MONASH College

MONASH UNIVERSITY FOUNDATION YEAR

Subject guide for studies in

Semester 1, 2024

UPDATED November 2023

MUF0121 Physics Unit 1: Mechanics and Thermodynamics

Overview

Mechanics is the study of motion. This course covers how a physical object moves and the analysis of why it moves. Thermodynamics is the study of heat and temperature and their relationship to energy and work.

The topics of mechanics and thermodynamics are interrelated and are applied across sciences and engineering. Examples where a knowledge of mechanics and thermodynamics is required include areas of sport, transport, design, construction and space exploration.

Prerequisites

MUF0121 Physics Unit 1: Mechanics and MUF0122 Physics Unit 2: Waves, Fields and Particles can be taken in either order or concurrently. However, it is recommended that students successfully complete MUF0121 Physics Unit 1: Mechanics and Thermodynamics prior to undertaking MUF0122 Physics Unit 2: Waves, Fields and Particles.

Knowledge outcomes

At the end of this unit students will be able to:

- Define a number of key physical quantities such as displacement, velocity, acceleration, work, momentum, impulse, power, energy, centripetal force, universal gravitation force.
- Define key thermodynamic quantities such as heat and temperature.
- State a number of key laws of classical mechanics such as Newton's Three Laws of Motion, work-energy, energy and momentum conservation, uniform circular motion and Newton's law of universal gravitation.
- State key equations that govern thermal expansion, specific heat capacity and latent heat and the transfer of heat
- Solve problems and give correct numerical answers, using a variety of techniques such as application of formulae, diagrams, graphical analysis and scale drawings.
- Apply physics concepts and equations to explain and understand various physical phenomena.
- Understand the role of physics as an experimental science and the need for measurements and data to test validity of models or hypotheses.
- Organise data and apply information to complex situations.
- Use measuring instruments to analyse aspects of kinematics, dynamics and statics.
- Design and perform appropriate experimental investigations
- Write scientific reports of experimental investigations

Skills and behaviours

At the end of this unit students will be able to:

- Apply the principles of classical mechanics when answering quantitative and qualitative questions
- Show independence, enterprise and flexibility in selecting and using a variety of problem-solving methods
- Measure and record experimental quantities accurately to the appropriate number of significant figures and give some estimate of the uncertainties
- Plan and perform experimental investigations efficiently, pay attention to safety
- Work independently to master new concepts making use of a variety of resources
- Work with other students in teams assigned by the teacher
- Communicate their understanding of physics in a clear and organised manner, using the key concepts and terms covered in this course
- Use measuring instruments and technology to obtain relevant experimental data
- Use spreadsheets to record and manipulate data and produce graphs and trendlines
- Write an experimental report which includes a conclusion and an evaluation

Assessment	
Assessment Task	**Weighting**
Skills and Application Task	15%
Practical Report 1	15%
Practical Report 2	15%
Research Project	15%
Participation	10%
Examination	30%

MUF0122 Physics Unit 2: Waves, Fields and Particles

Overview

This unit starts with the study of electromagnetic radiation, particularly visible light and investigates the properties of these types of waves. The Fields topic includes electricity and magnetism and how these concepts are applied. Particle physics, focusses on nuclear physics and the interaction of light and matter. There are many places that these technologies are applied in modern society, from communications, power generation, material analysis and medical imaging.

Prerequisites

MUF0121 Physics Unit 1: Mechanics and MUF0122 Physics Unit 2: Waves, Fields and Particles can be taken in either order or concurrently. However, it is recommended that students successfully complete MUF0121 Physics Unit 1: Mechanics prior to undertaking MUF0122 Physics Unit 2: Waves, Fields and Particles.

Knowledge outcomes

At the end of this unit students will be able to:

- Define key concepts of wave theory including frequency, period, wavelength, phase and amplitude; and use these concepts in explanations of superposition, interference, and standing waves.
- Define key concepts of electricity and magnetism, including charge, current, voltage, power, electric and magnetic fields, and magnetic flux; and use these concepts in explanations of transformers, electric motors, generators and mass spectrometers and synchrotrons
- Define key concepts of modern physics including sub-atomic particles (electrons, protons, neutrons and photons), the equivalence of mass and energy, energy levels, and de Broglie wavelength; and use these concepts in explanations of nuclear reactions, radioactivity, emission and absorption spectra and the photo-electric effect
- Solve problems and give correct numerical answers, using a variety of techniques such as application of formulae, diagrams, graphical analysis and scale drawings
- Apply physics concepts and equations to explain and understand various physical phenomena
- Understand the role of physics as an experimental science and the need for measurements and data to test the validity of models or hypotheses
- Organise data and apply information to complex situations
- Use measuring instruments to analyse aspects of waves, electricity and magnetism, and modern Physics
- Design and perform appropriate experimental investigations
- Write scientific reports of experimental investigations

Skills and behaviours

At the end of this unit students will be able to:

- Apply the principles of classical mechanics when answering quantitative and qualitative questions
- Show independence, enterprise and flexibility in selecting and using a variety of problem-solving methods
- Measure and record experimental quantities accurately to the appropriate number of significant figures and give some estimate of the uncertainties
- Plan and perform experimental investigations efficiently, paying attention to safety
- Work independently to master new concepts making use of a variety of resources
- Work with other students in teams assigned by the teacher
- Communicate their understanding of physics in a clear and organised manner, using the key concepts and terms covered in this course
- Use measuring instruments and technology to obtain relevant experimental data
- Use spreadsheets to record and manipulate data and produce graphs and trend lines
- Write an experimental report which includes a conclusion and an evaluation

Assessment	
Assessment Task	**Weighting**
Skills and Application Task	15%
Practical Report 1	15%
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Research Project	15%
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