

S.E. (ELECTRONICS) SEMESTER IV

Electronic and Electrical Measuring Instruments and Machine

Period per week	Lecture	4	
	Practical	2	
	Tutorial	---	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical	---	---
	Oral Examination	----	25
	Term Work	---	25
	Total	---	150

Detailed Syllabus		Lectures/Week
1	<p>Electronic and Digital Voltmeters: Principles of operation, advantages over conventional type analog voltmeters, basic voltmeter, peak reading, average reading true RMS reading, sampling type, FET voltmeters, sensitivity considerations & calculations. Methods of analog-to-digital and digital-to-analog conversion, principles of operation and typical specifications of a digital voltmeter, description of various types of DVMS with block diagrams, Resolution and Sensitivity of a digital meter, digital displays for meters.</p>	08
2.	<p>Frequency meters, phase meters and signal generators: Analog-schematic & operational details, limitations. Digital Frequency meters, Phase measurement by voltage addition method, balanced modulation type, phase meters using flip-flops, digital meters, advantages & limitations of each type. Requirement of a good laboratory type signal generator, A.F. signal generators, Beat frequency oscillator & its advantages.</p>	09
3.	<p>Oscilloscopes: Block diagram study of C.R.O., Description of panel layout & implementation of controls. Requirement of time base, triggered time base, delayed time base, external triggering etc. Lissajous patterns, use of these in phase & frequency measurements. Frequency time base, Wobbler scope & its applications, Dual trace, multi trace, Double beam, Sampling; Storage, Digital read-out oscilloscopes. Use of CRO in square wave testing of amplifiers, tracing of diode & transistor characteristics.</p>	09

4	Basic measuring instruments: Essentials of indicating instruments – deflecting, controlling and damping torque. Construction and working principles of moving iron and moving coil ammeters and voltmeters, electro-dynamometer watt-meters, induction type energy meters, power factor meters, instrument transformers.	12
5	Measurement of R, L and C: Measurement of low, medium, high resistances: Ohmmeter, Kelvin's double bridge, Wheatstone's bridge, Megger. Measurement of inductance: Maxwell's, Hay's and Anderson's bridge. Measurement of capacitance: Schering bridge.	08
6	6.1 DC Motors : Back e.m.f., voltage equation, characteristics of series, shunt and compound motors, torque equations, speed control of dc shunt/series motors, three point and four point starter and applications of dc motors. 6.2 Three phase induction motors: Construction and principle of operation, slip, rotor frequency, torque equation, torque-speed characteristics, starting methods of induction motors. 6.3 Stepper motors: Construction, working principle and applications of variable reluctance, permanent magnet and hybrid stepper motors.	04 03 03

Text books:

- 1) Cooper W. D. & Helfrick A.D., Electronics Instrumentation & Measurement Techniques, third edition Prentice Hall of India, 1985
- 2) Kalsi H.S., Electronic Instrumentation, first edition, Tata McGraw Hill, 1997.
- 3) Electrical and electronic measuring instruments: A.K.Sawhney.

Reference Books;

- 1) Electrical Measurements and measuring instruments: Golding and Widdis.
- 2) Electric Machines: Nagrath and Kothari.

Termwork:

The Termwork shall consist of at least eight experiments and three assignments covering the whole syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

SUGGESTED LIST OF EXPERIMENTS

- 1 Study of dual integrating DVM.
- 2
 - a) Measurement of frequency using intensity modulation.
 - b) Design and implementation of digital phase meter.
 - c) Design and implementation of digital frequency meter.
- 3
 - a) Measurement of frequency using Lissajous patterns.
 - b) Measurement of phase difference using X Y mode of CRO.
 - c) Application of CRO for component testing.
- 4
 - a) Calibration of single phase energy meter.
 - b) Conversion of galvanometer into ammeter/voltmeter.
- 5
 - a) Measurement of unknown resistance using Kelvin's double bridge.
 - b) Measurement of unknown capacitance using Schering's bridge.
 - c) Measurement of unknown inductance using Anderson's bridge.
- 6
 - a) Speed control of dc shunt motor using armature and field control.
 - b) Starting of three phase induction motor using auto transformer starter.

