Liverpool John Moores University

Title:	CIRCUIT THEORY
Status:	Definitive
Code:	**4501ICBTEL** (127014)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level:	FHEQ4	**Credit Value:**	15	**Total Delivered Hours:**	62
Total Learning Hours:	150	**Private Study:**	88		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	45
Practical	12
Tutorial	3

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Practice	AS1	Practical/ Workshop (1500 words)	30	
Exam	AS2	Exam	70	2

Aims

This module will introduce the fundamental theorems and analysis techniques for problem-solving in electrical circuit theory.

This unit provides students with the knowledge and intellectual skills necessary to model and analyse circuits in a wider electrical engineering and electronics context.

This unit used to develop practical and written skills by providing laboratory experiments.

Learning Outcomes

After completing the module the student should be able to:

1	Apply AC and DC circuit theory to solve series and parallel R-L-C circuits and apply complex wave to explain the basics of R-L-C circuits.
2	Identify two port network model to evaluate the basic electrical circuits and system include R-C, R- L Filter circuits and network.
3	Contrast transient behavior of switched circuits with first, second and higher orders.
4	Apply DC and AC circuits in the laboratory with the use of computer simulation software and laboratory equipment's.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Practical/ Workshop	4		
Exam	1	2	3

Outline Syllabus

Circuit theorems: Norton; Kirchhoff; Thevenin; superposition; maximum power.
Circuit analysis: mesh; nodal; maximum power transfer; impedance matching.
Phasor diagram to analyse the single phase circuits.
Complex notation in the analysis of single phase circuits.
Circuit performance: tolerance; effect of changes in component values

Two-port network models
Network models: symmetrical two-port network model; characteristic impedance, Zo; propagation coefficient (expressed in terms of attenuation, α, and phase change ß); input impedance for various load conditions including ZL = Zo; relationship between the neper and the dB; insertion loss
Symmetrical attenuators: T and π attenuators; the expressions for Ro and α in term of component values

Transients in R-L-C circuits
Laplace transforms: definition of the Laplace transform of a function; use of a table of Laplace transforms
Transient analysis: expressions for component and circuit impedance in the s-plane; first order systems must be solved by Laplace (i.e. RL and RC networks); second order systems could be solved by Laplace or computer-based packages.
Circuit responses: over, under, zero and critically damped response following a step input; zero initial conditions being assumed.
Properties: power factor; RMS value of complex periodic waveforms

Fourier coefficients of a complex periodic voltage waveform such as Fourier series for rectangular, triangular or half-wave rectified waveform, use of a tabular method for determining the Fourier series for a complex periodic waveform; use of a waveform analyser; use of an appropriate software package.

Use of software package (such as OrCad/pspise or similar industrial based software) to simulate the basic R-C, R-L and R-L-C circuit and analyse the circuit performance by measuring current voltage and power for DC/AC circuits.
Design and demonstrate basic R-C, R-L and R-L-C circuit in the laboratory and analyse the circuit performance by using signal generator, oscilloscope and multimeters.

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

Electrical circuit theory acquired through lectures, seminars, tutorials and group work.

Electrical circuit measurement test using simulation by appropriate learning software in computer laboratory classes.

Electrical circuit test using appropriate testing equipment in laboratory classes.

Notes

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