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| Program : Diploma in Electronics/ Electronics and Communication/ Biomedical Engineering | |
| 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:

| CO _n | 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 nose plier, tweezers, 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 | |



<https://mail.gptcthirurangadi.in>

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/ |