

**Kadi Sarva Vishvavidyalaya, Gandhinagar**  
**Bachelor of Engineering (Electrical Engineering Syllabus)**

**ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS**  
**B.E. SEM – III**  
**SUB. CODE: EE- 303**

**A. Course Objective:**

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Electrical measurement techniques.
- To focus on the study of electrical measurements.

**B. Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EE-303	Electrical Measurement & Measuring Instruments	3	0	2	5	4	3	70	30	20	30	150

**C. Detailed Syllabus**

1. Concepts of Measurements & Measurement Systems: Introduction to measurement and instrumentation, S. I. system, methods of measurement, static and dynamic characteristics of instruments, definitions – true value, accuracy, error, precision, sensitivity, resolution etc.
2. Analog Electromechanical Instruments: Classification of analog instruments, principle of operation, operating forces, errors in ammeters and voltmeters, permanent magnet moving coil, moving iron, dynamometer type, induction type, electrostatic type instruments.
3. Measurement of Power and Energy: Electrodynamometer type wattmeter, measurement of power in three phase circuits, three phase wattmeter, measurement of reactive power, energy meter for A.C. circuits, induction type energy meter
4. Miscellaneous Measuring Instruments: Maximum demand indicator, tri-vector meter, power factor meter, frequency meters, synchroscope.

**Kadi Sarva Vishvavidyalaya, Gandhinagar**  
**Bachelor of Engineering (Electrical Engineering Syllabus)**

5. Measurement of Resistance: Measurement of low, medium & high resistances, insulation resistance measurement, localization of cable fault, Loop tests.
6. Measurement of Inductance and Capacitance: A. C. bridges for inductance measurement- Maxwell, Hays, anderson and owen bridges, capacitance measurement – Desauty and Schering Bridge. measurement of frequency by Wien's bridge.
7. Potentiometers: Principle of D. C. potentiometer, direct reading potentiometers, accurate forms of potentiometers, A. C. potentiometer principle, polar and Co - ordinate type A. C. potentiometer, applications of A. C. and D. C. potentiometers.

**D. Lesson Planning**

SR No.	No. of Hours	% Weigh tage in Exam	Topic
1	07	35	Concepts of Measurements & Measurement Systems: Introduction to measurement and instrumentation, S. I. system, methods of measurement, static and dynamic characteristics of instruments, definitions – true value, accuracy, error, precision, sensitivity, resolution etc.
2	05		Analog Electromechanical Instruments: Classification of analog instruments, principle of operation, operating forces, errors in ammeters and voltmeters.
3	03		permanent magnet moving coil, moving iron, dynamometer type, induction type, electrostatic type instruments.
4	08	35	Measurement of Power and Energy: Electro dynamometer type wattmeter, measurement of power in three phase circuits, three phase wattmeter, measurement of reactive power, energy meter for A.C. circuits, induction type energy meter
5	07		Miscellaneous Measuring Instruments: Maximum demand indicator, tri-vector meter, power factor meter, frequency meters, synchroscope.  Measurement of Resistance: Measurement of low, medium & high resistances, insulation resistance measurement, localization of cable fault, Loop tests.
6	06	15	Measurement of Inductance and Capacitance: A. C. bridges for inductance measurement- Maxwell, Hays, anderson and owen bridges, capacitance measurement – Desauty and Schering Bridge. measurement of frequency by Wien's bridge.
7	05		Potentiometers: Principle of D. C. potentiometer, direct reading potentiometers, accurate forms of potentiometers,
8	04	15	A. C. potentiometer principle, polar and Co - ordinate type A. C. potentiometer, applications of A. C. and D. C. potentiometers.
TOTAL	45	100	

**Kadi Sarva Vishvavidyalaya, Gandhinagar**  
**Bachelor of Engineering (Electrical Engineering Syllabus)**

**E. Instructional Method & Pedagogy**

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- Two internal exams may be conducted and average of the same may be converted to equivalent of 15 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry a weight age of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar /Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.
- Experiments shall be performed in the laboratory related to course contents.
  - 1 Study of principle of operation of various types of electromechanical measuring instruments.
  - 2 Measurement of resistance using Wheatstone Bridge.
  - 3 Measurement of resistance using kelvin's Bridge.
  - 4 Measurement of self inductance using Anderson's Bridge.
  - 5 Measurement of capacitance using Schering Bridge.
  - 6 Plotting of Hysteresis loop for a magnetic material using flux meter.
  - 7 Measurement of frequency using Wein's Bridge.
  - 8 To study the connections and use of Current and potential transformers and to find out ratio error.
  - 9 Determination of frequency and phase angle using CRO.
  - 10 Measurement of unknown voltage using potentiometer.

**F. Students Learning Outcomes**

On successful completion of the course

- The student can acquire the basic knowledge of measurement principles and their application in electrical engineering.
- The students will be able to effectively employ electrical and electronics instruments for measurements of various electrical quantities.

**G. Recommended Study Materials**

**Text &Reference Books:**

1. J. B. Gupta - A course in Electronic and Electrical measurements and Instrumentation, S. K. Kataria Publication
  2. R.K.Rajput - Electrical and Electronic Measurements and Instrumentation
- Reference Books:
1. A. K. Sawhney - A course in Electrical Measurement and Measuring Instruments
  2. E. W. Golding - Electrical & Electronic Measurements & Instrumentation
  3. A. D. Helfrick and W.D. Cooper- Modern Electronic Instrumentation and Meas. Techniques
  4. U.A.Bakshi - Electrical and Electronic Measuring Instruments Text Books: