

Course code	Course Name	L-T-P - Credits	Year of Introduction
EE404	INDUSTRIAL INSTRUMENTATION AND AUTOMATION	3-0-0-3	2016
Prerequisite: Nil			
Course Objectives			
<ul style="list-style-type: none"> To impart knowledge about Industrial instrumentation and automation 			
Syllabus:			
Dynamic characteristic of instrumentation- Transducers: Characteristics, Applications – Nano instrumentation - signal conditioning, MEMS, Virtual instrumentation-Automation system - actuators – sequence control, PLC			
Expected Outcome:			
After the completion of the course, the students will be able to:			
<ol style="list-style-type: none"> Select instruments and transducers for various physical variables. Get an insight on data acquisition, processing and monitoring system Design various signal conditioning systems for transducers. Analyze dynamic responses of various systems. Get the concepts of virtual instrumentation Understand the programming realization of PLC 			
Text books:			
<ol style="list-style-type: none"> Curtis D Johnson ,” <i>Process Control Instrumentation Technology</i>”, PHI, 1986 Doebelin E.O, ‘Measurement Systems: Application and Design, Fourth Edition, McGraw Hill, Newyork, 1992 DVS. Murty, ‘Transducers and Instrumentation’ Second Edition, PHI Learning Pvt Ltd New Delhi ,2013 Madhuchhanda Mitra, Samarjit Sengupta, ‘Programmable Logic Controllers and Industrial Automation An Introduction’, Penram International Publishing (India) Pvt Ltd., 2009 Mickell. P. Groover ‘Automation, Production and computer integrated manufacturing’ Prentice Hall of India, 1992 Patranabis, D., ‘Principles of Industrial Instrumentation’, Second Edition Tata McGraw Hill Publishing Co. Ltd.. New Delhi Robert B. Northrop, ‘Introduction to instrdumentation and measurements’, CRC, Taylor and Francis 2005 			
References:			
<ol style="list-style-type: none"> G.K.McMillan, ‘Process/Industrial Instrument and control and hand book’ McGraw Hill, New York,1999 Michael P .Lucas, ‘Distributed Control system’, Van Nastrant Reinhold Company, New York 			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Process Control - block diagram of process control loop, definition of elements. Sensor time response - first and second order responses. Review of Transducers: Characteristics and Choice of transducer-	6	15%

	factors influencing choice of transducer		
II	Applications of Transducers Displace measurement: Resistance potentiometer, Capacitive and Inductive. Capacitive differential pressure measurement Torsional, shearing stress and rotating shaft Torque measurement using strain gauge. Flow measurement :Hotwire anemometer, constant resistance Constant current type Eddy current sensors, Variable reluctance tachometers Phase measurement :Analog and digital phase detectors Nano Instrumentation	8	15%
FIRST INTERNAL EXAMINATION			
III	Signal conditioning circuits-Instrumentation amplifiers- Unbalanced bridge. Bridge linearization using op amp Precision rectifiers, Log amplifiers, Charge amplifiers, Isolation amplifier, Switched capacitor circuits, Phase sensitive detectors, Noise problem in instrumentation and its minimisation	7	15%
IV	Micro Electromechanical system (MEMS) Advantages and Applications, MEMS micro sensors and actuators, Manufacturing process: Bulk micro machining and surface micromachining, MEMS accelerometers Virtual instrumentation system: architecture of virtual instruments – Virtual instruments and traditional instruments – concepts of graphical programming	7	15%
SECOND INTERNAL EXAMINATION			
V	Overview of Automation System - Architecture of Industrial Automation Systems, Different devices used in Automation Actuators, definition, types, selection. Pneumatic, Hydraulic, Electrical, Electro-Pneumatic and valves , shape memory alloys	7	20%
VI	Introduction to Sequence Control, PLCs - Working, Specifications of PLC Onboard/Inline/Remote IO's, Comparison of PLC & PC, Relay Ladder Logic- PLC Programming- realization of AND, OR logic, concept of latching, Introduction to Timer/Counters, Exercises based on Timers, Counters. Basic concepts of SCADA, DCS and CNC	7	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100

Exam Duration: 3Hours.

Part A: 8 compulsory questions.

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

Student has to answer all questions. $(8 \times 5) = 40$

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

