Year: B. Tech III (Semester VI)

Subject Name: Sensors, Actuators and Interfacing **Subject Code:** BTEA19625
Type of course: Honors (Group: Internet of Things)
Prerequisite (if any): Fundamentals of Internet of Things

Rationale: The course enables students to understand the basics of the Internet of things architecture. Students will also learn about the protocols understand the concepts of Web of Things.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
4	0	2	5	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests) CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Total Hrs
1.	**Data Acquisition and sensor characteristics:** Sensors, Signals, and Systems, Sensor Classification, Units of Measurements, various sensor characteristics- Calibration, Accuracy, Calibration Error, Hysteresis, Nonlinearity, Resolution, Reliability.	06
2.	**Sensor:** Motion Detectors, Position, Displacement, and Level sensor, Velocity and Acceleration, Force, Strain, and Tactile Sensors, Pressure Sensors, Flow Sensors, Acoustic Sensors, Humidity and Moisture Sensors, Light Detectors.	16
3.	**Actuators:** Definition, types and selection of Actuators, linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.	16
4.	**Sensors and Actuator Interfacing:** Interfacing of various sensors with Arduino, NodeMCU, and Raspberry Pi.	14
5.	**Controlling Sensors through Webpages:** Controlling LED with a Webpage, DHT11 connection for measurement of Temperature and Humidity sensor through Webpage.	8

Suggested Specification Table of Marks as per Bloom's Taxonomy (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	30	30	20	0	0

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels.

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN
1.	Handbook of modern sensors	Jacob Fraden	Springer
2.	Sensors and Transducers	D. Patranabis	PHI- India
3.	Internet of Things: Architecture and Design Principles	Raj Kamal	Mc Graw Hill Education

Note: Students should refer to the latest editions of books

Course Outcome:

Sr. No.	After learning this subject, students will be able to	Marks % weightage
CO-1	Understand Sensors and its characteristics.	20%
CO-2	Understand the role of actuators and transducers.	20%
CO-3	Provide overview of sensors and actuators interfacing devices for IoT applications.	20%
CO-4	Understand the quicker analysis in the area of monitoring and controlling.	20%
CO-5	Understand the use of sensors, actuators and IoT devices for safety.	20%

List of Practical:

	Temperature and Humidity Logging
	Create IFTTT Applet for Button
	Interfacing IoT device with sensors and Controlling appliances through actuators

List of equipment:

- Node MCU, ESP32, Sensors, Jumper wires, USB cable

List of Open Source/Learning website:

- https://onlinecourses.nptel.ac.in/noc22_cs53/preview

Whole course available here.

List of Open Software:

- Arduino 1.8.12