



# PHYS1210

## Physics for Life Sciences

Session 1, Weekday attendance, North Ryde 2020

*Department of Physics and Astronomy*

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## General Information

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Credit points

10

Prerequisites

(HSC General Mathematics Band 5 and above or 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.

## Assessment Tasks

### Coronavirus (COVID-19) Update

Assessment details are no longer provided here as a result of changes due to the Coronavirus (COVID-19) pandemic.

Students should consult [iLearn](#) for revised unit information.

[Find out more about the Coronavirus \(COVID-19\) and potential impacts on staff and](#)

students

## General Assessment Information

This unit has two hurdle requirements.

- 1. SGTA participation.** You must attend and participate in at least 11 of the 13 weekly tutorials to pass this unit, which implies coming to the class in time and handing in your completed work for the quiz. In case if you miss or do not participate in 3 or more tutorials, you need to lodge special consideration via [<https://students.mq.edu.au/study/my-studyprogram/special-consideration>], where compelling reasons are provided. In case if this special consideration 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 ten 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. The first practical session is introductory and **must** be attended by all students regardless of whether this is their first Physics unit or not. You can't do subsequent lab sessions if you don't attend the introductory one. The next 9 sessions each have a Prelab activity and a hurdle associated with them. **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 2-10. 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. Read the sections below for full details about catch up classes and when they are scheduled. **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 a catch-up class, then that will count as another missed lab.

Laboratory catch-up classes will be held during the mid-semester break and at the end of semester. The dates and times of the catch up classes will be available on the “Request a catch up lab” form.

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.

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

## Delivery and Resources

### Coronavirus (COVID-19) Update

Any references to on-campus delivery below may no longer be relevant due to COVID-19.

Please check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

### 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 are expected to attend all lectures. In person attendance is encouraged as the lectures regularly contain live demos which are not well captured by the recording system. If there are unavoidable timetable clashes, you can listen to the Echo recording of each lecture which is accessible from the course iLearn site. You should spend an average of 9 hours per week studying the unit.

### 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.

## Unit Schedule

### Coronavirus (COVID-19) Update

The unit schedule/topics and any references to on-campus delivery below may no longer be relevant due to COVID-19. Please consult [iLearn](#) for latest details, and check here for updated delivery information: [https://ask.mq.edu.au/account/pub/display/unit\\_status](https://ask.mq.edu.au/account/pub/display/unit_status)

## 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

22.4 Thermoregulation

22.5 Temperature and Health

24.2 The Second Law of Thermodynamics

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

35.9 Visual Acuity

**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

41.3 X-rays and Gamma Radiation

41.4 Particles

42.2 Mechanisms of Cell Damage

42.3 Dose and Dose Equivalent

43.2-43.5 Medical Imaging

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

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

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/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)

## Student Support

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

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## 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 previous unit offering was PHYS149 Physics for Life Sciences. This unit PHYS1210 is changed to cater more for the specific needs of students specialising in Life Sciences. The principal text book is changed to Introduction to Biological Physics for the Health and Life Sciences, 2nd Edition <https://www.wiley.com/en-au/Introduction+to+Biological+Physics+for+the+Health+and+Life+Sciences%2C+2nd+Edition-p-9781118934500> . The book provides excellent context to the Life Sciences students. Lectures are changed accordingly to correspond to this book structure.

## Changes since First Published

Date	Description
24/02/ 2020	Changed email addresses to phys1210@mq.edu.au to avoid flooding of the teachers' personal emails.
14/02/ 2020	Hurdle requirements and Delivery and Resources for practical sessions are amended as per Convenors Laboratory Info Pack