

Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW	Tutorial	Total
ETC 304	Circuits and Transmission Lines	04	--	--	04	--	--	04

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test 1	Test 2	Avg. of 2 Tests					
ETC 304	Circuits and Transmission Lines	20	20	20	80	--	--	--	100

Course pre-requisite:

FEC 105: Basic electrical and electronics engineering

Partial fraction expansion, matrices, determinants calculus and differential equations,

Course objectives:

- To analyze and synthesize circuits and to become familiar with the propagation of signals through transmission lines.
- To analyze the circuits in time and frequency domain
- To study network functions, inter relationship among various circuit parameters, solve more complex network using these parameters.

Course outcomes:

- Through test, laboratory exercises and home assignment, students will be able to apply their knowledge in solving complex circuits.
- Students will be able to evaluate the time and frequency response which is useful in understanding behavior of electronic circuits and control system.
- Student will able to understand how the information in terms of voltage and current is transmitted through the transmission lines and importance of matching.

Module No.	Unit No.	Topics	Hrs.
1.0		Electrical circuit analysis	12
	1.1	Analysis of DC circuits: Analysis of circuits with and without controlled sources using generalized loop and node matrix methods and Source Transformation, Superposition, Thevenin, Norton, Millman theorems	
	1.2	Magnetic circuits: Self and mutual inductances, coefficient of coupling, dot convention, equivalent circuit, solution using loop analysis	
	1.3	Tuned coupled Circuits: Analysis of tuned coupled circuits	
2.0		Time and frequency domain analysis	10
	2.1	Time domain analysis of R-L and R-C circuits: Forced and natural response, time constant, initial and final values Solution using first order equation for standard input signals: Transient and steady state time response, solution using universal formula	
	2.2	Time domain analysis of R-L-C Circuits: Forced and natural response, effect of damping Solution using second order equation for standard input signals: transient and steady state time response	
	2.3	Frequency domain analysis of RLC Circuits: S-domain representation, applications of Laplace Transform in solving electrical networks, driving point and transfer Function, Poles and Zeros, calculation of residues by analytical and graphical method, analysis of ladder and lattice network Response to standard signals: Transient and steady state time response of R-L-C circuits	
3.0		Synthesis of RLC circuits	10
	3.1	Positive real functions: Concept of positive real function, testing for Hurwitz polynomials, testing for necessary and sufficient conditions for positive real functions	
	3.2	Synthesis of RC, RL, LC and RLC circuits: Properties and synthesis of RC, RL, LC driving point functions	
4.0		Two port circuits	10
	4.1	Parameters: Open circuits, short circuit, transmission and hybrid parameters, relationship among parameters, reciprocity and symmetry conditions.	
	4.2	Interconnections of two-port circuits, T & π representation.	
	4.3	Terminated two-port circuits.	
5.0		Radio frequency transmission lines	10
	5.1	Transmission Line Representation: T and Π representations, terminated transmission line, infinite line	
	5.2	Parameters of radio frequency lines: Propagation constant, attenuation constant, phase constant, group velocity, input impedance, characteristic impedance, reflection coefficient, standing wave ratio, VSWR, ISWR, S-parameters	
	5.3	Smith Chart: Impedance locus diagram, impedance matching	
		Total	52

Text Books

1. Franklin F Kuo, "*Network Analysis and Synthesis*", Wiley Toppan, 2nd.ed. 1966
2. W L Everitt and G E Anner, "*Communication Engineering*", Mc-GrawHill, New York, 3rd Edition, 1956

Reference Books

1. M E Van Valkenburg, "*Network Analysis*", Prentice-Hall of India Pvt Ltd, New Delhi, 26th Indian Reprint, 2000
2. K V V Murty and M S Kamth, "*Basic Circuit Analysis*", Jaico Publishing house, London
3. A Chakrabarti, "*Circuit Theory*", Dhanpat Rai & Co., Delhi, 6h Edition

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered for final Internal Assessment.

End Semester Examination:

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. The students need to solve total 4 questions.
- 3: Question No.1 will be compulsory and based on entire syllabus.
- 4: Remaining question (Q.2 to Q.6) will be selected from all the modules.