# 17EE1101 - BASIC ELECTRICAL SCIENCES

(Common for EEE, ECE, CSE & IT)

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| **Course Category:** | Professional Core | **Credits:** | 4 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 3-2-0 |
| **Prerequisite:** | Fundamental concepts of Electricity and electromagnetic induction. | **Sessional Evaluation:**  **Univ. Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Objectives** | Students undergoing this course are expected to understand:   * Basic characteristics of R, L, C parameters and Network Reduction techniques. * The concept of form factor, Crest factor and j notation. * The concept of power triangle, series and parallel connection of R, L & C elements with sinusoidal Excitation. * Application of Graph theory to Electrical circuits. * Application of K.C.L and K.V.L * Concept of inductance & mutual inductance, Dot convention and coefficient of coupling. * Concept of Series and parallel resonance and current locus diagrams | | |

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| **Course Outcomes** | After completing the course the student will be able to | |
| CO1 | Given an Electrical network, find the equivalent resistance by using network reduction Techniques. |
| CO2 | Given a periodic waveform, finding the average, rms, form factor &crest factor. |
| CO3 | For a given circuit and the Excitation, determine the real power, reactive power, power factor and response of the circuit. |
| CO4 | For a given electrical network, able to apply nodal and mesh analysis. |
| CO5 | For a given magnetic circuits, finding the coefficient of coupling (K), and finding the equivalent inductance. |
| CO6 | For a given electrical circuit, finding Quality factor, band width and drawing current locus diagrams. |
| **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 valves , 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 application to circuit analysis- Problems - Duality & Dual circuits – Problems  **Analysis of Electrical Circuits:** Mesh and Nodal analysis of DC and AC circuits concept of super mesh and Super node.  UNIT-V  **Magnetic Circuits:** Faraday’s Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention in coupled coils, Coefficient of Coupling, Analysis of Series and Parallel Magnetic Circuits, MMF Calculations- Composite Magnetic Circuit.  UNIT-VI  **Resonance:** Series and parallel Resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies- Bandwidth – Quality factor.  **Locus Diagrams:** Series and parallel combinations of R-L, R-C, and R-L-C with variation of parameters. | |
| **Text Books and References** | Text Books:   1. “Engineering Circuit Analysis” by Hayt & Kemmerly, TMH publishers 2. “Network Analysis” by M.E Van Valkenburg,Third edition ,PHI learning private limited 3. ”Fundamentals of Electric circuits” by Charles k Alexander,Mathew N O Sadiku,Tata McGraw Hill Education private Limited | |
| Reference Books:   1. “Circuits & Networks” by A.Sudhakar and Shyam Mohan - TMH 2. “Circuit Theory” by A.Chakarabarti - Dhanpat Rai publishers 3. “Circuits & Systems” by K.M.Soni – Kataria Publishers | |
| **E-Resources** | 1. <https://nptel.ac.in/courses> 2. <http://iete-elan.ac.in> 3. <https://freevideolectures.com/university/iitm> | |