Course code	Course Name	L-T-P -C	Year of Introduction
EE492	Instrumentation Systems	3-0-0-3	2016

Prerequisite: NIL

Course Objectives

- To introduce the measurement techniques of force, torque, speed, pressure, flow & temperature.
- To introduce different types of electronic circuits for measurements and their applications.

Syllabus

General Concepts ,Generalised Configurations and Functional Description of Measuring Instruments, Measuring Devices, Force and Torque Measurements, Shaft Power Measurements, Pressure and Sound Measurements, Dynamic Testing of Pressure-Measuring Systems, Flow Measurement, Temperature Measurement, Bridge Circuits ,Amplifiers ,Filters, Integration and Differentiation, Voltage-Indicating and Recording Devices,Electromechanical Servo type XT and XY Recorders.

Expected outcome.

The students will be able to

i. Understand and analyze Instrumentation systems.

ii. Select proper measurement system for various applications.

Text Book:

1. Ernest O Doebelin and Dhanesh N Manik, Measurement Systems, Mc Graw Hill, 6e.

References:

1. Neubert H K P, Instrument Transducers, Oxford University Press, 1975
2. Turner and Hill, Instrumentation for Engineers and Scientists, Oxford University Press, 1999

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	General Concepts : Need for Measurement Systems, Classification of Types of Measurements Applications Generalised Configurations and Functional Description of Measuring Instruments : Functional Elements of an Instrument , Active and Passive Transducers , Analog and Digital Modes of Operation ,Null and Deflection Methods, Input-Output Configurations of Instruments and Measurement Systems	6	15%
II	Measuring Devices : Motion Measurements : Fundamental Standards, Relative Displacements: Translational and Rotational , Relative Velocity : Translational and Rotational, Relative - Acceleration Measurements Force and Torque Measurements : Standards and calibration , Basic Methods of Force Measurements , Characteristics of Elastic Force Transducers, Torque Measurement on Rotating Shafts	8	15%
FIRST INTERNAL EXAMINATION			
III	Shaft Power Measurements : Shaft Power Measurements (Dynamometers), Vibrating-Wire Force Transducers	8	15%

	Pressure and Sound Measurements: Standards and Calibration , Basic Methods of Pressure Measurements, Deadweight Gages and Manometers , Elastic Transducers, Vibrating-Cylinder and Other Resonant Transducers		
IV	Dynamic Testing of Pressure-Measuring Systems, High Pressure Measurement, Low Pressure(Vacuum) Measurement, Sound Measurements Flow Measurement :Local Flow Velocity , Magnitude and Direction , Gross Volume Flow Rate	6	15%
SECOND INTERNAL EXAMINATION			
V	Temperature Measurement : Standards and Calibration , Thermal-Expansion Methods ,Thermoelectric Sensors (Thermocouples),Electric-Resistance Sensors, Junction Semiconductor Sensors ,Digital Thermometers ,Radiation Methods	6	20%
VI	Bridge Circuits ,Amplifiers ,Filters, Integration and Differentiation Voltage-Indicating and Recording Devices : Standards and Calibration , AnalogVoltmeters and Potentiometers Electrical Instruments : RMS Voltmeter , Ohm Meter , Phase Meter , Q Meter Digital Voltmeters and Multimeters ,Signal GenerationSquare Wave Generation , Electromechanical Servo type XT and XY Recorders	8	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100 **Exam Duration: 3Hrs.**

Part A: 8 compulsory questions.

One question from each module of Module I - IV; and two each from Module V & VI.

Student has to answer all questions. (8 x5)=40

Part B: 3 questions uniformly covering Modules I & II. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part C: 3 questions uniformly covering Modules III & IV. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.

Part D: 3 questions uniformly covering Modules V & VI. Student has to answer any 2 from the 3 questions: (2 x 10) =20. Each question can have maximum of 4 sub questions (a,b,c,d), if needed.