DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

VI SEMESTER

ELECTIVE THEORY - II

32081 – MECHANICAL INSTRUMENTATION

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32081

Semester : VI

Subject Title : MECHANICAL INSTRUMENTATION

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Mechanical Instrumentation	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	TYPES OF MEASUREMENT, MEASUREMENT OF *ERROR*	15
II	DISPLACEMENT MEASUREMENT- PRESSURE MEASUREMENT	15
III	TEMPERATURE MEASUREMENT- FLOW MEASUREMENTS	15
IV	MISCELLANEOUS MEASUREMENT	15
V	CONTROL SYSTEMS	15
	REVISION AND TEST	7
	TOTAL	**75**

RATIONALE:

Measurements are more important for the quality of the product. In this subject various methods of measurements are discussed.

OBJECTIVES

- Study about the different instruments, errors.
- Impart knowledge on displacement measurements
- Understand about temperature measurement
- Study about miscellaneous measurement
- Understand the application of measurement system

MECHANICAL INSTRUMENTATION

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	Types of measurement, classification of instruments - Static terms and characteristics - Range and Span, Accuracy and Precision, Reliability, Calibration, Hysteresis and Dead zone, Drift, Sensitivity, Threshold and Resolution, Repeatability and Reproducibility, Linearity. Dynamic characteristics - Speed of response, Fidelity and Dynamic errors, overshoot**.** Measurement of *error* - Classification of errors, environmental errors, signal transmission errors, observation errors, operational errors Transducers **:** Classification of transducers, active and passive, resistive, inductive, capacitive, piezo-resistive, thermo resistive.	**14**
II	**Displacement Measurement:** Capacitive transducer, Potentiometer, LVDT, RVDT, Specification, Selection & application of displacement transducer. Optical measurement scale andencoders **Pressure Measurement:** Low pressure gauges- McLeod Gauge, Thermal conductivity gauge, Ionization gauge, Thermocouple vacuum gauge, Pirani gauge. High Pressure gauge-Diaphragm, Bellows, Bourdon tube, Electrical resistance type, Photoelectric pressure transducers, piezoelectric type, Variable capacitor type	**14**
III	**Temperature Measurement:** Non-electrical methods - Bimetal, Liquid in glass thermometer and Pressure thermometer. Electrical methods - RTD, Platinum resistance thermometer, Thermistor, Thermoelectric methods - elements of thermocouple, Seebek series, law of Intermediate metals, thermo emf measurement.	**14**

Flow Measurements: Variable area meter - Rota meter, Variable velocity meter – Anemometer, Special flow meter - Hot wire anemometer, Electromagnetic flow meter, Ultrasonic flow meter ,Turbine meter ,Vortex shedding flow meter

IV Miscellaneous Measurement: **13**

Introduction to sound measurement and study of Electro dynamic microphone and Carbon microphone.

Humidity measurement –Hair hygrometer, Sling psychrometer, Liquid level measurement – direct and indirect methods.

Force & Shaft power measurement - Tool Dynamometer (Mechanical Type), Eddy Current Dynamometer, Strain Gauge Transmission Dynamometer. Speed measurement -Eddy current generation type tachometer, incremental and absolute type, Mechanical Tachometers, Revolution counter & timer, Slipping Clutch Tachometer, Electrical Tachometers, Contact less Electrical tachometer, Inductive Pick Up, Capacitive Pick Up, Stroboscope, Strain Measurement - Stress-strain relation, types of strain gauges, strain gauge materials, resistance strain gauge- bonded and unbounded, types (foil, semiconductor, wire wound gauges), selection and installation of strain gauges load cells, rosettes.

V Control Systems : **13**

Block diagram of automatic control system, closed loop system, open loop system, feedback control system, feed forward control system, servomotor mechanism.

Comparison of hydraulic, pneumatic, electronic control systems, Control action: Proportional, Integral, derivative, PI, PD, PID. Applications of measurements and control for setup for boilers, airconditioners, motor speed control.

Text Books:

1) Mechanical Measurements &Control-D.S.Kumar-Metropolitan Publications, New Delhi.
2) Mechanical & Industrial Measurements-R.K.Jain-Khanna Publications, NewDelhi,

3) Mechanical Measurements &Instrumentation-A.K.Sawhney-Dhanpat Rai & Sons, NewDelhi.
4) Measurement Systems-E. O. Doebelin-Tata McGraw Hill Publications.
5) Mechanical Measurement &Control-R.V. Jalgaonkar-Everest Publishing House, Pune