Programme	**:**	**Diploma in ET**/CE/EE//ME/MT/CM/IT/DDGM
Programme Code	**:**	01/02/**03**/04/05/06/07/08/16/**17**/21/22/**23**/24/26
Name of Course	**:**	**Industrial Measurements**
Course Code	**:**	**ET 283**

Teaching Scheme:

	Hours /Week	**Total Hours**
Theory	**02**	**32**
Tutorial	**01**	**16**

Evaluation Scheme:

	Progressive Assessment	**Semester End Examination**			
		Theory	**Practical**	**Oral**	**Term work**
Duration	**Two class tests, each of 60 minutes**	**3 Hrs.**	**3 Hrs.**	**3 Hrs. For batch of 20 students**	**--**
Marks	**20**	**80**		**--**	

Course Rationale:

The science of instrumentation system plays vital role in the development of technology. Different types of transducers used for measurement of different physical quantities with their construction, working principle, advantages, and disadvantages are studied through this subject.

Course Objectives:

After studying this course, the student will be able to

- Understand the nature and working of instrumentation system used in industrial & general applications.
- Classify the physical parameters with their proper units
- Understand the concepts of different types of transducers

Course Content:

Chapter No.	Name of Topic/Sub topic	Hrs	Marks
1.	**Transducers:**		
	1.1 Instrumentation System: Block diagram of Instrumentation system: Function of each block, Explanation of basic instrumentation systems	**06**	**14**
	1.2 Transducer: Need of Transducer: Classification of transducers: Active and Passive, Analog and Digital, Primary and Secondary.		
	1.3 Electrical Transducers: Resistive transducers- Linear & Angular potentiometers Capacitive transducer Inductive transducer –LVDT, RVDT (As a displacement transducer) Piezoelectric transducer (Principle of operation and applications of above)		
	1.4 Selection criterion of transducers.		
2.	**Pressure Measurement**		
	2.1 Pressure: Definition Types - Absolute, Gauge, Atmospheric, Vacuum(Definition, Units)	**05**	**12**
	2.2 Classification of Pressure measuring devices		
	2.3 Non elastic pressure transducer: U tube Inclined Tube Well type manometer		
	2.4 Elastic pressure transducer: Bourdon Tube Bellows Diaphragm		
	2.4 Electronic pressure transducers: Bourdon tube with LVDT Diaphragm with Strain gauge		
3.	**Flow Measurement**		
	3.1 Flow: Definition Types of Flow –Laminar, turbulent , Reynolds number	**06**	**16**
	3.2 Classification of flow measuring transducers : Variable head flow meter- Venturimeter, orifice plate meter Variable area flow meter – Rota meter		

	Electromagnetic Flow meter.		
4.	**Level Measurement**		
	4.1 Level: Definition Need of level measurement	**06**	**16**
	4.2 Classification of level measurement methods: Float type – linear & rotary potentiometer (Contact type) Capacitive type (Contact type) Ultrasonic type (Non-contact type) Radiation type (Non-contact type)		
5.	**Temperature Measurement**		
	5.1 Temperature : Definition and units Different temperature scales & their conversions	**05**	**14**
	5.2 Classification of temperature measuring transducers: Gas Filled thermometer. Bimetallic thermometer Thermistor,RTD – (PT-100) , 2 wire systems (circuit diagram only) Thermocouple – Seeback & Peltier effect , Types J, K, R , S, T (Based on material, temperature ranges) Pyrometer - Optical, Radiation		
6.	**Special Transducers and Measurements**		
	6.1 Humidity:DefinitionTypes - Absolute, relative	**04**	**08**
	6.2 Humidity measurement devices: Psychrometer - Dry & wet Bulb thermometer type Hygrometer- hair type		
	6.3 Speed Definition Classification of speed measurement methods Photoelectric pick-up (Non contact type)		
	TOTAL	**32**	**80**

List of Practical/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment
1.	Measure DC Voltage & DC Current using PMMC instruments.
2.	Measurement of R.L.C using LCR, Q meter.
3.	Study front panel controls of specification of typical CRO.
4.	Measure frequency, voltage, phase difference (by time measurement) using CRO.
5.	Testing of component using CRO.
6.	Using Lissagous pattern find frequency & phase difference of unknown signal.
7.	Study & use of Digital Storage Oscilloscope.
8.	Measure frequency & voltage of the different o/p waveforms of function generator.
9.	Study of Logic analyzer
10.	Study of X-Y Recorders.

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Transducers	Classroom Teaching
2.	Pressure Measurement	Classroom Teaching
3.	Flow Measurement	Classroom Teaching
4.	Level Measurement	Classroom Teaching
5.	Temperature Measurement	Classroom Teaching
6.	Special Transducers and Measurements	Classroom Teaching

Text Books:

Sr. No	Author	Title	Publication
1.	S.K.Singh	Industrial Instrumentation & Control Tata McGraw Hill Publishing	Co. Ltd; N. Delhi
2.	A.K.Sawhney	Electrical and Electronic	Measurements and Instrumentation Dhanpat Rai & Sons.
3.	D. Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill Publishing Co. Ltd; N. Delhi

Reference Books:

Sr. No	Author	Title	Publication
1.	B.C.Nakra K.K.Chaudhry	Instrumentation Measurement and Analysis	Tata McGraw Hill Publishing Co. Ltd; N. Delhi.
2.	Rangan Mani Sharma	Instrumentation Systems and Devices	Tata McGraw Hill Publishing Co. Ltd; N. Delhi

Learning Resources:

Reference Books, Manuals and journals of devices, Components brochures

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Transducers	6	4	4	14
2.	Pressure measurement	4	4	4	12
3.	Flow Measurement	6	6	4	16
4.	Level Measurement	6	6	4	16
5.	Temperature measurement	6	4	4	14
6.	Special Transducers and Measurements	4	-	4	8
Total		32	26	24	80

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