Course Code	ECE 215
Course Name	Circuit Theory and Device [The committee suggests that the course name be changed to **Circuit Theory**]
Credits	4
Course Offered to	UG
Course Description	This course intends to develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems. Subsequently, most common aspects such as filter realization and stability will be elaborated through frequency response analysis, feedback topologies etc. Broadly, the goals of the course are to inculcate understanding of: (a) waveforms, signals, transient, and steady-state responses of RLC circuits, (b) the ability to apply circuit analysis to AC circuits, and (c) advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving circuits problems.

Pre-requisites	
Pre-requisite (Mandatory)	Pre-requisite (Desirable)
None	None
*Please insert more rows if required	

Course Outcomes				
CO1	**CO2**	**CO3**	**CO4**	**CO5**
Students are be able to analyze moderately complex electrical circuits	Students are able to synthesize simple electrical circuits (RLCs).	Students are able to find circuit response using Laplace transform.	Students are able to explain signal superposition and Fourier transform.	Students are able to use industry standard SPICE tools for simple circuit analysis.

Weekly Lecture Plan			
Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
Week 1	Introduction, Review of First-Order Circuits	CO1	Intro to MATLAB and SPICE Tools
Week 2	Review of First Order Circuits (Contd.), Second-Order Circuits - Source free Series and Parallel RLC Circuits	C01, C02, C05	Advanced Tutorials on MATLAB and SPICE Tools
Week 3 & 4	Second-Order Circuits (Contd.) - Step response of series and parallel RLC circuits, General Second Order Circuit, Second-Order Op Amp Circuits. AC Circuits: Sinusoids, Phasors, Phasor Relationships for Circuit Elements, KCL in Frequency Domain	C01, C02, C05	Assignment on first order and second order circuits. The assignments consist of problems requiring use of MATLAB and SPICE.

Week 4, 5, 6, 7	AC Circuits: Impedance Combinations, Phase-Shifters, AC Bridges. Sinusoidal Steady State Analysis: Nodal and Mesh Analysis, Superposition Theorem, Source Transformation, Thevenin and Norton Equivalent Circuits. AC Power Analysis: Instantaneous and Average Power, Maximum Average Power, Maximum Power Transfer, Apparent Power and Power Factor. Magnetically Coupled Circuits: Mutual Inductance, Energy in a Coupled Circuit, Linear and Ideal Transformers, Transformer as an Isolation Device, Transformer as a Matching Device .	C01, C02, C05	Assignments and Labs on AC ciruits, power analysis and magnetically coupled circuits. The assignments require extensive use of MATLAB and SPICE.
Week 7, 8, 9	Frequency Response: Transfer Function, Bode Plot, Series Resonance, Parallel Resonance, Passive and Active Filters. Scaling ((Magnitude, Frequency, Magnitude and Frequency)), Filter Synthesis. Intro to LT: Properties, Inverse of LT (Simple, Repeated and Complex Poles), Convolution Integral, Circuit Element Models, Circuit Analysis, Transfer Functions, State Variables.	C03, C05	Assignments on frequency response of circuits, filters, filter synthesis, laplace transforms, state variable. The assignments require extensive use of MATLAB and SPICE.
Week 10, 11,12, 13	Network Stability, Network Synthesis, Fourier Series, Symmetry, Filters, Circuit Analysis using Fourier Transforms, 2-port networks, 2 port parmaeters (Impedance, Admittance, Transmission, Scattering), Cascading of 2 port Networks	C03, C04, C05	Assignments and Labs on circuit element models, circuit analysis using Fourier Transforms, 2-port networks and cacading of 2 port networks. The assignments require extensive use of MATLAB and SPICE.

Assessment Plan	
Type of Evaluation	**% of contribution in grades**
Assignments and Labs	30
Class Test	20
Mid-Sem	25
End-Sem	25

Resource Material	
Type	**Title**
Textbook	Fundamentals of Electric Circuits, Charles K. Alexander and Mathew N. O. Sadiku, 5th Edition, Tata McGraw Hill
Textbook	Network Analysis and Synthesis, Franklin F. Kuo, 3rd edition, Wiley India