PHYS1210

Physics for Life Sciences

Session 1, Special circumstances, North Ryde 2021

Department of Physics and Astronomy

Contents

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Notice

As part of Phase 3 of our return to campus plan, most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to timetable viewer. To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff
Unit Convenor/Lecturer
Andrei Zvyagin
phys1210@mq.edu.au
Wednesdays, 1:30 - 2:30 p.m.

Lab coordinator
Danny Cochran
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Lab coordinator
James Wood
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Director of Teaching and Learning for Physics and Astronomy
David Spence
phys1210@mq.edu.au

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://students.mq.edu.au/important-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 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-study-program/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 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. See ilearn 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 the catch-up class you are booked into, 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

Assessment Tasks

Name	Weighting	Hurdle	Due
Final examination	50%	No	During Examination Period, tba
Quizzes	25%	Yes	Weeks 1 - 13
Lab book	25%	Yes	Weeks 1 - 12

Final examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 20 hours
Due: **During Examination Period, 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.

Quizzes

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 0 hours
Due: **Weeks 1 - 13**
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: **Weeks 1 - 12**
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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[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 Learning Skills Unit 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 are online. Labs and SGTA are on campus, and attendance is compulsory.

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 listen to and comprehend all online lectures. Lectures are pre-recorded using the Echo recording system and posted on the iLearn unit site prior to SGTA. 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 1st 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

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 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
- Grade Appeal Policy
- Complaint Management 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

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) 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 Enquiry Service

For all student enquiries, visit Student Connect at ask.mq.edu.au

If you are a Global MBA student contact globalmba.support@mq.edu.au

Equity 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.

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

The unit was offered in 2020 in both sessions, Session 1 and 2. The unit flow in Session 1 was interrupted by the COVID-19 outbreak and went fully online. In Session 2, the unit was run partly online partly in normal mode. This year, the unit is offered in normal mode, with the exception of lectures, which will be available online. The teaching team continues their efforts to optimise PHYS1210 to cater more for the specific needs of students specialising in Life Sciences.

Changes since First Published

Date	Description
10/03/2021	Updated consultation time for A.Z.
14/02/2021	Minor changes to description of second-half content.