

Course Code	Course Title	L	T	P	C
1151EC102	ELECTRIC CIRCUIT ANALYSIS	2	2	0	3

**a) Course Category**

Program Core

**b) Preamble**

The aim of this course is to develop the necessary fundamentals of circuits concepts which lays the foundation for communication engineers in analysis of practical circuits. The course deals with the analysis of circuits through graph theory, network theorems, fundamentals of AC circuit analysis, concepts of resonance, coupled circuits; transients through differential equations and Laplace transform technique.

**c) Prerequisite**

Nil

**d) Related Courses**

Electromagnetic Fields, Analog and Digital Control Systems

**e) Course Outcomes**

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Apply the basic laws and theorems for a given circuit	K3
CO2	Solve the problems on RL, RC and RLC DC transient circuit	K3
CO3	Interpret the characteristics of steady state analysis and power analysis.	K3
CO4	Apply the Laplace Transform technique to solve A/C circuits	K3
CO5	Compute the parameters of the two port N/W and the resonant frequency response characteristics.	K3

**f) Correlation of COs with POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	H	H	H	M	L	-	-	-	-	-	H	L	L	L
<b>CO2</b>	H	H	L	-	-	-	L	-	-	-	H	L	L	L
<b>CO3</b>	M	L	L	-	-	-	-	-	-	-	M	L	L	L
<b>CO4</b>	H	H	-	-	-	-	-	-	-	-	L	L	L	L
<b>CO5</b>	L	L	-	-	L	M	-	-	-	-	M	L	L	L

**g) Course Content**

**UNIT I THEOREMS IN CIRCUIT ANALYSIS 12**

Review of voltage and Current laws: KCL, KVL, Node and Mesh Analysis; Theorems: Superposition, Thevenin, Norton, Maximum power transfer, Reciprocity, Tellegens, Compensation and Milliman's.

**UNIT II DC TRANSIENT ANALYSIS 12**

RL and RC Circuits: Source free circuit-Properties of Exponential Response and Step function functions Natural and Forced Response-Driven RL and RC circuits; RLC Circuits: Source free-damped and underdamped parallel RLC circuit-Critical Damping, Source free series RLC-Complete Response and lossless Circuits.

**UNIT III SINUSOIDAL STEADY STATE AND POWER ANALYSIS 12**

Steady State Analysis: Characteristics-Forced Response to Sinusoidal functions- Phasor Relationship for passive components-Impedance and Admittance-Application of network theorems, Power Analysis: Instantaneous -Average and RMS-Power and Power factor, Introduction Magnetically Coupled Circuits.

**UNIT IV APPLICATION OF LAPLACE TRANSFORM TO CIRCUIT ANALYSIS 12**

Complex frequency and LT: complex frequency- Damped Sinusoidal forcing function- Introduction to Laplace Transform and Inverse Transform techniques: S-Domain -Impedance and Admittance Application Nodal and Mesh Analysis-Concept of Poles, Zeros and transfer function.

**UNIT V NETWORK TOPOLOGY AND TWO PORT NETWORK 12**

Graph Theory: Incidence- Tie Set and Cut matrix formulation, Two port Network: One port network Impedance Parameter- Admittance Parameter, Transmission line, Hybrid Parameter and their inter- relationship, Frequency Response: Resonant Frequency of circuits with L and C- Quality Factor and Bandwidth-Frequency and Magnitude scaling.

**Total 60 Hrs**

## **h) Learning Resources**

### **Text Books**

1. W.H.Hayt and J.E. Kemmerley, Engineering Circuit Analysis, Eight edition, print 2014.
2. K.V.V.Murthy and M.S. Kamath, Basic Circuit Analysis, 1st edition (reprinted with corrections) Jaico Publishing, 1998.
3. M. E. Van Valkenburg, NETWORK ANALYSIS, 3/E 3rd Edition, 2014

### **Reference Books**

1. N Balabanian and T.A. Bickart, Linear Network Theory : Analysis, Properties, Design and Synthesis, Matrix Publishers, Inc.
2. L.O. Chua, C.A. Desoer, E.S. Kuh, Linear and Nonlinear Circuits, McGraw - Hill International Edition 1987.
3. Joseph. A.Edminister "Electric circuits "Schaum's outline series, McGraw Hill Book Co. – 1987.
4. M.L.Soni, J.C. Gupta and P.V.Gupta "A course in Electrical Circuits and Fields" Dhanpatrai& sons, New Delhi,1981.

### **Online Resources**

1. [www.mit.org](http://www.mit.org)
2. [www.mooc.org](http://www.mooc.org)
3. [www.nptel.ac.in](http://www.nptel.ac.in)