EC-204	CIRCUIT THEORY	L	T	P	C
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COURSE OBJECTIVES:

1. To develop an understanding of the fundamental laws and elements of electrical circuits.
2. To learn the energy properties of electric elements and the techniques to measure voltage and current.
3. To develop the ability to apply circuit analysis to DC and AC circuits.
4. To understand transient and steady-state response of RLC circuits and to understand advanced mathematical methods such as Laplace transforms for solving circuit problems.
5. To provide an exposure to P-Spice.

COURSE OUTCOMES:

After successful completion of the course, the students are

1. Apply the knowledge of basic circuital laws and simplify the dc and ac networks using reduction techniques.
2. analyze the dc and ac circuits using mesh and nodal analysis and network simplification theorems. Analyze the series and parallel resonant circuits.
3. infer and evaluate transient response, steady state response of series, parallel and compound circuits.
4. develop Laplace transformed network for steady state and transient analysis.
5. analyze dc and ac circuits and time domain response using P-Spice..

UNIT I **(13)**

INTRODUCTION OF CIRCUIT ELEMENTS: Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, Active and Passive circuit elements; Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division; V-I characteristics of Passive elements and their series / parallel combination; Star Delta transformation, Energy stored in Inductors and Capacitors Kirchhoff's Voltage law and Kirchhoff's Current law.

GRAPH THEORY: Introduction to Graph Theory, Tree, Branch, Link, Cutset and loop matrices, Relationship among various matrices and parameters.

UNIT II **(13)**

INTRODUCTION TO ALTERNATING CURRENTS AND VOLTAGES: Instantaneous, Peak, Average and RMS values of various waveforms; Crest factor, Form factor; Concept of phase and phase difference in sinusoidal waveforms; Phase relation in pure resistor, Inductor and capacitor; Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits

METHODS OF ANALYSIS: Introduction, Nodal Analysis, Super Node Analysis, Mesh Analysis, Super Mesh Analysis for DC and AC Circuits.

UNIT III **(13)**

CIRCUIT THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits. Application of network theorems to AC circuits

POWER AND POWER FACTOR: Computation of active, reactive and complex powers, power factor

UNIT IV **(13)**

RESONANCE: Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with frequency, Q factor, magnification, reactance curves in parallel resonance.

TRANSIENTS ANALYSIS: Steady state and transient response, Source free, DC and Sinusoidal response of an R-L, R-C, R-L-C circuits.

UNIT V **(13)**

LAPLACE TRANSFORMS: Definition of the Laplace Transform. Properties of the Laplace Transform Inverse Laplace transforms, Initial and final value theorem, Transforms of typical signals, periodic functions, Application of Laplace transforms in circuit analysis.

PSPICE: Introduction to PSpice: D.C Analysis and control statements, dependent sources, DC Sweep, AC Analysis and control statements, Transient analysis.

LEARNING RESOURCES:

TEXT BOOK(s):

1. A Sudhakar and Shyam Mohan SP - Circuits and Networks: Analysis and Synthesis, 5th Edition, TMH, 2015.
2. Ch. Alexander and M.N.O Sadiku - Fundamentals of Electrical Circuit, 5th Edition, TMH, 2013.
3. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin - Engineering Circuit Analysis, 8th Edition,TMH, 2012.

REFERENCE BOOK(s):

1. M.E.Vanvalkenburg - Network Analysis, 3rd Edition, PHI, 2003
2. Franklin F.Kuo - Network Analysis and Synthesis, 2nd Edition, JohnWiley & Sons, 2003.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/