Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW	Tutorial	Total
EXC304	Circuit Theory	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	Ave. of 2 Tests					
EXC304	Circuit Theory	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:

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

Course Outcome:

1. Through test and laboratory exercises, students will be able to apply their knowledge in solving complex circuits.
2. Students will be able to evaluate the time and frequency response which is useful in understanding behavior of electronic circuits and control system.
3. Student will be able to understand how the power or information in terms of electromagnetic energy is transmitted through the transmission lines and importance of impedance matching.

Module No.	Unit No.	Topics	Hrs.
1.0		**Analysis of Electrical Circuits**	**09**
	1.1	**Analysis of DC circuits:** Analysis of circuits with and without controlled sources using generalized loop, node matrix, Superposition, Thevenin, Norton, Millman theorems	
	1.2	**Analysis of coupled circuits:** Self and mutual inductances, coefficient of coupling, Dot convention, equivalent circuit, solution using loop analysis	
	1.3	**Series and parallel resonance circuits:** Selectivity, bandwidth, quality factor	
2.0		**Time and Frequency Domain Analysis**	**12**
	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, frequency response	
3.0		**Synthesis of RLC Circuits**	**06**
	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 circuits:** Concepts of synthesis of RC, RL, LC driving point functions (numerical problems not expected on 3.2)	
4.0		**Two Port Networks**	**08**
	4.1	**Parameters:** Open Circuit, Short Circuit, Transmission and Hybrid parameters, relationships among parameters, reciprocity and symmetry conditions	
	4.2	**Series/parallel connection:** T and Pi representations, interconnection of Two-Port networks,	
5.0		**Flirters and attenuators**	**08**
	5.1	**Basic filter circuits:** Low pass, high pass, band pass and band stop filters, transfer function, frequency response, cutoff frequency, bandwidth, quality factor, attenuation constant, phase shift, characteristic impedance	
	5.2	**Concept of design and analysis of filters:** Constant K, M derived and composite filters (numerical problems not expected on 5.2)	
	5.3	**Attenuators:** Basic concepts, classification, attenuation in dB, K factor (impedance factor) and design concepts (numerical problems not expected on 5.3)	
6.0		**Transmission Lines**	**09**
	6.1	**Power frequency lines:** Representation, losses and efficiency in power lines, effect of length, calculation of inductance and capacitance (numerical problems not expected)	
	6.2	**Radio frequency lines:** Representation, propagation constant, attenuation constant, phase constant, group velocity, input impedance, characteristic impedance, reflection	
		coefficient, standing wave ratio, VSWR, ISWR, S-parameters	
	6.3	**Smith Chart**: Impedance locus diagram, impedance matching	
		Total	**52**

Recommended Books:

1. Franklin F Kuo, *"Network Analysis and Synthesis",* Wiley Toppan,
2. M E Van Valkenburg, *"Network Analysis",* Prentice-Hall of India Pvt Ltd, New Delhi
3. K V V Murty and M S Kamth, *"Basic Circuit Analysis",* Jaico Publishing house, London
4. A. Chakrabarti, *"Circuit Theory",* Dhanpat Rai and Co.,New Delhi
5. Reinhold Ludwig and Pavel Bretchko, "*RF Circuit Design"*, Pearson Education, Asia
6. Joseph J. Carr, "*Secrets of RF Circuit Design"*, Tata McGraw-Hill, New Delhi

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 as final IA marks

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 set from all the modules.
5: Weightage of marks will be as per Blueprint.