DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR

M SCHEME

IV SEMESTER

2015 – 2016 onwards

MEASUREMENTS AND INSTRUMENTS

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 33042

Semester : IV Semester

Subject Title : **MEASUREMENTS AND INSTRUMENTS**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MEASUREMENTS AND INSTRUMENTATION	5	75	25	75	100	3 hrs

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hours)
I	Classification and Characteristics of Instruments	15
II	Measurement of current Voltage and Resistance	15
III	Measurement of Power and Energy	12
IV	Measurement of Power factor Frequency and Phase difference	12
V	Measurement of L,C and waveforms	12
	Revision and Test	09
	Total	**75**

Rationale:

Measurement is the basic and primary operation, the result of which is used only to describe the system and hence treated as an independent operation. Automation of any kind begins with the measurement of certain system parameters; In fact, industrial growth moves hand in hand with the growth of the measurement of Science and technology. Therefore it is highly essential for Electrical students to study about the measurement of various electrical parameters in a system and the construction and working of different instruments used in measurement of such parameters.

Objectives:

- To define basic measurement terms.
- To learn about various operating forces and effects used in instruments.
- To study the construction and working of Moving coil and Moving Iron instruments, CT and PT and electrostatic voltmeter.
- To understand the measurement of resistance using different means.
- To study Single phase and Three phase power measurement using wattmeter.
- To study the construction and working of single phase, three phase energy meter and study about calibration
- To study the construction and working of Power factor meters, and phase sequence indicators.
- To study about the frequency measurement using different types of frequency meters.
- To learn about the measurement of inductance and capacitance using bridges.
- To study about CRO and its applications.

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**Classification and Characteristics of Instruments** General - Definition of Measurement – functions of Measurement system (Indicating, Recording and controlling function) – Applications of measurement systems – classification – Absolute and secondary instruments – Indicating Recording and Integrating Instruments –Analog and Digital – Definition of True value, accuracy, precision, error and error correction – Instrument efficiency – Effects used in instruments – operating forces – Deflecting, controlling and damping forces – constructional details of moving system – Types of Supports - Balancing – Torque weight ratio – control system (spring control and gravity control) Damping systems – Magnets – pointers and scales.	**15**
II	**MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE** Types of Instruments – construction, working and torque equation of moving coil, Moving iron, dynamometer type (Shaded pole) Instruments – Extension of instrument range using shunts and multipliers. (Calculation, requirements and simple problems). Tong tester – Electrostatic voltmeter – Rectifier type instruments – Instruments transformers CT and PT – Testing, Errors and characteristics of CT and PT - Classification of Resistance – measurement using conventional method – (Ammeter – voltmeter method) Measurement of low resistance using Kelvin's Bridge ohmmeter – measurement of Medium resistance using Wheatstone bridge – High resistance using Megger - earth resistance- – using Earth tester – Multimeters.	**15**

III	**MEASUREMENT OF POWER AND ENERGY** Power in D.C and A.C Circuits – watt meters in power measurement – Electrodynamometer type and LPF watt meters – Three phase power measurement using Three phase wattmeter- Reactive power measurement in balanced load. Measurement of Energy in AC circuits – Single phase and Three phase energy meters construction and operation – Errors and Error correction – calibration using RSS meter - Digital Energy meter.	**12**
IV	**MEASUREMENT OF POWER FACTOR, FREQUENCY AND PHASE DIFFERENCE** Power factor meters – single phase and Three phase Electro dynamometer type – construction and working – phase sequence Indicator – phase difference measurement using synchroscope –Trivector meter – Merz price maximum demand Indicator. Frequency measurement – Frequency meter – Weston type – Digital Frequency meter – (Simplified Block diagram	**12**
V	**MEASUREMENT OF L,C AND WAVEFORMS** Measurement of Inductance – Maxwell's Inductance bridge – Andersons bridge – Measurement of capacitance using Schering bridge.CRO – Block diagram – CRT – Applications - Measurements of voltage, frequency and phase difference using CRO - Time base and synchronization – Dural trace CRO – Digital storage oscilloscope – Block diagram	**12**

TEXT BOOK

S.No	Title	Author	Publishers
1.	A Course in Electrical and Electronics Measurements and Instrumentation	A.K. Sawhney	Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993

REFERENCE BOOK

S.No	Title	Author	Publishers
1.	Electronic Instrumentation	HS Kalsi	Tata Mc Graw Hill Publishing Co., Delhi 2010
2.	Modern Electronic Instrumentation and Measurement techniques	Albert D. Helfrick William David Cooper	Prentic – Hall of India (P) Ltd., New Delhi 2010
3.	Electronics and Instrumentation	Dr.S.K.Battachariya Dr. Renu Vig	S.K. Kataria & Sons, New Delhi
4.	A course in Electrical and Electronic Measurement and Instrumentation	Umesh Sinha	Satya Prakashan, New Delhi