**20EE1202 - ELECTRICAL CIRCUITS**

(ECE)

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| **Course category:** | | Professional core | | **Credits:** | 3 |
| **Course Type:** | | Theory | | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Prerequisite:** | | Fundamentals in engineering mathematics and concepts of Electricity in physics | | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |
| **Course**  **Objectives** | Students undergoing this course are expected to understand: | | | | |
| 1. The basic concepts of R, L, C elements 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. About the network theorems and their applications. 5. The two port network parameters for the given network. 6. The transient response of RL, RC, RLC series circuit for DC excitation. | | | | |
| **Course Outcomes** | Upon successful completion of the course , the students will be able to: | | | | |
| CO1 | | Perform the equivalent resistance calculation of electrical circuits and also find the solution of DC circuits by Nodal and Mesh analysis. | | |
| CO2 | | Compute the average, RMS, form factor &crest factor of a periodic waveform. | | |
| CO3 | | Enumerates real power, reactive power, apparent power and power factor for a given circuit and also evaluate the resonant frequency, Quality factor, band width. | | |
| CO4 | | Calculate the response for a given network using network theorems. | | |
| CO5 | | Evaluate the two port network parameters for the given network. | | |
| CO6 | | Determine the time constant and transient response of a given circuit with and without D.C excitation. | | |
| **Course**  **Content**  **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, Network reduction techniques, Star-Delta transformation, Kirchhoff’s laws - Mesh and Nodal analysis of DC circuits with independent sources.  **UNIT – II**  **FUNDAMENTALS OF AC CIRCUITS:** R.M.S, Average values , Form factor and Crest factor for different periodic waveforms, 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 (series, parallel and series-parallel combinations) with sinusoidal excitation - Phasor diagrams-Examples.  **RESONANCE:** Series and parallel resonance, Half power frequencies, Bandwidth and Q factor, Relation between half power frequencies, Bandwidth & Quality factor.  **UNIT- IV**  **NETWORK THEOREMS:** Superposition, Reciprocity, Thevenin’s and Norton’s theorems, Maximum power transfer theorem. Application of these theorems to DC excitation with dependent and independent sources.  **UNIT – V**  **TWO PORT NETWORK PARAMETERS** - Open circuit parameters – Short circuit parameters – Transmission parameters - Hybrid parameters –Inter-relationships of different parameters - Condition for reciprocity and symmetry of networks with different two port parameters.  **UNIT – VI**  **D.C TRANSIENT ANALYSIS:** Transient response of R-L, R-C & R-L-C circuits for DC excitations - initial conditions -Time constants -solution using Differential equation & Laplace transform methods. | | | | |
| **Text Books and Reference Books** | **TEXT BOOKS:**   1. “Engineering Circuit Analysis”, by Hayt & Kemmerly, 2nd Edition,TMH publishers 2. “Network Analysis”, by M.E Van Valkenburg,Third Edition,PHI learning private   Limited, 2006.   1. “Fundamentals of Electric circuits”, by Charles k Alexander,Mathew N O Sadiku,Tata McGraw Hill Education private Limited, 6th Edition,2017.   **REFERENCE BOOKS:**   1. “Circuits & Networks”, by A.Sudhakar and Shyam Mohan , 5th Edition(2015),TMH 2. “Circuit Theory”, by A.Chakrabarti, Dhanpat Rai publishers 6th Edition (2014). 3. “Circuits & Systems”, by Dr K.M.Soni, S.K.Kataria& sons Publication(2014). | | | | |
| **E-Resources** | 1. <http://nptel.ac.in/courses>  2. <http://iete-elan.ac.in>  3. http://freevideolectures.com/university/iitm | | | | |

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| Contribution of Course Outcomes towards achievement of Program Outcomes (3-High, 2-Medium, 1-Low) | | | | | | | | | | | | | | |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | - | 3 | 3 | - | - | - | - | 3 | 2 | 3 | - |
| CO2 | 3 | 3 | 2 | - | 3 | 3 | - | - | - | - | 3 | 3 | 3 | - |
| CO3 | 3 | 3 | 3 | - | 3 | 2 | - | - | - | - | 3 | 3 | 3 | - |
| CO4 | 3 | 3 | 2 | - | 3 | 2 | - | - | - | - | 3 | 2 | 3 | - |
| CO5 | 3 | 3 | 2 | - | 3 | 2 | - | - | - | - | 3 | 3 | 3 | - |
| CO6 | 3 | 3 | 2 | - | 3 | 3 | - | - | - | - | 3 | 2 | 3 | - |