GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma Engineering				Branch/Spec.	Electronics and Communication Engineering			
Semester	V				Version	1.0.0.0			
Effective from Academic Year	2026-27				Effective for the Batch admitted in	July 2024			
Course Code	1EC51PE02	Course Name			Sensors and IoT				
Teaching Scheme					Examination Scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites

Digital Electronics, Microcontroller, Embedded Systems

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	Explain the basic concepts, classification, and characteristics of sensors.
CO2	Describe the working principles of temperature, pressure, and optical sensors.
CO3	Explain the architecture and components of Internet of Things (IoT).
CO4	Describe basic IoT communication protocols and applications.
CO5	Develop simple conceptual IoT-based solutions using sensors.

Theory Syllabus

Unit	Content	Hrs.
1	**Introduction to Sensors** Definition of sensor and transducer, Difference between sensor, transducer, and actuator, Classification of sensors: Active and passive sensors, Analog and digital sensors, Contact and non-contact sensors, Absolute and relative sensors, Primary and secondary sensors, Sensing principles: Resistive (RTD, strain gauge), Capacitive (humidity, proximity sensors) Inductive (LVDT, inductive proximity sensors), Piezoelectric (pressure, vibration sensors), Optical (LDR, photodiode), Magnetic (Hall-effect sensors), Sensor selection criteria for industrial and IoT applications, Introduction to signal conditioning: amplification, filtering, ADC (concept only), Applications of sensors in automation, robotics, and IoT systems	8
2	**Temperature, Pressure and Environmental Sensors** Temperature Sensors: Temperature measurement principles, Resistance Temperature Detector (RTD): construction, working, characteristics, applications, Thermistors: NTC and PTC, characteristics, comparison with RTD, Thermocouples: Seebeck effect, types (J, K, T), cold junction compensation, IC temperature sensors: LM35, LM335, DS18B20 (features and applications), Infrared (Non-contact) temperature sensors – basic concept Pressure and Force Sensors: Pressure measurement fundamentals, Strain gauge: working principle, gauge factor, applications, Load cell (strain gauge based) – basic working, piezoelectric pressure sensors: working, advantages, limitations, capacitive pressure sensors – basic concept Environmental Sensors: Humidity sensors: resistive and capacitive types, Gas sensors: MQ-series gas sensors (LPG, smoke, CO – basic idea), Applications of temperature, pressure, and environmental sensors in IoT and industry, Earthquake sensors	9

3	**Optical, Proximity and Motion Sensors** Optical Sensors: Light Dependent Resistor (LDR): working, characteristics, applications, Photodiode: operating modes and applications, Phototransistor: working and comparison with photodiode, Optical encoder (incremental) – basic working Proximity and Distance Sensors: Infrared (IR) proximity sensors: obstacle detection, Ultrasonic sensors: distance measurement, applications, Inductive proximity sensors: working and applications, Capacitive proximity sensors: working and applications Motion and Position Sensors: Passive Infrared (PIR) motion sensor: working, block diagram, applications, Accelerometer (MEMS): working principle, applications, Gyroscope (MEMS): basic working and applications, Tilt sensor: working and applications Magnetic and Touch Sensors: Hall-effect sensor: working and applications, Touch sensors: resistive and capacitive touch sensors Applications: Comparison of optical, proximity, and motion sensors, Role of these sensors in smart home, security, robotics, and IoT systems	**9**
4	**Introduction to IoT** Definition of IoT, IoT characteristics, IoT architecture, IoT building blocks, sensors and actuators in IoT, applications of IoT in smart home, agriculture, healthcare, industry.	**10**
5	**IoT Communication and Applications** IoT communication protocols (MQTT, HTTP, CoAP – basics), overview of microcontrollers and single-board computers, cloud platforms basics, data acquisition, simple IoT case studies.	**9**

Practical Content
Practical assignments and tutorials are based on the above syllabus.

Text Books	
1	Internet of Things – A Hands-On Approach By Vijay Madisetti & Arshdeep Bahga, Universities Press, 2015

Reference Books	
1	Sensors and Transducers By Raghuwanshi, B. S, McGraw-Hill Education, 2018
2	Internet of Things: Architecture and Design Principles By Raj Kamal, McGraw-Hill Education, 2017.

ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/106105166
2	https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	2	2	3	2	2	2	1	2	2	3	1
CO2	2	1	2	3	3	2	2	2	1	1	2	3	1	3	2
CO3	3	3	3	2	2	1	2	2	3	2	2	3	2	2	2
CO4	2	2	2	1	2	2	1	3	2	1	2	2	2	1	3
CO5	2	2	2	2	3	3	3	2	2	1	2	2	3	1	2