Fundamentals of Mechanics and Electrical Circuits

Module Information

2022.01, Approved

Summary Information

Module Code	4500ICBTMT
Formal Module Title	Fundamentals of Mechanics and Electrical Circuits
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	15
Workshop	12

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	The various sources and forms of energy are discussed and the principles governing mechanics, AC electrical circuits, energy conversion and electrical transmission are described. The course covers four main topics: Mechanical definitions, basic mechanics and DC machines DC and AC circuit theory including real and reactive power The demand for electrical energy and conventional and renewable forms of electrical generation and their impact on the environmentWhy the existing electrical power system has its present structure

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Identify AC and DC circuit theory and basic principles of mechanics to solve series and parallel RL-C circuits.
MLO2	2	Describe the principles of conventional and renewable electricity generation and the matching of generation and demand.
MLO3	3	Explain simple mechanical and electrical systems.
MLO4	4	Identify the DC and AC circuit analysis in the laboratory with the use of computer simulation software and laboratory equipment.

Module Content

Outline Syllabus	Mechanics And Electrical Machines : Units and dimensions; velocity and acceleration; resolution of forces; Newton A circ's laws of motion; torque; friction; systems in equilibrium; energy (potential and kinetic); power; angular motion; conversion of energy; momentum; thermal energy; simple harmonic motion; damped and forced oscillations, force production in machines, DC machines.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 Electrical Power Systems: The use ac rather than dc transmission, Structure of transmission and distribution networks, 3 phase systems. Calculation of voltage and flows in a two-bus system and Transmission capacity. Use of software package (i.e. 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 mustimeters.
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Practical	30	0	MLO4
Exam	Examination	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