National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Year of Regulation	**2019-20**
Department	**Electrical Engineering**	Semester	**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE313	**Sensors and Transducers**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To discuss about units, standards, error analysis, characteristics of measurement systems and should be familiar with the common methods for converting a physical parameter into an electrical quantity		CO1	**Ability to enhance the knowledge about the need of sensor-based measurement systems and to familiar with various errors in the measuring process**
	To understand the static, dynamic characteristics of transducers and should be able to classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light.		CO2	**Ability to understand the principle of operation, construction and characteristics of resistive, reactance variation, electromagnetic and temperature Sensors used for measurement of various physical parameters**
	To describe the principle of operation, construction and characteristics of resistance, inductance and capacitance & other transducers.		CO3	**Ability to describe the principle of operation, construction and characteristics of flow, pressure and level transducers as well to analyse and design suitable signal conditioning circuits for transducers from the given specifications**
	To choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc			
	To set up testing strategies to evaluate performance characteristics of different types of sensors and transducers and develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.			

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**3**	**0**	**1**	**3**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**3**	**0**	**3**
2	CO2	**3**	**3**	**2**	**3**	**3**	**0**	**0**	**1**	**2**	**0**	**0**	**1**	**3**	**3**	**2**
3	CO3	**2**	**3**	**2**	**0**	**1**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**2**
4	CO4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

5	CO5	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
6	CO6	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction to Sensor- Based Measurement Systems:** **General Concepts and Terminology, Sensor Classification, General Input-Output Configuration, Static Characteristics Of Measurement Systems, Dynamic Characteristics, errors in measurement, Other Sensor Characteristics, Primary Sensors, Materials For Sensors, Microsensor Technology**	**09**	**CO1**
II	**Resistive, Reactance Variation, Electromagnetic and Temperature Sensors:** **Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Magnetoresistors, Light-Dependent Resistors (LDRs), Resistive Hygrometers, Resistive Gas Sensors, Liquid Conductivity Sensors, Signal Conditioning for Resistive Sensors: Resistance Measurement, Voltage Dividers, Dynamic Measurements, Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors. Physiological Transducers:**	**11**	**CO2** **CO1**
III	**Flow, Pressure and Level Transducers:** **Flow Transducers Like Differential Pressure, Variable Area, Positive Displacement, Electromagnetic, Anemometer, Ultrasonic Flow meter, Turbine Flow meter, Vortex Flow meter, Electromagnetic Flow meter, Coriolis Effect Flow meter, Pressure Transducers Like Mercury Pressure Sensor, Bellows, Membranes And Thin Plates, Piezoresistive Sensors, Capacitive Sensors, VRP Sensors, Optoelectronic Sensors, Vacuum Sensors, Level Transducers Like Displacer, Float, Pressure Gages, Balance Method, Time-Of-Flight Measurements, Level Measurements By Detecting Physical Properties.** **Signal Conditioning:** **Concept of signal conditioning, Introduction to AC/DC Bridges. Op-amp circuits used in instrumentation, Instrumentation amplifiers, analogue-digital sampling, introduction to A/D and D/A conversion, signal filtering, averaging, correlation, Interference, grounding and shielding.**	**16**	**CO3** **CO1**
Total Hours		**36**	

Essential Readings

1. Patranabis D., "Sensors and Transducers", Prentice-Hall India, 2nd edition, 2003.
2. Ramon Pallas & John G. Webster, "Sensors and Signal Conditioning", John Wiley & Sons, 2nd edition, 2001.
3. Murthy D.V.S., ``Transducers and Instrumentation", Prentice Hall of India, 2nd edition, 2008.

Supplementary Readings
1. Webster John G., "Instrumentation and Sensors Handbook", CRC Press, 2nd edition, 2014.
2. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs and Applications", Springer, 1st edition,1993
3. Shawhney A. K., "Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Sons, 4th edition, 1983.