

Module Details	
Module Title	Electronics and Mechanics
Module Code	ELE4013-B
Academic Year	2024/5
Credits	20
School	School of Computer Science, AI and Electronics
FHEQ Level	FHEQ Level 4

Contact Hours	
Type	Hours
Directed Study	128
Lectures	28
Tutorials	18
Laboratories	26

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year
BDB	University of Bradford / Academic Year

Module Aims
<ol style="list-style-type: none"> <li>1. To develop an understanding of basic electrical and electronic circuits, mechanical Energy dynamics and the laws which govern their behaviours.</li> <li>2. To provide the student with a clear and thorough understanding of the theory and applications of engineering mechanics for dynamical systems.</li> <li>3. To consolidate the theoretical part of the module in a series of lab work, and improve their individual skills and understanding.</li> </ol>

## Outline Syllabus

### Electronics:

- 1) Basic electrical concepts: units, quantities, voltage, charge, current, energy and power, basic components and electronic circuits, AC and DC sources;
- 2) Circuit variables and laws: Ohm's law, Kirchhoff's law;
- 3) Resistive circuits: series and parallel, combination;
- 4) Capacitors, Inductors and RC/RL circuits: charging/discharging;
- 5) Basic Magnetic principles: Flux, reluctance, magnetic circuits.
- 6) DC motors: power (torque & speed), Relays;
- 7) Semiconductor materials: diodes, LED;
- 8) half and full rectifier;
- 9) Bipolar junction transistor: Using the transistor as a switch for robot circuit;
- 10) Electrical safety and RoHS & WEEE legislation.

### Mechanics:

- 1) Kinematics - Displacement, velocity, acceleration concept to solve various Dynamics Situations;
- 2) Newton Laws and their application to complex motion;
- 3) Force systems ;
- 4) Spring force and friction;
- 5) Force and motion at linked bodies;
- 6) Angular motion;
- 7) Rotational solids;
- 8) Work, energy and power;
- 9) Non-conserved mechanical work and energy;
- 10) Momentum and impact.

## Learning Outcomes

Outcome Number	Description
01	Describe basic mechanical, electrical and electronic components and laws.
02	Describe and familiarise the design of simple mechanisms and be able to set up and solve equations of motion for a system of particles.
03	Application of basic electrical theory by evaluating simple problems both theoretically and practically.
04	Solve particle dynamic problems. Use the graphical method and analytical method to develop and analyse simple/planer mechanisms
05	Systematically/scientifically/creatively problem solve; communicate; and interpret data.

## Learning, Teaching and Assessment Strategy

Generally a 'Lectures, Tutorials and Laboratory' based teaching/learning. All mechanics theory is covered in the lecture sessions. The practical demonstration of motion mechanisms using a Simple Mechanisms Kit. Mechanical lab work to cover the practical mechanisms and simple machines. The electronics material will be mostly covered by laboratory work, with a small number of lectures to cover electrical safety and RoHS and WEEE legislation.

Formative assessment and oral feedback is given during the online Tutorials and Laboratory/Lab-class sessions. An assessment (i.e. Exam) examine the learning outcomes of the electronics part and the mechanics part expressed in the descriptor and student's ability to apply the principles and knowledge learnt. Also, there will be compulsory questions in the exam based on laboratory parts (Electronics and Mechanics parts). Specifically the learning outcomes 1,2,3,4,5 will be assessed by the exam.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Fourth Edition (AHEP4) as published by the Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify five key areas of learning which partially (C) or fully (M) meet the academic requirement for CEng registration: Science and Mathematics (1), Engineering Analysis (2-4), Design and Innovation (5-6), The Engineer and Society (7-11), and Engineering Practice (12-18). Further details of these learning outcomes can be found at <https://www.engc.org.uk/ahep/>

C1, M2, C2, C4, M12, C12, M13, C13, C16,

### Mode of Assessment

Type	Method	Description	Weighting
Summative	Examination - Closed Book	Exam Closed Book 1 (3 hours)	50%
Summative	Examination - Closed Book	Exam Closed Book 2 (3 hours)	50%

### Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>

#### *Please note:*

*This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.*