

Foundation Physics

Module Code:	MAE3002-B
Academic Year:	2018-19
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 Periods

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

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 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	Final Assess'
Summative	Laboratory Report	Laboratory reports Electricity and Magnetism	Worksheets Approx. 300wds	20%	No
Summative	Laboratory Report	Laboratory reports Waves and Vibrations	Worksheets Approx. 300wds	10%	No
Summative	Examination - closed book	Examination - closed book Electricity and Magnetism	1.5 hours	30%	Yes
Summative	Examination - closed book	Examination - closed book Waves and Vibrations	2 hours	40%	No
Referral	Examination - closed book	Supplementary Examination	3 hours	100%	No

Legacy Code (if applicable)

ENG0303L

Reading List

To view Reading List, please go to [rebus:list](#).