suitable Do it Yourself (DIY) project from internet and implement using Arduino and compatibles. (Open ended experiment)	1.5	Applying
CO4	**Develop simple interfacing applications using Raspberry pi.**		
M4.01	Familiarize Raspberry Pi and compatibles.	1.5	Understanding
M4.02	Install suitable raspberry pi operating system	1.5	Applying
M4.03	Familiarize raspberry pi operating system.	1.5	Applying
M4.04	Interface raspberry pi IO ports for input and output.	1.5	Applying
M4.05	Implement suitable DIY project from internet using Raspberry pi (Open ended experiment)	3	Applying
	Lab Exam II	1.5	

Online Resources:

Sl.No	Website Link
1	https://www.arduino.cc/
2	https://www.raspberrypi.org/
3	https://www.adafruit.com/
4	https://github.com/