PHYS1210

Physics for Life Sciences

Session 1, In person-scheduled-weekday, North Ryde 2025

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.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Good Health and Well Being

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

REQUIREMENTS TO PASS THE UNIT

To pass the unit you have to acheave the total sum at least 50 out 100 marks across all the assesments. There are **no** hurdle requirements.

Attendance and participation

As per Assessment Policy attendance is **not assessed or mandated**. Nonetheless, attendance and participation in all classes is very important for student success and is strongly encouraged. You will not be able to participate in the labs until you complete the safety training (scheduled at week 1). Analysis of the student performance from the past offerings indicate that you are very likely to fail unless participating in at least 9 out of 13 SGTAs.

Late Assessment Submission and Penalties

Only one activity --- the Problem Set --- wil lhave the submission due date. It is to be determined in consultation iwth students by week 3. It falls under Late Assesment Policy: Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day a written report or presentation assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 23:55. A grace period of one hour period will be provided to students who experience a technical concern.

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. *Problem Set*: If you experience circumstances or events that affect your ability to complete the written assessments in this unit *by the deadline*, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au. *Labs:* to catch up 1-3 missed labs no formal request is neded. Just fill the catch-up form on iLearn.

ASSESMENT TASKS

1. LABORATORY WORK (30%, estimated time on task = 10 hours outside of scheduled classes)

Laboratory work entails hands-on practical activities that are undertaken during scheduled laboratory classes. The first laboratory **[during week 1]** session will introduce you to the to the lab program and the skills you will develop. Attendance is mandatory ***– you cannot do subsequent lab sessions if you do not attend the introductory one.***

The next *eight* lab sessions involve experimental work and will be assessed. Preparation is required for each of these lab sessions and you will find the Prelab activities in the Laboratory Resources section of iLearn.

All laboratory work will be documented in the lab book provided to you. The final lab mark will be informed by individual lab contributions and the overall assesment of the lab book. Each individual report will be marked in your lab book after each class so that you can track your progress. You can earn up to 20 points for your work each lab session. To achieve full marks you would need to attend all lab sessions and achieve 20 points in all nine practical lab sessions. Your laboratory work accounts for 30% of your final mark for the unit.

A limited number of catch-up labs will be offered for students who miss a lab session. These will be held during the mid-session break, and towards the end of semester. A student can request ***no more than three*** catch up labs, via an online form on iLearn. Further details will be made available in the Lab Resources section of iLearn and during the first Lab session.

2. PROBLEM SET (20%, estimated time on task = 3 hours outside of scheduled classes)

A problem set will be issues druing week 9. It will consist of the problems similar to the ones discussed at SGTA sessions and quizzes during weeks 1-9. The deadline will be determined in consultion with students, approximately around week 10.

2. FINAL EXAMINATION (20%, estimated time on task = 20 hours outside of scheduled classes)

A two-hour written examination will be held during the university exam period, covering all content from the unit.

Assessment Tasks

Name	Weighting	Hurdle	Due
Lab book	30%	No	ongoing
Problem set	20%	No	11/05/2025
Final examination	50%	No	TBA

Lab book

Assessment Type [1]: Lab book
Indicative Time on Task [2]: 10 hours
Due: **ongoing**
Weighting: **30%**

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.

Problem set

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 3 hours
Due: **11/05/2025**

Weighting: **20%**

A set of SGTA -style problems that focus on basic problem-solving skills.

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 [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **TBA**
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

CONTACTS

For all unit-related inquiries email phys1210@mq.edu.au. Do NOT use personal emails of the staff unless it is a major emergency.

WEEK 1

All activities start at week 1

STRUCTURE

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

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.

1. LABORATORY WORK

Laboratory work entails hands-on practical activities that are undertaken during scheduled laboratory classes. The first laboratory session will introduce you to the to the lab program and the skills you will develop. It also includes important 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. Session 1 needs to be attended by *all* students. It will be shorter than the other sessions, but attendance is mandatory ***– you cannot do subsequent lab sessions if you do not attend the introductory one.***

The next *eight* lab sessions involve experimental work and will be assessed. Preparation is required for each of these lab sessions and you will find the Prelab activities in the Laboratory Resources section of iLearn. All laboratory work will be documented in the lab book provided to you. The teaching staff will assist you throughout each lab session, providing feedback, allocating “points” for pre-lab work, for demonstrating particular skills during class, and for the documentation in your lab book. The points will be recorded in your lab book after each class so that you can track your progress.

2. SGTA

2h sessions happen weekly, **including week 1** [yes, they are scheduled before the lectures].

Week 1 session will review the math that is neccessary for this unit. Sessions for weeks 2-13 will practice the theoretical material from the pervious weeks.

Quizzes are taken at the end of each SGTA. They will be marked [approximately half by hte teaching staff, and half by other students at the end of the SGTA]. Their marks will be recorded. These are indicative only, but the past expirience makes them the best predictor of the final grade. All problems in the Problem Set a majority of the tasks of the Final Examination will be based on the SGTA problems and quizzes.

3 Topics covered in lectures (+ weeks+texbook chapters).

[Some changes in assigned/recommended sections may occur]

WEEK 1 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

WEEK 2 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 Forces and Newton's Laws of Motion (Chapter 2) 3.2 Description of Circular Motion 3.3 Circular Velocity and Acceleration 3.4 Centripetal Force 33 3.5 Sources of Centripetal Force

WEEK 3 Rotation (Chapter 3) 3.2 Description of circular motion 3.3 Angular velocity, acceleration 3.5 Centripetal force **Rotational Statics (Chapter 4)** 4.2 Equilibrium 4.3 Torque 4.4 The Principle of Moments

WEEK 4 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 **Momentum (Chapter 6)** 6.1 Introduction 6.2 Linear Momentum 6.3 Newton's Laws and Momentum 6.4 Collisions 6.5 Elastic Collisions

WEEK 5 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

WEEK 6 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

WEEK 7/1 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

WEEK 7/2 -WEEK 8 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

WEEK 9 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 Magnetism (enreachment)

WEEK 10 Waves and Sound (Chapters 8, 9) 8.1-8.2 Nature of waves 10 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 9.5 The Ear 9.6 The Doppler Effect

WEEK 11 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 21.4 Radiation

WEEK 12 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*

WEEK 13 REVISION

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 connect.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/

Academic Success

Academic Success 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 the Service Connect Portal, 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.

Changes from Previous Offering

Links with topics in chiro and biomed sciences are added to the lectures. GAMSAT-style problems are introduced to quizzes/SGTA.

Unit information based on version 2025.04 of the Handbook