UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Foundation Physics
Module Code	MAE3002-B
Academic Year	2024/5
Credits	20
School	School of Engineering
FHEQ Level	RQF Level 3

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

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

Module Aims

The fundamental physics principles of electricity, magnetism, wave and vibrations are the basic in all engineering applications. Electricity and its generating principles are applied in various electro-mechanical and electronics devices at home, work place, and in a wide range of industries, and wave and vibrations involve in all engineered systems around us with sound and/or movement.

This module aims to:

* Provide the students with basic principles in the four pillars of physics, including electricity, magnetism, waves and vibrations, which will be needed in engineering courses.

* Provide practical skills and illustrate the relevance of the above principles in engineering applications that are essential to help students be ready for further engineering studies.

Outline Syllabus

Semester 1: Electricity and Magnetism:

* Electrical safety. What is electricity? Electrical charge: relationship between charge and current.
* Current, voltage, and resistance: observation and confirmation of Ohm?s law.
* Kirchhoff?s laws; power and energy; meters.
* Capacitors; series and parallel systems of resistance and capacitance.
* Electric field: strength, force between charges; electrical potential difference and relation to field strength.
* Magnetic fields: Generation by permanent magnets and electrical currents; electromagnetics: Faraday-Lenz?s law of electromagnetic induction. Electric motors and generators.
* AC circuits and elements.
* Transformers, diodes and rectifiers.
* Applications in engineering and science.

Semester 2: Waves and Vibrations:

* Simple harmonic motion
* Wave properties: modes of travelling, frequency, amplitude, wavelength, phase, wave fronts.
* Superposition of wave, 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.
* Light & colour.
* Applications in engineering and science.

Learning Outcomes

Outcome Number	Description
01	Describe key concepts and principles in the fields of electricity, magnetism.
02	Describe key concepts and principles in the fields of waves and vibrations.
03	Apply the tools for predicting the behaviour of physical systems in these fields.
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 theme of the course is best demonstrated practically in the weekly laboratories. Students will work in pair doing lab experiments to promote teamwork. Weekly laboratory quizzes related to the experiments and lab data collected are used to test student understanding.
* A theory lecture is delivered after the experiments to review the past lab sessions, explain the theory behind the lab sessions.
* Supports are provided for students from various backgrounds and skills during the lab sessions by a team lead by the lecturer together with lab technicians and demonstrators. Several class examples and exercises are available in the review theory lectures to help students strengthen the knowledge learned and achieve the learning outcomes.

Semester 2:

* The waves and vibrations element of the course is delivered using lecture sessions of 40-50 minutes, interspersed with tutorial sessions.
* Several example questions are available to allow the cohort to experiment with the new techniques presented and support students with different backgrounds and skills.
* A single laboratory session allows students to work in group and explore fundamental characteristics of oscillating systems and understand the concept of experimental errors.

The assessment for this module will take place in two forms: Assessment of practical skills via the lab activities and report and knowledge elements by exams. Both methods will prepare students for the types of assessment they will be exposed to on the Engineering undergraduate courses.

* Formative assessment in semester 1 will take the form of online weekly Canvas quizzes for weekly lab sessions (Computer-based assessment) following on from the session?s practical session (LO3, LO4), which will help students to prepare for the end of semester exam. There will be a summative exam at the end of the semester that will assess theme one on electricity and magnetism (LO1, LO5).

* In semester 2, formative assessment will take the form of a laboratory coursework within lab (recorded in the lab report) and an exam at the end of the semester on the topic of waves and vibration (LO2, LO5). The student will also submit the completed lab report to demonstrate the development of their practical and experimentation skills (LO3), alongside their ability to analyse the resulting data (LO4).

Mode of Assessment

Type	Method	Description	Weighting
Summative	Computerised examination	Laboratory quizzes on Electricity and Magnetism	20%
Summative	Laboratory Report	Laboratory report on Waves and Vibrations	10%
Summative	Examination - MCQ	Exam 1 on Electricity and Magnetism	30%
Summative	Examination - Closed Book	Exam 2 on Waves and Vibrations	40%
Formative		Method - Computer-based assessment Description - Weekly canvas tests and feedback - 30 mins Method - Laboratory Report Description - Feedback on lab activities - ongoing	N/A

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.

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