# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Diploma in Engineering**
**Level: Diploma**
**Branch: Computer Engineering / Computer Science & Engineering**
**Course / Subject Code : DI02000091**
**Course / Subject Name : Electronics Workshop and Practice**

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|---|---|
| w. e. f. Academic Year: | 2024-2025 |
| Semester: | 2nd |
| Category of the Course: | ESC |

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|---|---|
| **Prerequisite:** | --- |
| **Rationale:** | The course objective is to equip first-year students with foundational knowledge and practical skills in electronics. By engaging students in activities such as soldering, circuit assembly, and the use of diagnostic tools, the course aims to develop essential skills that are crucial for understanding and implementing electronic systems. Furthermore, the integration of safety practices and standards ensures that students are well-prepared for real-world scenarios, and promoting innovation and problem-solving abilities in the field of electronics. |

**Course Outcome:**
After Completion of the Course, Student will able to:

| No | Course Outcomes | RBT Level |
|---|---|---|
| **01** | Identify electronic components and computer peripherals | Understand |
| **02** | Demonstrate use of instruments and tools for measuring characteristics of Electronics components. | Apply |
| **03** | Identify cables and ports to use for making electronics circuit. | Apply |
| **04** | Prepare the given basic electronics circuit on PCB. | Apply |
| **05** | List the types of Arduino Controllers and their functionalities. | Remember |

**Revised Bloom's Taxonomy (RBT)*

**Teaching and Examination Scheme:**

| Teaching Scheme (in Hours) | | | Total Credits L+T+ (PR/2) | Assessment Pattern and Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | Tutorial / Practical | | |
| L | T | PR | C | ESE (E) | PA / CA (M) | PA/CA (I) | ESE (V) | |
| 0 | 2 | 2 | 3 | 00 | 00 | 20 | 30 | 50 |

**Course Content:**

| Unit No. | Content | No. of Hours | % of Weightage |
|---|---|---|---|
| 1. | **Identification of electronic components with specification:** Diode, Transistor, Resistance, Inductor and Capacitor.[Study Functionality, type, size, color-coding, package, symbol, cost] **Identification of Computer Peripherals:** CPU, RAM, HDD, Optical Drive (CD/DVD), Motherboard, SMPS, Monitor [Study basic functionality, interface] | **10** | **16** |
| 2. | **Application of testing instruments and commonly used tools:** Multi meter, CRO, Function generator, Power Supply. **Soldering components and testing circuit.** **Various Tools:** Pliers, Tweezers, Crimping tool, Wire cutter, wire stripper, screwdrivers, testers, IC plucker /puller. | **12** | **20** |
| 3. | **Ports and Cables:** Twisted Pair Cable, Fiber Optic Cable, Coaxial Cable, Ribbon Cable, HDMI Port, RS-232 Interface, RJ-45 Connectors, USB Connectors, Audio Jack **Circuit Design Simulation:** Introduction to free Circuit maker/simulation software or online tools [any one of Tinkercad Circuits, Circuit Lab, Multisim or circuit-diagram]. | **12** | **20** |
| 4. | **Inter-connection methods and soldering practice.** [Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general-purpose PCB, Crimping.] **Printed circuit boards (PCB)** [Types, Single sided, Double sided, PTH, Processing methods, Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.] | **14** | **24** |
| 5 | **Introduction to Arduino controller:** Types of Arduino Controller: Uno, Mega, Nano Blink built in LED, interface LEDs, potentiometer with Arduino board. | **12** | **20** |
| | **Total** | **60** | **100** |

**Suggested Specification Table with Marks (Theory):**

| Distribution of Theory Marks (in %) | | | | | |
|---|---|---|---|---|---|
| **R Level** | **U Level** | **A Level** | **N Level** | **E Level** | **C Level** |
| **NA** | **NA** | **NA** | **NA** | **NA** | **NA** |

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

**References/Suggested Learning Resources:**

**(a) Books:**

1. A .P. Malvino, "Electronic Principles", TMH Edition
2. V. K. Mehta, "Principles of Electronics", S Chand Publication
3. Mottershead, Allen, "Electronic Devices and Circuit: An Introduction", Goodyear Publishing Co. ,New Delhi
4. J. M. Hughes, "Arduino: A Technical Reference", O'Reilly Media, Inc

**(b) Open source software and website:**

1. www.tinkercad.com ,
2. www.circuitlab.com ,
3. https://www.circuit-diagram.org/

**Suggested Course Practical List:**

1. Identification of various Active and Passive Electronics components and study their characteristics/specifications.
2. Identification of Computer peripherals and study their interfacing and functionalities.
3. To study and demonstrate resistance color coding, measurement using color code and multimeter and error calculation considering tolerance of resistance.
4. To study and demonstrate Multimeter and CRO front panel controls, working of CRO.
5. To study and demonstrate Vp(peak voltage),Vpp(peak to peak voltage), Time, frequency and phase using CRO
6. Introduction to function generator. Functions of front panel controls and measurement of different functions on CRO
7. To study and demonstrate variable DC regulatedpower supply, function of controls and DC measurement using multimeter and CRO
8. Identification of different types of Cables and Ports and study their applications in Electronics circuits.

9. Study and Demonstrate the use of Pliers, Tweezers, Crimping tool, Wire cutter, wire stripper, screwdrivers, testers, IC plucker/puller.
10. Design basic electronics circuits using software/ online tools like Tinkercar, circuitlab, Multisim or circuit-diagram.
11. Demonstrate the soldering and desoldering of electronics components using appropriate method.
12. Study the Arduino Board and their types.
13. Develop Arduino program to blink built-in LED.
14. Develop Arduino program to blink/glow external LED interfaced with Arduino Board.
15. Interface Potentio meter/Variable resister with Arduino board and Develop Arduino program to read potentio meter/ Variable resister values.

**List of Laboratory/Learning Resources Required:**

1. Electronics components such as Diode, Transistor, Resistance, Inductor and Capacitor.
2. Measuring tools CRO, Function generator, Power Supply, Digital multimeter.
3. Soldering iron and soldering materials, PCBs, Breadboard.
4. Arduino Controller board (any of Arduino Uno/Mega/Nano)
5. Logic Gates, LED, Potentio meter/Variable resister.

**Suggested Project List:**

Assembling of electronic circuit/system on general purpose PCB, test & show the functioning(Any One)

1. Fixed voltage power supply with transformer, rectifier diode, capacitor filter, zener/IC regulator.
2. Square wave generation using IC 555 timer in IC base.
3. Sine wave generation using IC 741 OP-AMP in IC base
4. LED blinking circuit using a stable multi-vibrator with transistor BC 107.
5. AND and NAND gates in diode transistor logic.
6. Interfacing LEDs and Variable resistor with Arduino board to control LED brightness.

**Suggested Activities for Students:**

a) Prepare presentation on any of the active/passive component, measurement tools and its applications, Controllers like Arduino, Raspberry Pi.
b) Undertake micro-projects in teams.
c) Prepare charts to explain use/process of the identified topic.
**d)** Students are encouraged to register themselves in various MOOCs such as: Swayam, Coursera, Udemy etc to further enhance their learning.