MODULE TITLE	**Electrical and Electronic Principles**	**CREDIT VALUE**	**15**
MODULE CODE	**CSM1259**	**MODULE CONVENER**	**Dr Declan Vogt (Coordinator)**

DURATION: TERM	**1**	**2**	**3**
DURATION: WEEKS	**0**	**10**	**0**

Number of Students Taking Module (anticipated)	**60**

DESCRIPTION - summary of the module content

This hands on module gives you the chance to explore basic electrical and electronic concepts, using a combination of a theoretical and practical approach to applications, and troubleshooting.
This module is a prerequisite for subsequent modules, including the Electrical Energy Conversion and Transport second year module, in the BEng Mining Engineering and BSc/MEng Renewable Energy degree programmes.

AIMS - intentions of the module

The main aims of the module are to develop your understanding of a wide range of electrical and electronic engineering concepts principles. This module will give you confidence in using and developing basic electrical/electronic designs through circuit diagrams, mapping circuit diagrams to physical circuits, building physical circuits and using laboratory test and measurement equipment.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module, ***you should be able to:***
Module Specific Skills and Knowledge:
1 Understand electrical concepts, and demonstrate competence in the analysis of both direct current and alternating current electrical circuits;
2 Confidently use standard laboratory instrumentation;
3 Recognise electronic devices and their applications;
Discipline Specific Skills and Knowledge:
4 Comprehend engineering concepts, model these concepts mathematically, form a rigorous solution and assess the practical limitations of such solutions;
Personal and Key Transferable/ Employment Skills and Knowledge:
5 Show skills in problem solving, numeracy, practical engineering laboratory work, data analysis and presentation.

SYLLABUS PLAN - summary of the structure and academic content of the module

Fundamentals:
- Introduction: electricity, electrical charge, current, voltage, conductance and resistance, electrical and electronics systems, signals, physical quantities and measurement;
- Electric Circuits: SI units, common prefixes, electrical circuits, circuit symbols, direct current and alternating current, resistors, capacitors, and inductors, voltage sources and current sources. Ohm's Law and Kirchhoff's Laws, dependent voltage and current sources, resistors in series and parallel, resistive potential dividers, power dissipation in resistors;
- DC circuits: Norton's theorems, superposition, nodal analysis, mesh analysis, solving simultaneous circuit equations, choice of techniques;
Electrical engineering:
- Basics of Alternating Voltages and Currents: voltage and current, phasor diagrams, impedance, complex notation;
- Inductance and Magnetic Fields: electromagnetism, reluctance, inductance, self-inductance, inductors, inductors in series and parallel, energy storage in an inductor, mutual inductance, transformers, transient (or DC) response of inductors, AC response of inductors, circuit symbols;
- Capacitance and Electric Fields: capacitors and capacitance, electric fields, capacitors in series and parallel, voltage and current, energy stored in a charged capacitor, transient (or DC) response, AC response, circuit symbols;
- AC Circuits: RC and RL circuits, RLC circuits, resonance, series and parallel relationships;
- Power in AC Circuits: power in resistive components, power in capacitors, power in inductors, circuits with resistance and reactance, active and reactive power, power triangle, power factor correction, power transfer, power measurement;
Electronic engineering:
- Digital Systems: binary quantities and variables, logic gates, Boolean algebra, combinational logic, Karnaugh maps, automated methods of minimisation, propagation delay and hazards, number systems and binary arithmetic, numeric and alphabetic codes, examples of combinational logic design;
- Diodes and Applications: introduction to semiconductors, diodes and characteristics, diode rectifiers, power supplies, and special purpose diodes;
- Transistors: DC operation of field-effect transistor (FET), the FET as a switch, DC operation of bipolar junction transistor (BJT), BJT class A amplifiers, BJT class B amplifiers, the BJT as a switch, applications of transistors;
- Operational Amplifiers: introduction to the operational amplifier, comparators, summing amplifiers, integrators and differentiators, oscillators, active filters, voltage regulators, application assignment.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	58.00	**Guided Independent Study**	92.00	**Placement / Study Abroad**	

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
Scheduled Learning and Teaching Activities	30	Lectures
Scheduled Learning and Teaching Activities	18	Laboratory Sessions
Scheduled Learning and Teaching Activities	10	Tutorials
Guided Independent Study	92	Private Study

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

Form of Assessment	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Tutorial Exercises	One for each major topic, (typically 2-4 hours of work)	1, 4, 5	Self-Assessment

SUMMATIVE ASSESSMENT (% of credit)

Coursework	30	**Written Exams**	70	**Practical Exams**	

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Lab Report	20	1,500 words	1-5	Written
Ten Weekly Online Concept Quizzes	10	30 minutes	1, 3-5	Automatic and Group (in Class)
Examination	70	2 hours	1, 3-5	Tutor Meeting

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-reassessment
Summative Assessment	Additional Assessment	As Above	August Ref/Def period
Examination	Additional Examination	As Above	August Ref/Def period

RE-ASSESSMENT NOTES

One piece of Coursework (30%) and/or one Exam (70%).

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Web based and electronic resources:
ELE – http://vle.exeter.ac.uk/
Further reading list:
Horowitz and Hill, The Art of Electronics, now in its 3rd edition, (but any edition will be useful), Cambridge University Press - the single best reference on electronics, and highly recommended if you take this up as a profession or hobby.
Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Storey, Neil	Electrical & Electronics Systems	1st	Pearson Prentice Hall	2004	978-0130930460	[Library]
Set	Horowitz, P. and Hill, W.	The Art of Electronics	3rd	Cambridge University Press	2015	978-0521809269	[Library]

CREDIT VALUE	15	**ECTS VALUE**	7.5
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	4	**AVAILABLE AS DISTANCE LEARNING**	No
ORIGIN DATE	Thursday 06 July 2017	**LAST REVISION DATE**	Thursday 18 July 2019
KEY WORDS SEARCH	Electrical Electronics Engineering		