Course No.	Course Name	L-T-P - Credits	Year of Introduction
AE204	SENSORS AND TRANSDUCERS	3-0-0-3	2016

Prerequisite:

Course Objectives

• To give ideas on various types of Sensors & Transducers and their working principle
• To understand Resistive, Capacitive and Inductive transducers
• To enable the students to select and design suitable instruments to meet the requirements of industrial applications

Syllabus

Definition of transducers– Classification of transducers – Resistance transducer- Capacitance transducer Motion Transducers – Sound transducers- Pressure Transducers - Hall effect transducers – Piezo electric sensors - Fiber optic sensor- Semiconductor sensor – Basics of seismic instrument- Flow Transducers

Expected outcome .

The students will be able to

- apply working principles of sensors and transducers while doing projects in instrumentation.
- differentiate between the types of transducers available
- gain information about the function of various measuring instruments and sensors and their uses

Text Book:

1. John P. Bentley, “Principles of Measurement Systems”, 3rd Edition, Pearson Education,
2. S.M. Sze, “Semiconductor sensors”, John Wiley & Sons Inc., Singapore, 1994.
4. S. Renganathan “Transducer Engineering”, Allied publishers Limited, Chennai, 2003.

Data Book (Approved for use in the examination):

References:

1. Murthy D. V. S, “Transducers and Instrumentation”, Prentice Hall, New Delhi, 1995.
2. Neubert H.K.P, “Instrument Transducers - An Introduction to their Performance and Design”, 2nd Edition, Oxford University Press, Cambridge, 1999.
3. Patranabis, “Sensors and Transducers”, 2nd Edition, Prentice Hall India Pvt. Ltd., 2003.
4. Waldemar Nawrocki, “Measurement Systems and Sensors”, Artech House, 2005.
5. Doebelin E.O, “Measurement Systems - Application and Design”, 4th Edition, McGraw-Hill, New York, 2003.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Transducers: Definition of transducers, classification based on transduction principle, measurand, material and technology, Analog and digital transducers, Active and passive transducers, Primary and Secondary transducers. Characteristics of transducers.	6	15%
II	Resistance Transducer : Basic principle – Potentiometer – Loading effects, Resolution, Linearity, Resistance strain gauge –Types.	6	15%

	Inductance Transducer :- Basic principle – Linear variable differential transformer – RVDT-types. Capacitance Transducer : Basic principle- transducers using change in area of plates – distance between plates- variation of dielectric constants-frequency response –Types		
FIRST INTERNAL EXAMINATION			
III	Force and Torque Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound Transducers: Sound level meter, sound characteristics, Microphone. Torque transducer design-the torque measurement system-the rotation rate measurement system	7	15%
IV	Pressure Transducers: basic principle- different types of manometers-u tube manometer-well type manometers. Level transducer-continuous level measurement-discrete level measurement-mass –capacitive level gauges, Dead weight calibrator .	7	15%
SECOND INTERNAL EXAMINATION			
V	Hall effect transducers, Digital transducers, Proximity devices, , Piezo-electric sensors, eddy current transducers, tachogenerators and stroboscope, Magnetostrictive transducers, Fibre optic sensor, Semiconductor sensor. Basics of Seismic instrument and accelerometers	8	20%
VI	Flow Transducers: Bernoulli's principle and continuity, orifice plate, nozzle plate, venture tube, Rota meter, anemometers, electromagnetic flow meter, impeller meter and turbid flow meter	8	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum marks : 100 Time : 3 hours

Part A

Answer any two out of three questions uniformly covering Modules 1 and 2. Each question carries 15 marks and may have not more than four sub divisions. (15 x 2 = 30 marks)

Part B

Answer any two out of three questions uniformly covering Modules 3 and 4. Each question carries 15 marks and may have not more than four (15 x 2 = 30 marks)

Part C

Answer any two out of three questions uniformly covering Modules 5 and 6. Each question carries 20 marks and may have not more than four sub divisions. (20 x 2 = 40 marks)