Prerequisite: None	ECM1001		Circuit Th	eory				LT	P J	C
Objectives: • This course will provide the students with an overview of the fundamental concepts in Electrical Engineering Expected Outcome: 1. Derive the empirical relationship between power, voltage and current and analyze DC a AC circuits with dependent sources in steady state. 2. Understand application of network theorems for electrical circuits. 3. Understand paplication of Laplace Transform in linear network analysis. 5. Understand basics of two port networks and its different parameters like Z,Y, h,ABCD. 6. Design passive filters for various applications Student Learning Outcomes (SLO): 1,2,14 Module:1 DC Circuit analysis: 4 hours SI Mesh Analysis, Node voltage analysis, Network Theorems- Source transformation, Superpositheorem, Thevenin's & Norton's theorem, Maximum power transfer theorem Module:2 DC Transients: 4 hours SI Source free RC circuits, Source free RL circuits, Step response of RC circuits, Step response RL circuits, Response of second order circuit (RLC)-Series, parallel circuits. Module:3 Sinusoidal Steady -State Analysis: 4 hours SI Sinusoids, Average value, Root Mean Square value, Phasors, Complex impedance, AC cir analysis. Module:4 Complex power and Resonance: 4 hours SI Concept of complex power, Series and parallel resonance, Introduction to coupled circuits. Module:5 Circuit Analysis in the S domain: 5 hours SI Introduction to Laplace transform, Analysis of circuits using Laplace transforms, poles, zeros transfer functions.								2 0	2 0	3
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Significance and applications of one port and two networks, Two port network analysis using Admittance (Y) parameters, Impedance (Z) parameters, S-Parameters, Hybrid (h) parameters, Transmission (ABCD) Parameters, Interconnection of Two port networks.

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List of Challenging Experiments (Indicative)

- 1. Design a resistive circuit to derive the specified load voltage and load current from a DC power source.
- 2. Build and test the voltage across and the current through any element using appropriate circuit analysis techniques.
- **3.** Build and test the voltage across and the current through any element driven by more than one source.
- **4.** Build a circuit with appropriate number of nodes with a variable load and determine the voltage and current.
- **5.** Design a circuit topology having star/delta connected network and determine the resistance at which the maximum brightness of the LED (Load device) occurs.
- **6.** For a given time constant, design a RL/RC circuit. Determine its current/voltage response and analyse the step response and the source free response of your circuit with initial conditions.
- **7.** Design a temporary power source using energy storage elements and determine the capacity of the power source.
- **8.** Design a phase shifter circuit for a given phase shift and validate its phasor diagram.
- 9. For a given a reactive load (Inductive/Capacitive) and determine the power factor of the load.
- 10. Design a radio tuner circuit which tunes to a given frequency using a toroid.
- 11. Design and test the two port network that realizes the specified Z/Y parameters.
- **12.** Realize the bandpass filter for the specified band of frequencies by cascading suitable high pass filter and low pass filter.