



**Technical Examination Board, Gujarat State,
Gandhinagar**

Elementary Electronics and Sensors

Title	ESDM103: Elementary Electronics and Sensors
Level	Certificate Course
Course Duration	Four Month (Part time) Three Week (Full Time) 120 Hrs (Th. 48 Hrs Pr. 72 Hrs)
Entry Qualification	B.E./B.Tech/Diploma/B.E. Sem.III onward/ Diploma Sem. IV onward (EC/IC/IT/CE or Similar Branch)/ BCA/MCA/B.Sc./M.Sc./Any other graduate(with Physics/IT)

Teaching Scheme:

Sub Code	Subject Name	Teaching Scheme		Examination Scheme				Term Work Marks	Total Marks
		Theory	Practical	Theory Marks	Hrs.	Practical Marks	Hrs.		
ESDM103	Elementary Electronics and Sensors	4	6	50	2	100	4	25	175

Total Week	= 12	Theory	= 1 hour slot
Total Teaching slot/Week	= 04	Practical	= 2 hour slot
Theory Periods	= 48	Total teaching	10 hours/week (Part-time) 06 hours/day (Full time)
Practical Periods	= 72		

ESDM 103: Elementary Electronics and Sensors

Internet of Things (IoT) is a new paradigm that has changed the traditional way of living into a high-tech lifestyle including Smart city, smart homes, pollution control, energy saving, smart transportation, smart industries. The Internet of Things (IoT) is an emerging paradigm that enables the communication between electronic devices and sensors through the internet in order to facilitate our lives. IoT uses smart devices and the internet to provide innovative solutions to various challenges and issues related to various businesses, governmental and public/private industries across the world. IoT is progressively becoming an important aspect of our life that can be sensed everywhere around us. In whole, IoT is an innovation that puts together an extensive variety of smart systems, frameworks and intelligent devices and sensors.

Course Objectives:

After completion of this course students will be able to

- Test electronics components
 - Interface sensors and actuators with IoT Embedded devices
 - Write python programs for Raspberry PI and similar boards
 - Understand architecture of internet of things
 - List applications of Internet of things
 - Program embedded device useful for IoT applications
 - Understand working of basic electronics components, sensors, actuators
- Solve real life challenges with help of IoT

ESDM103: Elementary Electronics and Sensors

Unit-1	Basics of Electronics
1.1	Overview of electronics components like resistor, capacitor, inductor, diode, transistor, relay, integrated circuits. Concept of voltage, current, resistance, Ohm's Law
1.2	Use and work with testing & measuring instruments – CROs, Multimeter, Power supplies, Signal Generator and Power Analyzer and Analysis of waveforms with it. Soldering & desoldering of components.
1.3	Construct a simple electronics circuit and know how it works, Basics of LEDs, Seven Segment display with the help of theory and hands on sessions, use testing and measuring instruments to measure voltage, current, resistance and test electronics components. Know procedure for disposal of electronic Waste
Unit-2	Basics of Actuators
2.1	Importance of actuators for IoT applications, Types of actuators and its application at different places
2.2	Working principle of Buzzer, Electromagnetic Relay, Solid State Relay, Solenoid, DC Motor, AC Motor, Servo Motor with help of theory and hands on sessions
Unit-3	Basics of Sensors
3.1	Importance of sensors for IoT applications, Classification of sensors, Difference between active and passive sensors
3.2	Working principle of temperature sensor, proximity sensor, ultrasonic sensor, weight sensor, water level sensor, pH sensor, Soil moisture sensor, Light sensor, Flow sensor, Smoke sensor, Gas sensor, Vibration sensor, Gyro sensor, Motion sensor, Capacitive touch sensor, Flex sensor, Joystick sensor, Camera
Unit-4	EDA tools
4.1	PCB Design using open-source tool KiCAD (or any other similar tool)
4.2	Simulation of electronics circuit using EDA tools (Orcad, Proteus or any other available tool)
4.3	Micro Project: Construct project as per guidance of faculty

Suggested List of Practicals

Sr. No	Practical Name
1	Familiarisation with Resistor, inductor, and capacitor.
2	Test and verify ohm's law.
3	Testing transistors using multimeter.
4	Test characteristics of p-n junction diodes.
5	Display various alphanumeric characters on a seven-segment led display.
6	Test and characterise the different types of sensors.
7	Perform different types of data acquisition and identify the correct sensor for their measurements.
8	Create a door lock application using a reed switch and magnet and give a beep when the door is opened.
9	Write Digital on/off sensor (PIR and IR) Interfacing program.
10	Analog sensor programming and uploading sensor data on cloud.
11	Interfacing and programming of actuators, controlling devices remotely using cloud.
12	Create alcohol detection using MQ-3 sensor.
13	create an Earthquake alert system that will notify the people about an Earthquake.
14	PCB Design of selected microproject using open-source tool KiCAD.

Reference books:

- (1) Internet of Things (IoT) A Quick Start Guide by Lele Chitra, BPB Publications
- (2) Principle of Electronics by V K Mehta and Rohit Mehta, S. Chand publication.
- (3) Professionalism—Skills for Workplace Success, Lydia E. Anderson and Sandra B. Bolt, 4e, Pearson Education/PHI
- (4) Internet of Things with Arduino Cookbook, Macro Schwartz, Packt Publication
- (5) Python Programming Fundamentals- A Beginner's Handbook by NischayKumar Hegde
- (6) Fundamentals of Python – First Programs, Kenneth A. Lambert, CENGAGE Publication
- (7) An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications, Rahul Dubey, Cengage India Publication
- (8) Programming the Raspberry Pi: Getting Started with Python, By. Simon Monk
- (9) Freeduino.begin() The ultimate beginners guide to Arduino platform, By. Siddharth and BhagyashriSharangpani
- (10) Sensors and Transducers by D. Patranabi, PHI Learning publication
- (11) Transducers and Instrumentation by Murty, D.V.S., PHI Learning publication
- (12) Electronic Instrumentation by H. S. Kalsi, McGraw-Hill publication.

Software list:

- Anaconda Python Development Software
- Arduino IDE
- MIT App Inventor

Websites:

- <https://thestempedia.com/>
- <https://www.arduino.cc/education>
- <https://www.raspberrypi.org/>
- <https://www.arduino.cc/education/explore-iot-kit>
- <https://www.kicad.org/>

Software list:

- Windows OS : 10x or higher
- Linux/Ubuntu/Unix OS
- Network Simulation Tool
- Packet Tracer
- LAN Protocol Simulation & Analyzer Software

Subject Course Committee

Prof. C. H. Vithalani, Prof. P. J. Brahmbhatt, Prof. T. P. Chanpura, Prof. M. S. Dave, Prof. P. B. Bhatt, Prof. J. A. Dhumale, Prof. A. S. Patel, Prof. A. K. Konkani