

22ECE605		MODERN SENSORS AND ITS APPLICATIONS			SEMESTER VI			
PREREQUISITES		CATEGORY			PE	Credit		3
		Hours/Week			L	T	P	TH
					3	0	0	3
<b>Course Objectives:</b>								
1	To know the various stimuli that are to be measured in real life instrumentation.							
2	To select the right process or phenomena on which the sensor should depend on							
3	To aware of the various sensors available for measurement and control applications.							
<b>Unit I</b>		<b>PROBLEM SOLVING</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>
Introduction to sensors and transducers. Need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors. Static and dynamic characteristics of sensors - zero, I and II order sensors – Response to impulse, step, ramp and sinusoidal inputs. Environmental factors and reliability of sensors.								
<b>Unit II</b>		<b>SENSORS FOR MECHANICAL SYSTEMS</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>
Sensors for mechanical systems or mechanical sensors - Displacement - acceleration and force - flow of fluids - level indicators - pressure in fluids - stress in solids. Typical sensors - wire and film strain gauges, anemometers, piezo electric and magneto strictive accelerometers, potentiometric sensors, LVDT								
<b>Unit III</b>		<b>THERMAL AND OPTICAL SENSORS</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>
Thermal sensors: temperature – temperature difference – heat quantity. Thermometers for different situation – thermocouples thermistors – color pyrometry. Optical sensors: light intensity – wavelength and color – light dependent resistors, photodiode, photo transistor, CCD, CMOS sensors. Radiation detectors: radiation intensity, particle counter – Gieger Muller counter (gas based), Hallide radiation detectors.								
<b>Unit IV</b>		<b>MAGNETIC AND ACOUSTIC SENSORS</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>
Magnetic sensors: magnetic field, magnetic flux density – magneto resistors, Hall sensors, super conduction squids. Acoustic or sonic sensors: Intensity of sound, frequency of sound in various media, various forms of microphones, piezo electric sensors.								
<b>Unit V</b>		<b>APPLICATIONS OF ELECTRICAL AND HIGH FREQUENCY SENSORS</b>			<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>
Electrical sensors: conventional volt and ammeters, high current sensors, (current transformers), high voltage sensors, High power sensors. High frequency sensors like microwave frequency sensors, wavelength measuring sensors. MEMs and MEM based sensors.								
<b>Total(45L) =45 Periods</b>								

<b>Text Books:</b>	
1.	Doebelin, “Measurement Systems: Application and Design”, McGraw Hill Kogakusha Ltd,1983.
2.	Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim “Microsensors, MEMS and Smart Devices”, New York: Wiley, 2001.
<b>Reference Books:</b>	
1.	Henry Bolte, “Sensors – A Comprehensive Sensors”, John Wiley.
2.	Jacob Fraden,” Handbook of Modern Sensors, Physics, Designs, and Applications”, Springer,2014
3.	Manabendra Bhuyan,” Intelligent Instrumentation Principles and Applications”, CRC Press,2017
4.	Randy Frank,” Understanding Smart Sensors”, Second edition, Artech House,2000.
<b>E-References:</b>	
1.	<a href="https://onlinecourses.nptel.ac.in/noc22_ee50/preview">https://onlinecourses.nptel.ac.in/noc22_ee50/preview</a>
2.	<a href="https://www.youtube.com/watch?v=1uPTyjxZzyo">https://www.youtube.com/watch?v=1uPTyjxZzyo</a>
3.	<a href="https://nptel.ac.in/courses/115107122">https://nptel.ac.in/courses/115107122</a>

<b>Course Outcomes:</b> Upon completion of this course, the students will be able to		<b>Bloom's Taxonomy Mapped</b>
CO1	Appreciate the operation of various measuring and control instruments which they encounter in their respective fields.	L2
CO2	Visualize the sensors and the measuring systems when they have to work in areas of interdisciplinary nature and also think of sensors and sensors systems when for a new situation they encounter in their career	L4
CO3	Identify and select the right process or phenomena on which the sensor should depend on.	L2
CO4	Know various stimuli that are to be measured in real life instrumentation.	L2
CO5	Apply all types sensor in various fields.	L3, L4

### COURSE ARTICULATION MATRIX

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO1	1	2											2		
CO2	2	2	1	1		2	1				3	1	3	2	
CO3	2	2	2	1			3				2		2		
CO4	3	2	3	2	3						1		1	2	
CO5	3	2	3		2	2	1				2	2	2		1
Avg	2.2	2	1.8	0.8	1	0.8	1				1.6	0.6	2	0.8	0.2
3/2/1 - indicates strength of correlation (3-High,2- Medium,1- Low)															