No	Course Information (2019-2020)	
1	Unit Name :	Engineering Circuit Analysis I
2	Unit Code:	EcE 31001
3	Classification :	Engineering Subject
4	Credit Value :	3.5 (2-1-2)
5	Semester /Year Offered :	1/3
6	Pre-requisite (if any) :	
7	Mode of Delivery:	Lecture, Tutorial and Practical
8	Assessment System and Breakdown of Marks:	
	Practical	20%
	Tutorial/ Assignment	10%
	Examination	70%
9	Academic Staff Teaching Unit: Department of Electronic Engineering	
10	Learning Outcome of Unit: After completing this unit, students will be able to: • determine the response of first order RL, RC circuits and second order RLC circuits • solve the RLC circuits either by using s-domain analysis • simulate and construct the RL, RC and RLC circuits	
11	Synopsis of Unit: The course covers RL circuits, RC circuits, RLC circuits, Laplace transformation, circuit analysis in the s-domain, frequency response, two-port networks and Fourier analysis.	
12	Topics and Contents **Topic 1: Basic RL and RC Circuits** ・ The Source-Free RL Circuit, Properties of the Exponential response ・ The Source-Free RC Circuit ・ A more general perspective ・ The Unit-Step Function ・ Driven RL Circuits ・ Natural and Force Response ・ Driven RC Circuits **Topic 2: The RLC Circuits** ・ The Source-Free parallel circuit ・ The Overdamped parallel RLC circuit ・ Critical Damping ・ The Underdamped parallel RLC circuit	

	• The Source-Free series RLC circuit • The Complete response of the RLC circuit • The Lossless LC Circuit **Topic 3: Complex Frequency and the Laplace Transform** • Complex Frequency • The Damped Sinusoidal Forcing Function • Definition of the Laplace Transform • Laplace Transforms of simple time functions • Inverse Transform Techniques • Basic Theorems for the Laplace Transform • The Initial-Value and Final-Value Theorem **Topic 4: Circuit Analysis in the s-Domain** • Z(s) and Y(s) • Nodal and Mesh Analysis in the s-Domain • Additional Circuit Analysis Techniques • Poles, Zeros and Transfer Functions • Convolution • The Complex-Frequency Plane • Natural Response and the s-Plane • A technique for synthesizing the Voltage Ratio $H(s) = V_{out}/V_{in}$

Main References:

1. Engineering Circuit Analysis, Eighth Edition, Willian H-Hayt, Jr.Jack E-Kemmerly, Steven M.Durbin, 2012, ISBN 978-0-07-352957-8

Additional References:

2. Circuit Analysis, John E Whitehouse, 1997, ISBN 1-898563-40-3

Information on Lab Practical

Lab	Activity

1	Topic: Experiment 1: Response of First Order RL Circuit Outcomes: • To determine the time constant of an RL circuit. • To plot the response of the first order RL circuit. Resources: Multisim Software
2	Topic: Experiment 2: Response of First Order RC Circuit Outcomes: • To determine the time constant of an RC circuit. • To plot the frequency response of the first order RC circuit. Resources: Multisim Software
3	Topic: Experiment 3: Response of Second Order RLC Series Circuit Outcomes: • To describe the transient response to a step input. • To observe the second-order circuit response waveforms over-damping, critical damping and underdamping. • To plot the frequency response of second-order circuit Resources: Multisim Software
4	Topic: Experiment 4: Laplace Transform for RLC Circuit Outcomes: • To demonstrate the Laplace transform techniques • To plot the response of a series RLC circuit to a step function using Matlab Resources: Matlab software, Computer
5	Topic: Experiment 5: Wien Bridge Oscillator Circuit

	Outcomes: • To simulate the Wien Bridge oscillator using multisim software. • To find the effect on output frequency with variation in RC combination. Resources: Multisim Software

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