



Kadi Sarva Vishwavidyalaya
Faculty of Engineering & Technology
First Year Bachelor of Engineering (All Branches)
 With effect from: Academic Year 2019-20

Subject Code: EE606-N	Subject Title: Industrial instrumentation
Pre-requisite	

Course Objective:

- To focus on the application of industrial instrumentation of various electrical parameters.
- To have an adequate knowledge about different industrial instrumentation.
- To study in detail, the constructional and operational aspects of various instruments used in industry.
- Practical aspects of the subject will make the students capable of static and dynamic characteristics of industrial instrumentation.

Teaching scheme				Total Credit	EvaluationScheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	02	05	04	03	70	30	20	30	150

Outline of the Course:

Sr. No	TitleoftheUnit	Minimum Hours
1	Introduction To Instrumentation:	4
2	Transducers:	5
3	Level Measurement:	6
4	Strain Gauge And Measurement Of Strain:	8
5	Displacement Measurement:	6
6	Flow Measurement:	6
7	Pressure Measurement:	5
8	Temperature Measurement:	5

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75



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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weight age(%)
1	Introduction To Instrumentation: Role of instruments in industrial processes. Block representation of measurement systems Need for calibration and standards Instrument parameters: Sensitivity, Accuracy, Resolution, Span, Range Static errors: Zero error, Proportionality error, hysteresis, maximum non-linearity error.	4	10
2	Transducers: Introduction to instrumentation system, static and dynamic characteristics of an instrumentation system, Principles and classification of transducers, Electrical transducers, basic requirements of transducers.	5	10
3	Level Measurement: Factors influencing level measurement, Direct level measuring systems: the dip stick, the sight glass, floats Resistive, inductive and capacitive techniques for level measurement Ultrasonic and radiation methods.	6	10
4	Strain Gauge And Measurement Of Strain: Theory of strain gauge Types of strain gauge Strain gauge circuits, Ballast circuits Wheastone Bridge, gauge sensitivity and temperature compensation Strain gauge calibration Load Cells Applications of strain gauges .	8	5
5	Displacement Measurement: Resistive potentiometer (Linear, circular and helical), L.V.D.T., R.V.D.T. and their characteristics, variable inductance and capacitance transducers, Piezo electrical transducers-output equations and equivalent circuit, Hall effect devices, Large displacement measurement using synchros and resolvers, Shaft encoders.	6	20



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6	Flow Measurement: Differential pressure meter like Orifice plate, Venturi tube, flow nozzle, Pitot tube, Rotameter, Turbine flow meter, Electromagnetic flow meter, hot wire anemometer, Ultrasonic flow meter.	6	5
7	Pressure Measurement: Mechanical devices like Diaphragm, Bellows, and Bourdon tube for pressure measurement, Variable inductance and capacitance transducers, Piezo electric transducers, L.V.D.T. for measurement of pressure, Low pressure and vacuum pressure measurement using Pirani gauge, Ionization gauge, Pressure gauge calibration.	5	10
8	Temperature Measurement: Thermistors:-Construction, Characteristics, Applications and Salient features, Thermocouples:- Thermoelectric laws and construction, Bimetallic thermometers, Thermistors:-Construction, Characteristics, Applications and Salient features, Humidity measurement and Moisture measurement techniques.	5	20
Total		45	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carry five marks in overall evaluation.
- One internal exam of 30 marks is conducted as a part of mid semester evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry a weightage of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome

On successful completion of the course



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- The students will be well aware with the construction, working principle, Operation and application of various industrial instrumentation like strain gauge, thermocouples, thermistors, transducers, tachometers, load cells, Radiation Pyrometers, Thermopile, Bolometer, accelerometers, recorders.
- After successful completion of this course, students will be able to carry the fundamental knowledge to understand a fact behind the industrial automation process.

Text Book & Reference Books:

- A. K. Shawney, Electrical and Electronics Measurement and Instrumentation
- Rangan, Sharma, Mani, Industrial Instrumentation
- Patranabis, Transducers and Instrumentation.
- Murthy, Transducers and Instrumentation
- R. K. Jain, Mechanical & Industrial Measurements
- S. K. Singh, Industrial Instrumentation & Control
- S.K. Singh, Industrial Instrumentation and Control, Tata McGraw Hill, Revised edition.
- D.P. Eckman, Industrial Instrumentation, Wiley Eastern Ltd.
- **Suggested List of Experiments**

1.	Measurement and control of temperature using RTD.
2.	Measurement and control of temperature using thermocouple.
3.	To perform and measurement the pressure by using the pressure transducer.
4.	To study the operation of synchro transmitter and receiver.
5.	To perform strain measurement using Strain gauge.
6.	To study and perform the Linear Variable Differential Transducer(LVDT)
7.	To study and perform analog and digital converter.
8.	To study and perform digital and analog converter.
9.	To study angular displacement by using electrical transducer.
10.	To study various types of liquid flow meters.
11.	Introduction Of Data Acquisition System.