

# Electrical and Electronic Principles

## Module Information

2022.01, Approved

### Summary Information

Module Code	4513NCCG
Formal Module Title	Electrical and Electronic 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
Nelson and Colne College Group

### Learning Methods

Learning Method Type	Hours
Lecture	48
Placement/Practice	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-PAR	PAR	September	12 Weeks
SEP_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

## Aims and Outcomes

Aims	This module builds up from physical principles including our understanding of the atom, the concept of electrical charge, electric fields, and the behaviour of the electron in different types of material. This understanding is applied to electric circuits of different types, and the basic circuit laws and electrical components emerge. Another set of principles is built around semiconductor devices, which become the basis of modern electronics. An introduction to semiconductor theory leads to a survey of the key electronic components, primarily different types of diodes and transistors. The amplifier and its characteristics are introduced and simple circuits made from logic gates are considered.
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**After completing the module the student should be able to:**

### Learning Outcomes

Code	Number	Description
MLO1	1	Apply an understanding of fundamental electrical quantities to evaluate circuits with constant voltages and currents
MLO2	2	Evaluate circuits with sinusoidal voltages and currents
MLO3	3	Describe the basis of semiconductor action, and its application to simple electronic devices.
MLO4	4	Explain the difference between digital and analogue electronics, describing simple applications of each.

## Module Content

Outline Syllabus	Fundamental electrical quantities and concepts Circuit laws: voltage sources, Ohm's law, resistors in series and parallel, the potential divider, Kirchhoff's and Thevenin's laws; superposition Energy and power Fundamental quantities of periodic waveforms: frequency, period, peak value, phase angle, waveforms Mathematical techniques: trigonometric representation of a sinusoid, rotating phasors and the phasor diagram, complex notation applied to represent magnitude and phase Reactive components: inductor and capacitor, current and voltage phase relationships with steady sinusoidal quantities, representation on phasor diagram Circuits with sinusoidal sources: series and parallel RL, RC and RLC circuits, frequency response and resonance, power, root-mean-square power quantities, power factor Ideal transformer and rectification: the ideal transformer, half-wave and full-wave rectification, use of smoothing capacitor, ripple voltage Semiconductor materials: characteristics of semiconductors; impact of doping, p-type and n-type semiconductor materials, the p-n junction in forward and reverse bias Bipolar and field effect transistor types, the bipolar transistor as switch and amplifier Simple semiconductor applications Analogue concepts: analogue quantities Amplifier: gain, frequency response, input and output resistance, effect of source and load resistance Digital concepts: logic circuits implemented with switches or relays Use of voltages to represent logic 0 and 1, binary counting Logic Gates (AND, OR, NAND, NOR) to create simple combinational logic functions, truth tables
Module Overview	
Additional Information	

## Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Test	Online Test	50	0	MLO1, MLO2
Report	Assignment	50	0	MLO3, MLO4

## Module Contacts

### Module Leader

Contact Name	Applies to all offerings	Offerings
Christian Matthews	Yes	N/A

### Partner Module Team

Contact Name	Applies to all offerings	Offerings
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