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| Course No | Course Name |  L-T-P-Credits |
| **EE 205**  | **Network Theory** |  **3-0-0: 3** |
| Pre-requisite: nil Co-requisite: nil |
|  **Course Objectives**:1. To understand basic electrical networks, their laws and topologies.2. To familiarize students with network analysis and its characteristics. |
|  **SYLLABUS** |
| **Module** | **Contents** | **Hours** |
| I | **Introduction to electrical circuits**:Electrical Circuit and Network: Concept and Terminology, Classification of electrical networks, R-L-C Parameters, Voltage and current sources, Independent and dependent sources, Source transformation, Voltage-current relationship for passive elements, Kirchhoff’s laws, Network reduction techniques-Series, Parallel, Series-parallel, Star to Delta transformation, Nodal and Mesh analysis. Concept of Self and Mutual inductance, Co-efficient of coupling, Dot convention and loop analysis. | 07 |
| II | **Network theorems:**Statement and proof: Superposition theorem, Thevenin’s theorem, Norton’s theorem, Maximum power transfer theorem, Millman’s theorem, Reciprocity theorem, Tellegen’s theorem under the dependent and independent sources for DC and AC excitation.**Resonance in AC circuits:** Characteristics and properties of resonance circuits, Series and parallel resonance circuits, Selectivity, Bandwidth and Quality factor.  | 08 |
| III | **Laplace transform and Transient analysis:** Advantages of Laplace transform method, Definition and basic theorems of Laplace transform, Laplace transform of some basic functions and periodic functions, Inverse Laplace transform, Transient response of R-L, R-C, R-L-C networks using Laplace transform method with DC and AC excitation. Response to step, Impulse and ramp inputs. | 07 |
| IV | **Two port networks:**Limitations Z, Y, ABCD, h-parameters, Conversion of one parameter to another parameter, Condition for reciprocity and symmetry, Two port network connections in series, parallel and cascaded.**Network topology:**Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and Loop currents, Cut-set matrix and node pair potentials, Duality and Dual networks. | 09 |
| V | **Fourier series & Fourier transforms:**Fourier series representation of non-sinusoidal waves, Discrete spectra, rms values of non-sinusoidal waves, Steady state response of linear circuits to non-sinusoidal waves, Power in such circuits, Applications to RL and RC circuits, Fourier transform of signum and step functions. | 05 |

**Essential Readings:**

1. Franklin F. Kuo, “Network Analysis and Synthesis”, John Wiley & Sons, Second Edition, 2006.
2. M. E. Van Valkenburg, “Network Analysis”, Prentice-Hall of India Pvt. Ltd., Third Edition, 2014.
3. S. P. Ghosh and A. K. Chakraborty, “Network Analysis and Synthesis”, McGraw Hill Education India Pvt. Ltd., Fourth Edition, 2010.
4. D. Roy Choudhary, “Networks and Systems”, Second Edition, New Age International, 2013.

**Supplementary Readings:**

1. W. H. Hayt and J. E. Kemmerley, “Engineering Circuit Analysis”, Tata McGraw Hill, Eighth Edition, 2013.
2. A. Chakrabarti, “Circuit Theory: Analysis and Synthesis”, Sixth Edition, Dhanpat Rai & Co., 2014.
3. C. L. Wadhwa, “Network Analysis and Synthesis”, New Age International Publishers, 2007
4. Donald E. Scott, “An Introduction to Circuit analysis: A System Approach”, New edition McGraw Hill Inc., 1987.