**17EE2103-ELECTRICAL MEASUREMENTS**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 2-2-0 |
| **Pre-requisite:** | Basic electrical sciences, principle's of energy conversion. | **Sessional Evaluation:****External Exam Evaluation:****Total Marks:** | 4060100 |

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| **Course Objectives:** | 1. To provide knowledge in the specific area of electrical measuring instruments.
2. To impart knowledge on various potentiometers and bridges (both DC & AC).
3. To learn the working principle of indicating instruments and integrating instruments.
4. To learn knowledge on various instrument transformers, frequency meters and power factor meters and to understand the calibration of various meters .
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| **Course Outcomes:** | After completing the course the student will be able to |
| CO1 | Understand the basics of measurements. |
| CO2 | Empathize various types of measurements, requirement of calibrations and instruments with errors in measurement etc. |
| CO3 | Compare the working principles, merits, demerits and errors of different types of indicating instruments and integrating instruments. |
| CO4 | Know the working principle of instrument transformers, frequency meters and power factor meters. |
| CO5 | Understand the working of DC and AC potentiometers. |
| CO6 | Discriminate different bridges used for measurement of resistance, capacitance and inductance. |
| **Course Content:** | **UNIT-I****General theory of instruments:** Accuracy, Precision, Resolution, sensitivity, types of Errors. **Classification of instruments**-characteristics of measurement system-deflecting, control and damping torques-types of supports.**UNIT-II****Ammeters and Voltmeters:** PMMC, Moving Iron, rectifier, thermal type instruments – deflecting torque and control torque – Errors and compensations, range extension of ammeter and voltmeter–Ohmmeter.**UNIT-III****Measurement of power:** Single phase dynamometer wattmeter, expression for deflecting and control torques – errors and compensations –Range extension of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. **Single phase Induction type Energy meter** :Driving and braking torques – errors and compensations – testing by phantom loading. Three phase energy meter – trivector meter.**UNIT-IV****Instrument transformers:** CT and PT – Ratio and phase angle errors – design considerations.**Power Factor meters:** Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph P.F meters.**Frequency meters:** Resonance type and Weston type – synchroscopes. **UNIT-V****Potentiometers:** Principle and operation of D.C. Crompton’s potentiometer – standardization – Measurement of unknown resistance, current, voltage. **A.C. Potentiometers:** Polar and co-ordinate types standardization – applications.**UNIT-VI****Resistance measurement:** Ammeter Voltmeter method – Wheatstone’s bridge – Kelvin’s double bridge – Megger – loss of charge method. **AC bridges:** **Measurement of Inductance:** Maxwell’s bridge– Hay’s bridge– Anderson’s bridge–Owen’s bridge.**Measurement of Capacitance:** Desauty bridge–Wien’s bridge – Schering Bridge. |
| **Text Books & Reference Books:** | **TEXT BOOKS:**1. “Electrical and Electronics Measurements and Instrumentation”, Prithwiraj

Purkait, Tata McGraw Hill, 2013. 1. “Electrical & Electronic Measurements and Instrumentation”, A.K. Sawhney, Dhanpath Rai& Co (P) Ltd, 2004.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and

F.C. Widdis, 5th Edition Reem publication,2011.**REFERENCE BOOKS:**1. “ Electrical Measurements and Measuring Instruments”, [Rajendra Prasad](https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Rajendra+Prasad%22),

Khanna publications,1984.1. “Electrical and Electronics Measurements”, R.K.Rajput, S.Chand publications.
2. Electrical Measurements: Fundamentals, Concepts, Applications – by

Reissland, M.U, New Age International (P)Limited,2010. |
| **E-Resources:** | http://nptel.ac.in/courseshttp://iete-elan.ac.inhttp://freevideolectures.com/university/iitm |