

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

(CURRICULUM DEVELOPMENT CELL)

CURRICULUM

PROGRAMME : DIPLOMA IN ELECTRONICS & TELECOMM. ENGG.

COURSE CODE : EC6607

LEVEL NAME : APPLIED TECHNOLOGY COURSES

COURSE NAME : ELECTRONIC INSTRUMENTATION

TOTAL CREDITS : 06 THEORY : 04 PRACTICAL: 02

EXAMINATION SCHEME :

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	75	25	100	--	25	25	150
MIN.	30	--	40	--	10	10	60

TIME ALLOTTED FOR TERM EXAM : 03 HRS.

TIME ALLOTTED FOR PROGRESSIVE TEST : 01 HR.

PREREQUISITE : EC6102

● **RATIONALE:-**

This course is introduced with a view that students will be made aware of various electronic instruments and measuring techniques. It deals with various basic transducers needed for the measurements of various physical parameters, their types and recording systems with interfacing circuits needed in measurements systems. It also deals with various parameter measurement systems.

● **SKILLS:-**

- 1) Understanding the working of various instruments.
- 2) Carrying out different tests.
- 3) Using the various transducers available for measurement of parameters like temperature, displacement, pressure etc.
- 4) Developing complete measurement system for different physical parameters.
- 5) Understanding the use of recorders, data processors in measurement systems.

- **OBJECTIVES:-**

After completing this course, students will be able to:

- 1) Understand the working of various instruments
- 2) Use of various transducers available for measurement of parameters like temperature, displacement, pressure etc.
- 3) Develop complete measurement system for different physical parameters.
- 4) Understand and use recorders ,data processors in measurement systems.
- 5) Understand the parameter monitoring of various processes in system.

- **CONTENTS:-**

A. THEORY

1. Instrumentation

(H-07, M- 08)

Use and information of instrumentation system in industrial context. Role of instrumentation system in industry and system definition. Principles and need of system characteristics. Definitions of static and Dynamic characteristics. Accuracy, precision, error. Sensitivity and resolution, Repeatability and reproducibility. Linearity and Nonlinearity of systems. Standards in measurement. Dynamic performance of system, hysteresis, drift, speed of response, lag, fidelity. Block diagram of instrumentation system and transducer selection factors. Important applications of instrumentation system.

2. Transducers

(H- 10, M-12)

Introduction to transducer in Instrumentation. Classification of different transducers. Working principle, constructional detail, specification of transducers: Resistive transducers: Potentiometric, Strain, RTD, Thermistors. Thermal transducer: Thermocouple, Inductive transducers. principles of working of LVDT. RVDT, pressure transducer- burden tube Capacitive transducers:- Linear and Angular. Piezoelectric transducer, Photoelectric transducer. Linear & Rotary encoder.

3. Discrete Component Measurement

(H-08, M-09)

Resistance measurement: wheatstone bridge, Kelvin's Bridge, Guarded Wheatstone Bridge. Low Frequency Inductance, Capacitance measurements using Bridges (Maxwell, Hay, Schering), Leakage capacitance measurement, High frequency component measurement using Q-meter, LCR meter

4. Signal Conditioning

(H-07, M-08)

Introduction to signal conditioning. Concept of AC signal conditioning and DC signal conditioning. Necessity of signal conditioning circuit. Different types of signal conditioning circuits required in instrumentation system, integrators, differentiators, chopper stabilized amplifier, Filters. Use of signal conditioning circuits for instrumentation system in industrial context.

5. Cathode Ray Oscilloscope

(H-08, M-10)

Specifications of oscilloscope, constructional detail and working of CRT . Functional block diagram and working principle of CRO, Vertical deflection system, Horizontal deflection system. Dual beam and dual trace CRO. front panel of control of CRO, Applications of CRO. Measurement of voltage, frequency, phase, time, current and power using CRO.

6. **Recorders** (H- 08, M-10)
Voltage recording instruments,. Null balance potentiometric recorder, Magnetic Tape Recorder. Digital instruments DVM, DFC, DMM, storage oscilloscope, Logic analyzer. Graphic recorders - strip chart, X - Y recorder. Principle of recorders. spectrum analyzer
7. **Data Processors** (H-07, M-08)
Necessity of DAS and Data logger. Introduction to Data processing in instrumentation. Comparison of DAS and Data loggers, Factors that decide the configurations of DAS. Configuration of Data processors and its principle. Block diagram of DAS and Data loggers. Use of Data processor in process industries for acquiring different types of data in instrumentation..
8. **Operation Of Instrumentation System** (H-09, M-10)
Introducing different parameters required to be measured and controlled in industrial processes and their importance in industrial context. Instrumentation system for measurement of pressure-using burden tube and LVDT, capacitive transducer, Temperature-thermistor, thermocouple. Velocity-angular with tachogenerator. liquid level using capacitive transducer. Liquid Flow –variable head orifice, flaw measurement using ultrasonic transducer, Thickness measurement using capacitive & inductive transducer . Displacement measurement using LVDT& RVDT, pH measurement.

**B. LABORATORY WORK / LABORATORY EXPERIENCES:
(Any Twelve)**

1. To measure displacement using LVDT.
2. To plot characteristic of thermistor.
3. To plot characteristic of thermocouple
4. To design and test instrumentation amplifier.
5. To study voltage to frequency converter.
6. To study front panel and operate controls of CRO
7. Measurement of frequency by lissajous pattern method .
8. To study front panel and operate controls of logic analyzer.
9. To measure the values of inductance, capacitance and resistance using LCR meter.
10. To study front panel of storage oscilloscope and operate different function of controls.
11. To observe and measure parameters of waveforms generated from function generator on storage oscilloscope.
12. To study front panel and operate controls of digital frequency counter.
13. Measurement of temperature using instrumentation system
14. To measure liquid level using instrumentation system
15. Measurement of angular displacement.

ASSESSMENT OF LABORATORY EXPERIENCES :

Continuous assessment of practicals , viva.

C. SUGGESTED INSTRUCTIONAL STRATEGIES

Reference books, charts, OHP, Transparencies

D. SUGGESTED LEARNING RESOURCES:

PRINT: Text Books, manual

NON PRINT: Transparencies, cutouts, audio-visual

E. REFERENCES :

1. Electrical and Electronic Measurements & Instrumentation - A.K.Sawhney-Pub. Dhanpat rai and sons
2. Instrumentation - Devices and Systems : Rangan C.S. , Sharma G.R. and Mani V.S. Pub. Tata McGrawHill.
3. Transducer and Display Systems : B.S.Sonde. Tata McGrawHill
4. Instrumentation : Malvino
5. Fundamentals of Industrial Instruments : Fribance.Austine Pub. Tata McGrawHill
6. Electronics Instruments and Measurement Technique- Cooper-Prentice Hall of India.
7. Electronics Instrumentation-H.K. Kalsi -Pub. Tata McGraw-Hill
8. Industrial Instrumentation And Control –S.K. Singh- Tata McGrawHill
9. Transducers and Instrumentation-D.V.S. Murthy- Prentice Hall of India.