# 19EE1101 - BASIC ELECTRICAL SCIENCES

**(Common to EEE, CSE & IT)**

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| Course Category: | Professional core | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 2-1-0 |
| Prerequisite: | Fundamental concepts of Electricity and Electromagnetic induction. | Sessional Evaluation:Univ. Exam Evaluation:Total Marks: | 4060100 |
| Objectives: | Students undergoing this course are expected to understand:1. Basic characteristics of R, L, C parameters and network reduction techniques.
2. The concept of form factor, Crest factor and j notation.
3. The concept of power triangle, series and parallel connection of R, L & C elements with sinusoidal Excitation.
4. Concepts of Graph theory and application of KCL and KVL.
5. Concept of inductance & mutual inductance, Dot convention and coefficient of coupling.
6. Concept of Series, parallel resonance and current locus diagrams
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| Course Outcomes | Upon successful completion of the course, the students will be able to: |
| CO1 | Find the equivalent resistance by using network reduction Techniques. |
| CO2 | Calculate average, RMS, form factor & crest factor for a given periodic waveform. |
| CO3 | Determine the real power, reactive power, power factor and response for a given circuit and Excitation. |
| CO4 | Understand the concepts of graph theory and apply nodal and mesh analysis for the given circuit. |
| CO5 | Perform the calculation of coefficient of coupling (K) and equivalent inductance for a given coupled coil. |
| CO6 | Accomplish the computation of Quality factor, band width and current locus diagram for a given electrical circuit. |
| Course Content | UNIT-I**Concept of Electric Circuits**: Introduction, Active and passive elements, V-I Characteristics of R, L and C elements, Ideal & Practical Sources, Source Transformation, Kirchhoff’s laws, Network reduction techniques, Star-Delta transformation.UNIT-II**Fundamentals of AC circuits:** R.M.S, Average values, form factor and crest factor for different periodic wave forms, Sinusoidal Alternating Quantities - Phase and Phase Difference, Complex and Polar Forms of Representations, j-Notation. Concept of Reactance, Impedance, Susceptance and Admittance.UNIT-III**Single Phase AC Circuits:** Concept of Active and reactive power, power factor –power triangle. Examples Steady state Analysis of R, L and C elements (in series, parallel and series parallel combinations) –with sinusoidal Excitation - Phasor Diagrams-Examples.UNIT-IV**Graph Theory:** Network topology, Cut set and Tie set matrices – Incident matrices – Problems.**Analysis of Electrical Circuits:** Mesh and Nodal analysis of DC and AC circuits concept of super mesh and Super node with only independent sources.UNIT-V**Coupled Coils**: Faraday’s Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention in coupled coils, Equivalent inductance of series and parallel connection coupled coils, Coefficient of Coupling.UNIT-VI**Resonance:** Series and parallel Resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies- Bandwidth – Quality factor.**Locus Diagrams:** Locus diagramsof Series and parallel combinations of R-L, R-C with variation of parameters. |
| Text Books &ReferencesBooks | **TEXT BOOKS**1. “Engineering Circuit Analysis”, by Hayt & Kemmerly, Fourth edition,TMH publishers
2. “Network Analysis”, by M.E Van Valkenburg, third edition, PHI learning private Limited, 2006.
3. “Fundamentals of Electric circuits”, by Charles k Alexander, Mathew N O Sadiku, Tata McGraw Hill Education Private Limited, sixth edition,2017.

**REFERENCE BOOKS**1. “Circuits & Networks”, by A.Sudhakar and Shyam Mohan , Fifth edition(2015),TMH
2. “Circuit Theory”, by A.Chakrabarti , Dhanpat Rai publishers, sixth edition 2014.
3. “Circuits & Systems”, by Dr K.M.Soni, S.K.Kataria& sons Publication, Eleventh edition, Reprint 2016.
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| E-Resources | 1. <http://nptel.ac.in/courses>
2. <http://iete-elan.ac.in>
3. <http://freevideolectures.com/university/iitm>
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