PHYS1210
Physics for Life Sciences
Session 1, In person-scheduled-weekday, North Ryde 2023
School of Mathematical and Physical Sciences

Contents

General Information ........................................ 2
Learning Outcomes ........................................ 2
General Assessment Information ......................... 3
Assessment Tasks .......................................... 4
Delivery and Resources ................................... 6
Policies and Procedures .................................... 11

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General Information

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Credit points
10

Prerequisites
HSC Mathematics Standard 2 Band 5 and above or Mathematics Advanced Band 3 and above or Extension 1 or Extension 2 Band E2 and above

Corequisites

Co-badged status

Unit description
This unit develops a conceptual and quantitative approach to key physics topics including: waves, light and sound; electricity; forces and motion; and thermodynamics, with illustrations of these topics using medical, biological and technological applications. It teaches students to apply their knowledge of science to solve problems; to think and reason logically and creatively; and to communicate effectively. Students will practice the basic techniques of physical measurement, data analysis and verification of theoretical models. Written communication skills for documenting laboratory work and problem-solving techniques are emphasised throughout the unit.

For students who do not meet the mathematics prerequisite, please contact your course authority for details of a suitable Bridging Course.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes
On successful completion of this unit, you will be able to:

ULO1: demonstrate knowledge of foundational physics concepts, principles and theories, by predicting outcomes of ‘thought experiments’ (conceptual answers) and by
calculating outcomes in specific physical situations (numerical answers).

**ULO2**: apply physics principles to solve real-world problems including those involving topics in the life sciences.

**ULO3**: use the tools, methodologies, language, conventions of physics to test and communicate ideas and explanations.

**ULO4**: collect experimental data with appropriate precision and uncertainties, using a range of measurement and data analysis tools, and interpret and report on your results.

**ULO5**: demonstrate foundational learning skills including active engagement in your learning process.

**General Assessment Information**

This unit has two hurdle requirements.

1. **SGTA participation.** Assessment Type 1: Quiz/Test Indicative Time on Task 2: 0 hours
Due: weekly Weighting: 25% This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

*Details:* Quizzes are taken at the end of each SGTA. To take the quiz you must participate in the SGTA itself. You must attend and participate in at least 9 (nine) of the 13 weekly quizzes to pass this unit, which implies coming to the class on time and handing in your completed work for the quiz. Your best 8 (eight) quiz scores will contribute to your overall quiz mark for the unit. If you need to lodge special consideration (via https://students.mq.edu.au/study/my-study-program/special-consideration), and this is granted, your average mark for quizzes will be worked out based on the appropriately reduced number of quizzes. It is recommended that you work with the same group of people (at the same table) for the entire duration.

2. **Completion of practical sessions.**

Satisfactory completion of laboratories is a hurdle requirement. You must attend all nine laboratory sessions. The first lab session is in week 1 and includes work health and safety information. Students may also be assigned to lab groups, lab books will be handed out, and computer access will be checked. It needs to be attended by all students regardless of whether this is their first Physics unit or not. It will be shorter than the other sessions, but attendance is mandatory – you can’t do subsequent lab sessions if you don’t attend the introductory one. The next eight lab sessions involve experimental work and will be assessed. You must obtain a mark of at least 40% for each of the laboratory sessions in order to pass the unit.

Preparation is required for each of the lab sessions 2-9. You will find the Prelab activities in the Laboratory Resources section of iLearn. Your prelab work will account for some of the marks for each laboratory session.

If you miss a session or fail to achieve at least 40% for any lab session, you must complete a “Request to schedule a Catch-up laboratory session” form, which can be found on iLearn. The dates and times of the catch-up classes will be available on the catch-up request form.
Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Hurdle</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>25%</td>
<td>Yes</td>
<td>weekly</td>
</tr>
<tr>
<td>Lab book</td>
<td>25%</td>
<td>Yes</td>
<td>after each lab</td>
</tr>
<tr>
<td>Final examination</td>
<td>50%</td>
<td>No</td>
<td>examination period</td>
</tr>
</tbody>
</table>

Quizzes
Assessment Type 1: Quiz/Test
Indicative Time on Task 2: 0 hours
Due: weekly
Weighting: 25%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Short quizzes taken in the SGTAs.

On successful completion you will be able to:

- demonstrate knowledge of foundational physics concepts, principles and theories, by predicting outcomes of 'thought experiments' (conceptual answers) and by calculating outcomes in specific physical situations (numerical answers).
- apply physics principles to solve real-world problems including those involving topics in the life sciences.
- use the tools, methodologies, language, conventions of physics to test and communicate ideas and explanations.
- demonstrate foundational learning skills including active engagement in your learning process.

Lab book
Assessment Type 1: Lab book
Indicative Time on Task 2: 10 hours
Due: after each lab
Weighting: 25%
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Assessment of your in-lab record of practical activities, as well as any pre-lab preparation.

On successful completion you will be able to:
- collect experimental data with appropriate precision and uncertainties, using a range of measurement and data analysis tools, and interpret and report on your results.

Final examination
Assessment Type 1: Examination
Indicative Time on Task 2: 20 hours
Due: examination period
Weighting: 50%
Examination during the university exam period, covering all content from the unit.

On successful completion you will be able to:

• demonstrate knowledge of foundational physics concepts, principles and theories, by predicting outcomes of 'thought experiments' (conceptual answers) and by calculating outcomes in specific physical situations (numerical answers).
• apply physics principles to solve real-world problems including those involving topics in the life sciences.
• use the tools, methodologies, language, conventions of physics to test and communicate ideas and explanations.
• collect experimental data with appropriate precision and uncertainties, using a range of measurement and data analysis tools, and interpret and report on your results.

1 If you need help with your assignment, please contact:
   • the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
   • the Writing Centre for academic skills support.

2 Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

**Delivery and Resources**

Lectures 2h/week | SGTA 2h/week | Labs 2.5h/week

All activities are in-person. The lectures will be recorded and available via iLearn. Additional video materials may be posted from time to time.

**Required Text**


Teaching Strategy PHYS1210 consists of lectures, tutorials, laboratory sessions and assessment including tutorial quizzes, laboratory reports and formal exams. You should spend an average of 9-10 hours per week studying for this unit (indicative only). This time is inclusive of all scheduled learning.
Laboratory Sessions

The laboratory component is an essential component of your studies and so counts for an appreciable fraction of your final assessment. You will be introduced to some of the basic skills and techniques required of practicing physicists, scientists and engineers. You will be issued with a Laboratory Notebook, provided with instructional material in the form of Laboratory Notes which can be found in the Laboratory Resources section of iLearn, and assisted in the laboratory by a team of demonstrators. For each laboratory session, except in week 1, you are required to complete some preparatory work (Pre-Lab) before attending your nominated Lab session. To figure out which Prelab to do, please consult the Laboratory Schedule on iLearn.

Location: There are two laboratories used for 1st year physics they are both in 14 SCO (formerly E7B):

Please check iLearn to see where your lab class will take place.

Laboratory Safety: You are required to follow all safety guidelines given in the first Lab session, your lab notes, and the lab staff. Food and drink cannot be consumed in the lab, and students without suitable covered footwear will be refused admission.

Topics covered in lectures (+ textbook chapters). Some changes in assigned/recommended sections may occur

Kinematics (Chapter 1)

1.1 Introduction
1.2 Distance and Displacement
1.3 Speed and Velocity
1.4 Acceleration
1.5 Average Velocity or Speed
1.6 Change in Displacement Under Constant Acceleration
1.7 The Acceleration Due to Gravity

Forces and Newton’s Laws of Motion (Chapter 2)

2.2 The Concept of Force
2.2 Newton’s Laws of Motion
2.3 Kinds of Force
2.4 Newtonian Gravity
2.5 Fictitious Forces

Rotational Statics (Chapter 4)

4.2 Equilibrium
4.3 Torque
4.4 The Principle of Moments

Energy (Chapter 5)

5.2 What is Energy?
5.3 Work
5.4 Kinetic Energy
5.5 Potential Energy
5.6 Conservative Forces
5.7 Conservation of Total Energy
5.8 Power

Electricity (Chapters 26, 27, 28)

26.2 Charge
26.3 Conductors and Insulators
26.4 Charging of Objects
27.2 Coulomb’s Law
27.3 Superposition of Electric Forces
27.5 The Electric Field
28.3 Electrical Potential
28.4 Electrical Potential and Work
28.7 The Heart and ECG

Currents and Circuits (Chapter 30)

30.2 Electric Current
30.4 Direct Versus Alternating Current
30.5 Circuits and Circuit Diagrams
30.6 Power Sources
30.7 Resistance and Ohm’s Law
30.8 Resistors and Resistivity
30.11 Resistors in Series and Parallel
30.12 Power Dissipation
30.14 Electric Shock Hazards
30.15 Electricity in Cells

Fluids (Chapters 11, 12, 14)
11.2 Pressure
11.3 Density
11.4 Pascal's Principle
11.5 Measurement of Pressure
11.6 Pressure and the Human Body
12.2 The Buoyant Force
14.1-14.2 Fluid Dynamics of Non-viscous Fluids
14.3 The Equation of Continuity
14.4 Bernoulli's Equation

Heat (Chapters 17, 19, 21)
17.2 Thermal Equilibrium
17.3 Measuring Temperature
19.2 Phase Changes
19.3 Temperature Changes
19.4 Energy Conservation
21.2 Heat Transfer: Conduction
21.3 Convection
21.4 Radiation

Thermodynamics (Chapters 22, 24)
22.2 The First Law
22.3 Energy and the Body
24.2 The Second Law of Thermodynamics
24.3 Entropy
24.4 Heat Engines

Waves and Sound (Chapters 8, 9)
8.1-8.2 Nature of waves
8.3 Frequency, Wavelength, and Speed
8.4 The Form of the Wave
8.5 Types of Wave
8.6 Superposition and Interference
8.7 Beats
8.8 Reflection
8.9 Standing Waves
8.10 Waves and Energy
9.2 Sound Waves in Media
9.3 Pitch and Loudness
9.4 Resonance and Sound Generation
9.5 The Ear
9.6 The Doppler Effect

**Light (Chapter 32, 33, 34)**
32.2 Electromagnetic Waves
32.3 Reflection
32.4 Refraction
32.5 Dispersion
33.1 Geometric Optics
33.2 Ray Diagrams
33.3-33.4 Mirrors
33.6 Lenses
34.1-34.9 The eye and vision

**Wave optics (Chapter 35)**
35.2 Superposition and Interference
35.4 Diffraction
35.5 Young’s Double-Slit Experiment

**Atoms and Atomic Physics (Chapter 38)**
38.2 Parts of the Atom
38.4 The Böhr Model of the Atom
38.6 Quantum Mechanics

**Nuclear Physics (Chapters 39, 40, 41, 42, 43)**
39.2 Nuclei and Isotopes
39.5 Nuclear Decay and Stability
40.2 Nuclear Decay Processes
40.3 Activity and Half-Life
Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/
The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.