

Electrical Circuit Principles

Module Information

2022.01, Approved

Summary Information

Module Code	4503USST
Formal Module Title	Electrical Circuit Principles
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 4
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
University of Shanghai For Science and Technology

Learning Methods

Learning Method Type	Hours
Lecture	33
Tutorial	22

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

Aims	To enhance knowledge and understanding of the essential mathematics underpinning electrical and electronic engineering. To develop intellectual abilities in selecting and applying appropriate circuit analysis techniques for analysing various electrical and electronic circuits. To introduce passive electronic components and understand their operating characteristics. To introduce the operating principles of transformers and electronic filters.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Appraise the fundamental relationships governing electric circuits
MLO2	2	Apply circuit analysis techniques to determine operating points of dc circuits
MLO3	3	Derive the power relations in ac circuits and perform calculations
MLO4	4	Describe the operating principles of transformers
MLO5	5	Apply complex numbers and phasors to solve ac circuits.

Module Content

Outline Syllabus	1 Passive components, AC circuits and phasors Scientific notation, voltage, current, power and energy. Introduction to electric fields, permittivity, Capacitance, impedance of a capacitor. Introduction to magnetic fields, self and mutual inductance, impedance of an inductor. Operating principles of transformers. Alternating current fundamentals, period, frequency and angular frequency. Peak, and rms values. Complex representation of sinusoidal quantities. Phasors. Application of complex numbers in simple ac circuits. Powers in ac circuits. Complex-waveforms and introduction to the Fourier series. Resonance in simple series ac circuits. Series RLC circuit as a band-pass filter. RC circuits as low-pass and high pass filters. 2 Circuit analysis techniques Steady-state dc and ac circuit analysis: Kirchhoff's laws. Voltage and current divider rules. The superposition principle. Mesh current analysis. Nodal potential analysis. Non-ideal current and voltage sources, Thevenin's and Norton's equivalent circuits. Maximum power transfer theory.
Module Overview	
Additional Information	The material delivered in this module will be complemented by the practical skills module where students will undertake practical experiments to reinforce the material delivered in this module.

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Exam	Exam	60	2	MLO2, MLO3, MLO4
Report	Test	40	0	MLO1, MLO2, MLO5

Module Contacts

Module Leader

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

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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