

COURSE TITLE	ELECTRICAL AND ELECTRONIC INSTRUMENTS
COURSE CODE	01EE1304
COURSE CREDITS	3

Objective:

- 1 The objective of this subject is to give exposure to the students about the various measurement devices and sensors. Also, the student will be able to use and interface the sensors with the microcontroller.

Course Outcomes: After completion of this course, student will be able to:

- 1 Select the suitable transducers and sensors for given application.
- 2 Differentiate between various measurement devices based on their working principles and applications.
- 3 Analyse the performance characteristic of various instruments.
- 4 Measure various attributes of waveform using oscilloscope.

Pre-requisite of course:NONE

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Concepts of Measurement Measurement System, Classification of instrument system, Methods of Measurement, Static Characteristics like accuracy, precision, sensitivity, linearity, range, reproducibility, drift, threshold, dead zone etc, Dynamic Characteristics like speed of response, fidelity overshoot etc., Errors in measurement.	4
2	Transducers Definition, different types of transducers, criteria for selection, RTD, Thermocouple and Thermistor measurement of temperature,, Bourdon tube and bellows for measurement of pressure,, strain gauge, LVDT and RVDT for measurement of displacement, shaft encoder, torque, Hall Effect transducer, Synchro	10
3	Sensors Basic concept of sensors, Temperature sensors, Ultrasonic sensors, IR sensor, inductive proximity sensor and Hall effect sensors.	4

Contents : Unit	Topics	Contact Hours
4	Electronic and Digital Instruments Introduction, Essentials of an electronic instruments, Advantages of electronic instruments, , electronic voltmeters, vacuum tube voltmeter, Signal sampling concept in digital instruments,, true R.M.S. reading voltmeter, , electronic multimeter, electronic energy meter, LCR meter, tachometer.	6
5	Oscilloscope: Introduction, Oscilloscope Block Diagram, Cathode Ray Tube, Delay Line, Multiple Trace, Oscilloscope Scope and Transducers,, Oscilloscope Techniques, Digital Storage Oscilloscope: Principle of Operation, block diagram, waveform reconstruction, Comparison between Analog and Digital storage oscilloscopes.	4
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment No. 01 Measurement of various parameters using Digital Multimeter.	2
2	Experiment No. 02 Use a Digital Storage Oscilloscope for measurement of various parameters of alternating waves.	2
3	Experiment No. 03 Obtaining the winding resistance and inductance of choke coil.	2
4	Experiment No. 04 Use of LVDT for measurement of displacement.	2
5	Experiment No. 05 Measurement of weight using strain gauge.	2
6	Experiment No. 06 Temperature measurement using RTD.	2
7	Experiment No. 07 Temperature measurement using Sensor (DHT11).	2
8	Experiment No. 08 Distance measurement using Ultrasonic sensor.	2
9	Experiment No. 09 Speed measurement using optical sensor and inductive proximity sensor.	2
10	Experiment No. 10 Current measurement using Hall effect sensor.	2
11	Experiment No. 11 Light intensity measurement using LDR.	2
12	Experiment No. 12 Position control system by using synchro.	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
13	Experiment No. 13 To demonstrate usage of DSO for steady state periodic waveforms produced by a function generator.	2
Total Hours		26

Textbook :

- 1 Industrial Instrumentation and Control, Shio Kumar Singh , TMH Publication, 2009
- 2 Electrical and Electronics Measurement sand Instrumentation, A. K. Shawney, Dhanpatrai & Sons Publication , 2014
- 3 Electrical Measurement and Measuring Instruments, R. K. Rajput, S. Chand Publication, 2009

References:

- 1 Principle of Industrial Instrumentation, Principle of Industrial Instrumentation, D Patranabis, Mc Graw Hill Publication, 2010
- 2 Mechanical & Industrial Measurements, Mechanical & Industrial Measurements, R. K. Jain, Khanna Publication, 1974

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	30.00	20.00	15.00	10.00	5.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos, recourses, Virtual Laboratory.

Supplementary Resources:

- 1 https://e2e.ti.com/blogs_/

Supplementary Resources:

- 2 <http://controlandinstruments.blogspot.com/>
- 3 <https://blog.msjacobs.com/>
- 4 <https://www.affinityenergy.com/blog/>
- 5 <https://instrumentationandcontrol.net/>
- 6 <https://industrialinstrumentationsolutions.blogspot.com/>
- 7 <https://www.csiaexchange.com/IndustrialAutomationBlog.aspx>
- 8 <http://www.pacontrol.com/industrial-instrumentation.html>