

KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : EE C205
Course Title : **Electrical Measurements**
Course Structure : 3-0-2
Course coordinator : Mr D Kalyan
Instructors : J Sravanthi, V Usha Rani, G. Madhusudhan Rao, D.Seshu Reddy,

1. Course Description:

Moving Coil instruments, Permanent magnet moving coil, Moving Iron instruments for the measurement of voltage, current, power, and Frequency. Measurement of Inductance and capacitance – Anderson, Schering Bridge. Magnetic measurements- B-H loops, Digital Instruments- DVM's, Operation of CRO. Transducers – classification, selection, Strain gauges, LVDT.

2. Scope and Objective of the Course:

The measurement of a quantity is essential to design any system. The advancement of science and technology is depends upon a parallel progress in measurement techniques. The aim of this course is to give the broad categories of electrical parameter measurements like resistance measurement, current, voltage and power measurement using varieties of meters. The measurement course gives a fundamental base for students to implement innovative thoughts into action.

3. Books:

(i) Textbook:

- a. A Course in Electrical and Electronic Measurements and Instrumentation by A.K.Sawhney, Dhanpat Rai & Co, 18th Revised Ed.
- b. A Course in Electronic and Electrical Measurements and Instrumentation by J B Gupta, S K Kataria & Sons, 12th Revised Ed.

(ii) Reference Book:

- a. Electric measurements & measuring instruments by Harris
- b. Electrical measurements by Baldwin
- c. Electrical measurements by H.V.Satyanarayana
- d. Electrical Measurements by E.W.Golding

4. Syllabus:

UNIT – I

Instruments:

Permanent magnet moving coil, moving iron, dynamometer, induction electrostatic indicating instruments for current, voltage, power, energy, power factor meters, frequency meters and Synchroscope.

UNIT – II

Instrument Transformers:

CTs, PTs, principle of operation, extension of ranges, errors and testing

Bridges:

Measurement of inductance, capacitance and resistance bridge methods, Maxwell's, Anderson's, Wien's, Heaviside's, Campbell's, Schering's, Kelvin's double bridge.

UNIT – III

Magnetic Measurements:

Ballistic galvanometer, Calibration by Hibbert's magnetic standard, B-H loop, flux meter, measurement of permeability, Epstein's square.

UNIT – IV

Digital Instruments:

Principle of operation of DVM's, display devices LEDs, LCDs

Oscilloscope:

Basic operation, deflection mechanism, time base circuits, vertical amplifiers, alternate and chop modes, applications of CRO.

UNIT-V

Transducers:

Classification, principles and selection of transducers, Strain Gauge, Thermister, Thermocouple. LVDT, Opto electrical sensors

5.Course Plan:

Course plan is meant as a guideline. There may probably be changes.

Lecture No	Content	Learning Objective At the end of the session the student able to	Chapter in the textbook
1	Introduction	Understands the basics of Measurement Systems	T1 P1-P8
2	PMMC	Understands the Constructional features and working principle	T1 P294-P298
3	MI instruments	Understands the Constructional features and working principle	T1 P315-P321
4	Electro dynamo meters	Understands the Constructional features and working principle	T1 P328-P333
5	Electro static meters	Understands the Constructional features and working principle	T1 P346-P349
6	Watt meter	Understands the Constructional features and working principle	T1 P464-P472
7	Power factor meters	Understands the Constructional features and working principle	T1 P495-P500
8	Frequency meters	Understands the Constructional features and working principle	T1 P500-P506
9	Synchroscope	Understands the Constructional features	T1 P507-P508
10	Instrument	Identifies the significance of	T1

	s Transformers	transformers in the measurements	P387-P389
11	CT	Understands the Construction, phasor diagrams.	T1 P405-P411
12	PT	Understands the Construction, phasor diagrams	T1 P406-P409
13	Extension range	Extending the meter range measurements.	T1 P297
14	Maxwells bridge	Understands the bridge construction, balance equation	T1 P589
15	Andersons bridge	Understands the Bridge construction, balance equation	T1 P592-P593
16	Wien's bridge	Understands the Bridge construction, balance equation	T1 P605-P606
17	Heaveside bridge	Understands the Bridge construction, balance equation	T1 P603-P604
18	Campbell's	Understands the Bridge construction, balance equation	T1 P605-P606
19	Schering bridge	Understands the Bridge construction, balance equation	T1 P598-P599
20	Kelvin's double	Understands the Bridge construction, balance equation	T1 P534-P535
21	Magnetic measurements	Basics of magnetic measurement parameters.	T1 P660-P670
22	Calibration of galvanometers	Understands the working principle	T1 P661-P662
23	B-H loop	Understands the concept of Hysterisis	T1 P663-P664
24	B-H loop	Understands B-H graph analysis	T1 P664-P665
25	Flux meter	Understands the Working principle	T1 P673-P675
26	Measurement of permeability	Evaluates the permeability	T1 P674-P675
27	Epstein's square	Understands epstein's square Method	T1 P676-P679
28	DVM's-Introduction	Introduction to digital systems significance	T 1 P1303- P1305
29	Types of DVM's	Classify various DVM's	T1 P1305- P1307
30	Display devices	Overview on various display devices	T1 P1276-

			P1278
31	LED's	Understands working of LED	T1 P1284- P1285
32	LCD's	Understands the LCD working	T1 P1285- P1287
33	Cathode ray tube	Understands basics of CRO	T1 P784-P788
34	Basic operation	Understands Operation principle	T1 P784-P787
35	Deflection mechanism	Understands the CRT working mechanism	T1 P785-P787
36	Time base circuits	Analyses the Time base circuits	T1 P794-P797
37	CRO - Modes	Distinguishes the modes of operation	T1 P801-P803
38	Applications of CRO	Apply for various measurements	T1 P810-P814
39	Introduction	Understands the basics of transducer	T1 P913
40	Transducers- Classification	Classify various transducers	T1 P913-P918
41	Principles of transducers Selection of Transducers	Understands the principle of operations, selection of transducer	T1 P935-P936
42	Strain gauges, Strain measurements	Understands the strain gauge principle and types	T1 P964-P971
43	Thermistors, Thermocouples	Analyze the output characteristic	T1 P979-P991
44	LVDT	Understands Operation, calibration and application	T1 P1001- P1008
45	Opto electric sensors	Understands the principle and applications	T 1 P1046- P1054

6. Self learning material:

UNIT	TOPIC	SOURCE
I	Basic principles of Non-electrical measurement systems(Mechanical& Optical)	Will be uploaded in E-learning site
I	2/3 Wattmeter method to measure power in AC circuit	Will be uploaded in E-learning site
II	Methods to find earth's resistance	Will be uploaded in E-learning site
II	Industrial application of AC/DC bridges.	Will be uploaded in E-learning site
III	Derivation for the governing equations of Ballistic and flux meters	Check out in Prescribed Text book
III	List out the underwater magnetic measurement systems with principles	Will be uploaded in E-learning site
IV	Detailed features of digital storage oscilloscope	Will be uploaded in E-learning site
V	Aero space/Nuclear application of thermocouple	Will be uploaded in E-learning site
V	Design various signal conditioning circuits for various transducers.	Will be uploaded in E-learning site

7. Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	7.5	10	13-08-2010 9.30 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Test-2	50 Min	7.5	10	17-09-2010 9.30 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Assignment submission		3.75	5	Continuous	
Assignment Test	50 Min	3.75	5	29-10-2010 9.00 to 10.20	CSE001,004, 005,101,102,

				A.M	105,106,201, 204,205,301, 509, NSH
Quiz	30 Min	3.75	5	29-10-2010 9.00 to 10.20 A.M	CSE001,004, 005,101,102, 105,106,201, 204,205,301, 509, NSH
Regular Lab Evaluation	Continuous	12.5	50		
Comprehensive Lab Exam	3 Hrs	10	40		
Comprehensive Exam	3 Hrs	45	60		
Attendance for Theory & Tutorial		3.75	5	Continuous	
Attendance for Lab		2.5	10	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

Course Coordinator