



# PHYS1210

## Physics for Life Sciences

Session 1, In person-scheduled-weekday, North Ryde 2022

*School of Mathematical and Physical Sciences*

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## General Information

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Credit points

10

Prerequisites

(HSC Mathematics Standard 2 Band 5 and above or Advanced Mathematics Band 3 and above or Extension 1 or Extension 2)

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.** You must attend and participate in at least 10 of the 13 weekly tutorials to pass this unit, which implies coming to the class on time and handing in your completed work for the quiz. The first quiz is marked but the score is not logged: this is your only practice quiz. Quizzes in Weeks 2 to 13 are marked and logged. Your best 10 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 your remaining marks.

**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.

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
<a href="#">Quizzes</a>	25%	Yes	Every week during SGTA
<a href="#">Final examination</a>	50%	No	During University Examination Time
<a href="#">Lab book</a>	25%	Yes	In lab, see iLearn schedule

### Quizzes

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 0 hours

Due: **Every week during SGTA**

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.

### Final examination

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 20 hours

Due: **During University Examination Time**

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.

## Lab book

Assessment Type <sup>1</sup>: Lab book

Indicative Time on Task <sup>2</sup>: 10 hours

Due: **In lab, see iLearn schedule**

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.

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<sup>1</sup> 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.

<sup>2</sup> 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

**SGTAs and labs are on-campus and are compulsory. Lectures are on-campus and Echo360 recorded.**

Required Textbook

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 are expected to listen to and comprehend all online lectures. Lectures are live streamed and recorded and posted on the iLearn unit site prior to SGTA. You should spend an average of 9-10 hours per week studying for this unit. 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 1<sup>st</sup> year physics they are both in **14 SCO (formerly E7B)**:

**Room 114** (Ground floor at the North-East corner of building)

**Room 254** (First floor, north-facing side of the atrium)

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.

Covid-19 considerations: Labs are scheduled for on-campus delivery. You will need to comply with a number of Covid safety procedures, including the wearing of masks, sanitising hands and cleaning of work surfaces. In the event that a Covid outbreak causes the suspension of on-campus delivery, then an online version lab program will be provided, at the same time as your timetabled on-campus lab class. Instructions will be provided via iLearn should this change become necessary.

## Unit Schedule

### Topics covered in lectures

#### 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 Bohr 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 \(https://policies.mq.edu.au\)](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 \(https://students.mq.edu.au/support/study/policies\)](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 \(https://policies.mq.edu.au\)](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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto: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 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/](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.

## Changes from Previous Offering

The unit was offered in 2021 with a mix of in-person and on-line classes. This Session, all lecture classes, labs and SGTAs will be on campus. Lectures will be Echo recorded. The teaching team keeps a close look at COVID-19 restrictions regulations and adapts to them. All communications will be made as announcements via iLearn.

## Changes since First Published

Date	Description
07/02/2022	Changes from Previous Offering section was updated.