PHYS1210

Physics for Life Sciences

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Mathematical and Physical Sciences

Contents

General Information

Unit convenor and teaching staff
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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 itslef. 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 op 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

(these are often held in the mid-semester break or at the end of classes). **No more than 3 catch-ups are allowed for missed labs/lab hurdles**, except where Special Consideration has been approved. If you fail to attend the catch-up class you are booked into, then that will count as another missed lab.

3. Final examination

Assessment Type [1]: Examination Indicative Time on Task [2]: 20 hours Due: **S2 examination period** Weighting: **50%** A written 2h exam covers all content from the unit.

The 'estimated time on task' for each assessment item is an estimate of the *additional* time needed to complete each assessment outside of all scheduled learning activities. These estimates assume that you actively engage with all scheduled learning activities *and* spend an additional 38 hours of self-led study during the session.

If you receive special consideration for the final exam, a supplementary exam will be scheduled after the end of the normal exam period. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

All assessment tasks are at scheduled times. In case of illness or misadventure, please apply for Special Consideration.

See the following website: https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/assessment

Assessment Tasks

Name	Weighting	Hurdle	Due
Quizzes	25%	Yes	weekly
Lab book	25%	Yes	after each lab
Final examination	50%	No	examination period

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.

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[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

Introduction to Biological Physics for the Health and Life Sciences, 2nd Edition, 2019, ISBN: 978-1-118-93450-0 OR E-text, ISBN: 978-1-118-93448-7

https://www.wiley.com/en-au/Introduction+to+Biological+Physics+for+the+Health+and+Life+Sciences%2C+2nd+Edition-p-9781118934500

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 (+ texbook 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

42.3 Dose and Dose Equivalent*

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.