

Module Details	
Module Title:	Foundation Physics
Module Code:	MAE3002-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Mechanical and Energy Systems Engineering
Subject Area:	Mechanical and Automotive Engineering
FHEQ Level:	FHEQ Level 3
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	28.5
Tutorials	12
Laboratory	34.5
Directed Study	125

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year (Sept - May)

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

1	LO1. Describe key concepts in the fields of electricity, magnetism, waves and vibrations LO2. Apply the tools for predicting the behaviour of physical systems in these fields.
2	LO3. Assemble basic circuits and carry out measurements. LO4. Critically assess experimental apparatus and demonstrate the use of error analysis to describe confidence in the resulting data LO5. Select the correct method for calculating the physical properties of electrical, magnetic and vibrating systems.
3	LO6. Interpret data and define fundamental characteristics of physical systems LO7. Solve problems systematically using the scientific method. LO8. Locate and study additional material from sources such as books, journals and online resources.

Learning, Teaching and Assessment Strategy

Laboratory work and lectures/ seminars make up the contact time, the remainder being given over to student private study comprising report writing, tutorial exercises, directed reading and examination preparation.

The electricity and magnetism sections of the course are best demonstrated practically in the laboratories so an approach of combining short lectures (LO1, LO5) and hands-on practical activities (LO2, LO3, LO4, LO6, LO7) is adopted.

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	Length	Weighting
Summative	Laboratory Report	Laboratory reports Electricity and Magnetism	Worksheets Approx. 300wds	20%
Summative	Laboratory Report	Laboratory reports Waves and Vibrations	Worksheets Approx. 300wds	10%
Summative	Examination - closed book	Examination - closed book Electricity and Magnetism	1.5 hours	30%
Summative	Examination - closed book	Examination - closed book Waves and Vibrations	2 hours	40%
Referral	Examination - closed book	Supplementary Examination	3 hours	100%

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.