**20EE1101 - BASIC ELECTRICAL SCIENCES**

**(EEE)**

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| **Course Category:** | Professional core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Fundamental concepts of Electricity and electromagnetic induction. | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | Students undergoing this course are expected to learn: | |
| 1. Basic characteristics of R, L, C parameters and network reduction techniques. 2. The concept of form factor, Crest factor ,j notation and power triangle 3. The concept of series and parallel connection of R, L & C elements with sinusoidal Excitation and also graph theory concepts 4. Concepts of 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 | |
| **Course Outcomes:** | After completing the course the student 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 and determine the real power, reactive power& power factor. |
| **CO3** | Determine steady state response for a given circuit and understand the concepts of graph theory. |
| **CO4** | Understand 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. Concept of Active and reactive power, power factor –power triangle, Examples.  **UNIT – III**  **Single Phase AC Circuits:** Steady state Analysis of R, L and C elements (in series, parallel and series parallel combinations) – with sinusoidal Excitation - Phasor diagrams-Examples.  **Graph Theory:** Network topology, Cut set and Tie set matrices – Incident matrices – Problems.  **UNIT – IV**  **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 diagrams of Series and parallel combinations of R-L, R-C with variation of parameters. | |
| **Text Books & Reference Books:** | **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, DhanpatRai publishers, sixth edition 2014.  3. “Circuits & Systems”, by Dr K.M.Soni, S.K.Kataria & sons Publication, Eleventh edition, Reprint 2016. | |
| **E-Resources:** | http://nptel.ac.in/courses  http://iete-elan.ac.in  http://freevideolectures.com/university/iitm | |