

Module Details	
Module Title	Foundation Physics
Module Code	MAE3002-B
Academic Year	2022/3
Credits	20
School	Department of Mechanical and Energy Systems Engineering
FHEQ Level	RQF Level 3

Contact Hours	
Type	Hours
Lectures	29
Laboratories	30
Tutorials	12
Directed Study	129

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

Module Aims
To introduce electricity and magnetism as a basis for an Engineering Degree programme, and to provide a quantitative understanding of the many phenomena that waves and vibrations exhibit that will be needed in engineering courses. There is an emphasis on applications to provide practice, and to illustrate the relevance of the material.

Outline Syllabus

Electricity and magnetism:

Electrical Safety. What is electricity? Examples in nature and engineering. Experimental or empirical nature of electrical concepts. Electrical charge: Forces between isolated charges. Relationship between charge and current. Current, voltage, resistance and capacitance: Observation and confirmation of Ohm`s Law. Kirchhoff`s Laws. Series and parallel resistance and capacitance. Meters and bridges: Ammeters, voltmeters, potentiometers and Wheatstone bridges. Electrical Field Strength. Force on unit charge. Potential energy. Electrical potential difference: Relation to field strength. Magnetic Fields: Generation by permanent magnets and electrical currents. Examples in nature and engineering. Concept of magnetic flux density: arising from currents and magnetic materials. Electromagnetics: Lorentz-Heaviside equation for the force on moving charge, Faraday-Lenz law of electromagnetic induction. Electric motors and Generators.

Waves and Vibrations:

Simple harmonic motion: wave properties: modes of travelling, frequency, amplitude, wavelength, phase, wave fronts, superimposition, interference, diffraction, refraction, Doppler effect, beating, amplitude and frequency modulation.. Specific behaviour of sound waves: Creation and detection, quantification, intensity, and the acoustic decibel. Resonance in pipes and strings, waves in solids, attenuation.. Ultrasonic Waves. Applications in engineering and science

Learning Outcomes

Outcome Number	Description
01	Describe key concepts in the fields of electricity, magnetism, waves and vibrations
02	Apply the tools for predicting the behaviour of physical systems in these fields.
03	Assemble basic circuits and carry out measurements.
04	Critically assess experimental apparatus and demonstrate the use of error analysis to describe confidence in the resulting data
05	Select the correct method for calculating the physical properties of electrical, magnetic and vibrating systems.
06	Interpret data and define fundamental characteristics of physical systems
07	Solve problems systematically using the scientific method.
08	Locate and study additional material from sources such as books, journals and online resources.

Learning, Teaching and Assessment Strategy

Semester 1:

The electricity and magnetism sections of the course are best demonstrated practically in the laboratories. A short lecture at the start of each section will review the activities of the previous week and introduce the current week's activities. Students will be assisted face to face in laboratory sessions but students unable to attend will be assisted virtually in a synchronous session using Proteus software and in Zoom meeting sessions depending on their location.

Assessment will take the form of an online Canvas Quiz to be submitted each week, and an exam at the end of the semester.

Semester 2:

For the waves and vibrations element of the course, the content is delivered using lecture sessions of approximately 40 minutes (LO1, LO2), interspersed with tutorial sessions with example questions (LO6, LO7) to allow the cohort to experiment with the new techniques presented and to retain levels of engagement and concentration. A single laboratory session allows them to explore fundamental characteristics of oscillating systems (LO2, LO5) and understand the concept of experimental errors (LO4)..

Mode of Assessment

Type	Method	Description	Weighting
Summative	Laboratory Report	Electricity and Magnetism: Set of lab. quizzes	20%
Summative	Examination - Closed Book	Electricity and Magnetism: Closed-book exam (1.5 hours)	30%
Summative	Laboratory Report	Waves and Vibrations: Worksheets (approximately 300 words)	10%
Summative	Examination - Closed Book	Waves and Vibrations: Closed-book exam (2 hours)	40%

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.