

Circuit Theory

Module Information

2022.01, Approved

Summary Information

Module Code	4501ICBTEL
Formal Module Title	Circuit Theory
Owning School	Engineering
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	45
Practical	12
Tutorial	3

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks

JAN-PAR	PAR	January	12 Weeks
SEP_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

Aims and Outcomes

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.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	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.
MLO2	2	Identify two port network model to evaluate the basic electrical circuits and system include R-C, R- L Filter circuits and network.
MLO3	3	Contrast transient behaviour of switched circuits with first, second and higher orders.
MLO4	4	Apply DC and AC circuits in the laboratory with the use of computer simulation software and laboratory equipment's.

Module Content

Outline Syllabus	<p>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, Z_0; propagation coefficient (expressed in terms of attenuation, α, and phase change β); input impedance for various load conditions including $Z_L = Z_0$; relationship between the neper and the dB; insertion loss. Symmetrical attenuators: T and π attenuators; the expressions for R_0 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.</p>
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Practical/ Workshop	30	0	MLO4
Exam	Exam	70	2	MLO1, MLO2, MLO3

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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