PHYS143

Physics IB

S2 Day 2017

Dept of Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff
Lecturer and Laboratory Convener
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Credit points
3

Prerequisites
(HSC Mathematics Band 4-6 or Extension 1 Band E2-E4 or Extension 2) or MATH130 or MATH123(HD)

Corequisites
Co-badged status
Unit description This unit, together with PHYS140, provides an overview of physics. This unit includes a broad range of topics suitable for engineering students or those majoring in any of the sciences. This unit begins with topics in classical physics: the physics of oscillations and wave motion, including sound waves, diffraction and the wave behaviour of light, leading to an introduction to geometrical and physical optics and the operation of some optical instruments. The unit then moves on to look at some of the theories of modern physics that influence the way that we view the natural world, and the fundamental laws that govern it. An introduction is given to molecular kinetic theory and the important universal laws of thermodynamics, the latter valid for everything from the boiling of a kettle to exploding black holes. Einstein's theory of special relativity and its counter-intuitive views on space and time, the uncertain world of quantum physics, and what the latter tells us about the structure of atoms and nuclei, conclude the unit. Regular guided laboratory work enables students to investigate the phenomena discussed in the lectures, using modern techniques in a well-equipped laboratory.

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:

Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.

Students will be able to analyse the description of a physical problem, be able to break the problem into component parts relating to different areas of physics, identify known quantities and apply mathematical models to arrive at a numerical value for an unknown quantity.

Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.

Students will be able to record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.

Students will be able to identify sources of uncertainty in physical measurements, be able to propagate these uncertainties through calculations, and express results in a

meaningful way.

Students start to acquire the skills required to investigate real-world problems, and interpret how numerical data and predictions relate to the physical world.

Students will be able to design experiments to measure or investigate physical phenomena

Assessment Tasks

Name	Weighting	Hurdle	Due
Quizzes	20%	Yes	weeks 2 - 13
Laboratory sessions	20%	Yes	Throughout the session
Mid-term exam	15%	No	15th of September 2017
Final exam	45%	Yes	Exam period

Quizzes

Due: **weeks 2 - 13**
Weighting: **20%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

There will be a test of 10 minutes duration in each tutorial from week 2 to week 13. The tests will comprise one or two questions based on those questions covered in the exercises and tutorial of the previous week. The results of your best 8 tests from the total of 12 will contribute 20% of your final mark.

Satisfactory performance in quizzes is a hurdle requirement. You must obtain a mark of at least 40% in at least 8 out of the 12 scheduled quizzes to pass the unit. No additional quizzes will be offered for those who fail to meet this requirement.

We require effective participation in tutorials, entailing a focused work effort and attendance for the full session. If you do not participate effectively in a given week, for example leaving the tutorial early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz, and that quiz will then not count towards passing the hurdle requirement.

On successful completion you will be able to:

- Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
- Students will be able to analyse the description of a physical problem, be able to break

the problem into component parts relating to different areas of physics, identify known quantities and apply mathematical models to arrive at a numerical value for an unknown quantity.

Laboratory sessions

Due: **Throughout the session**
Weighting: **20%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Laboratory sessions commence in **week 1**. The first week's lab contains important rules and explanations, including concerning safety in the lab. This session **must be completed** in order to access the lab in following weeks.

Satisfactory completion of laboratories is a hurdle requirement. You **must** attend **all ten** laboratory sessions. You **must** obtain a mark of **at least 40%** for each of the laboratory sessions in order to pass the unit.

Catch-up lessons will be offered at the following times:

1. In the mid-semester break:
    - Monday 18th September at 9am
    - Wednesday 27th September at 2pm
    - Thursday 28th September at 2pm
2. In week 13:
    - Wednesday 8th November at 2pm
    - Thursday 9th November at 9am
    - Thursday 9th November at 2pm

https://forms.office.com/Pages/ResponsePage.aspx?id=wRTFghenh0C-BtQNIHCtUibrTxmgZIdBmIKwD_PRvg5UREpURVJPR1hBN0Q5V1haTkZKUTBYUlFYUy4u

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.

On successful completion you will be able to:

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- Students will be able to record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.
- Students will be able to identify sources of uncertainty in physical measurements, be able to propagate these uncertainties through calculations, and express results in a meaningful way.
- Students start to acquire the skills required to investigate real-world problems, and interpret how numerical data and predictions relate to the physical world.
- Students will be able to design experiments to measure or investigate physical phenomena

Mid-term exam

Due: **15th of September 2017**
Weighting: **15%**

A mid-session exam will be held in the 4 p.m. lecture time slot on Friday the 15th of September i.e. the end of week 7. This 50-minute exam will cover content from weeks 1-5 inclusive. Further details will be provided in lectures leading up to this date.

You are expected to make yourself available for the mid-session exam. If you miss it, you will need to go through the formal disruption to studies process to take a catch-up.

On successful completion you will be able to:

- Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
- Students will be able to analyse the description of a physical problem, be able to break the problem into component parts relating to different areas of physics, identify known quantities and apply mathematical models to arrive at a numerical value for an unknown quantity.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.

Final exam

Due: **Exam period**
Weighting: **45%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

You are expected to present yourself for the final examination at the time and place designated

in the University examination timetable (http://www.timetables.mq.edu.au/exam/). The timetable will be available in draft form approximately eight weeks before the commencement of examinations and in final form approximately four weeks before the commencement of examinations.

The final examination is a hurdle requirement. You must obtain a mark of at least 40% to be eligible to pass the unit. If your mark in the final examination is between 30% and 39% inclusive then you will be a given a second and final chance to attain the required level of performance.

If you apply for Disruption to Study for your final examination, you must make yourself available for the week of December 11 – 15, 2017. If you are not available at that time, there is no guarantee an additional examination time will be offered. **Second-chance hurdle examinations will also be offered in this week.** Specific examination dates and times will be determined at a later date.

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Delivery and Resources

General Information

Study material is hosted on the iLearn webpage for the unit as are all announcements http://ilearn.mq.edu.au

Asking for help

A number of people can assist students while they undertake PHYS143. For any inquiry please use this e-mail address:

PHYS143@mq.edu.au

instead of using people's personal e-mails. This will insure that the best answer to your question is obtained.

Unit textbook and textbook resources

The textbook for this unit is "Fundamentals of Physics" by Halliday, Resnick, & Walker, Extended 10th edition. It is essential that you obtain a copy (digital or physical) of this textbook, as we will be following it closely and you will find it an invaluable resource while working on 'assigned problems' in PHYS143.

Print versions of the textbook are available from the CoOp bookshop (hard- and soft-cover) and digital options are available through http://au.wiley.com/WileyCDA/WileyTitle/productCd-EHEP002531.html .

Students are also encouraged to sign up to the Wiley Plus website to make use of the extended learning resources available there - including interactive problem solving resources. Instructions will be provided in lectures.

Technology

Audio recordings and copies of slides from lectures will be available in iLearn through the Echo360 system. By virtue of the activities that occur in a physics lecture (demonstrations, problem solving) making use of these resources is not equivalent to attending. These resources are good for review and revision.

The use of calculators in the laboratory classes, when completing quizzes, in the in-session exam and in the final examination for this unit is usually necessary. In accordance with the Science Faculty's policy, calculators *with a full alphabet* on the keyboard are not allowed in the quizzes, in-session exam or the final examination.

Personal electronic devices such as smart phones, tablets, or laptops will be used for self assessment quizzes and other learning enhancement classroom activities.

Unit Schedule

Lectures:

A more detailed week-by-week schedule will be placed on iLearn. The unit is taught in two halves:

Waves, Sound Waves, Light as a Wave, Light – Images, Light – Interference, Light – Diffraction, A/Prof. Andrei Zvyagin, Weeks 1-6: Chapters 16, 17, 33–36 (Extended 10th edition)

Heat & Thermodynamics, Modern Physics, Prof Helen Pask, Weeks 7-12: Chapters 18-19, 37-38, 42-43 (Extended 10th edition)

Lecture times are on Thursday at 2-3 pm, Thursday at 12-13 pm and Friday at 4-5 pm.

Laboratory sessions:

Each student will attend 10, 3-hour long laboratory sessions, starting in week 1.

Tutorials:

Each student will attend 13, 1-hour long tutorials, starting in week 1.

Learning and Teaching Activities

Lectures

Three hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos. Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures. Attending lectures is an important part of studying physics since it allows you to gain an insight into the subject matter that reading the textbook alone cannot provide. The lecturers can explain the concepts from several points of view, can point out and explain the most important aspects of the material and, very importantly, can illustrate the relationships and connections between the different concepts that are studied in PHYS143 – no subject in physics stands on its own.

Tutorial

Each student will attend one hour a week of tutorial class. Tutorials are group activities, comprising approximately 20 students and one tutor. Four tutorial questions pertaining material discussed in the lectures of the previous week, are provided and are discussed and solved in a group setting. In tutorials examples illustrating the material are presented for discussion (with fellow classmates and tutors) and problem solving methods are practiced. Tutorials in weeks 2-13 will include a 10-minute quiz, based on one of the assigned problems issued the previous week. Tutorials form an important learning component of PHYS143 and are therefore compulsory. We require effective participation in tutorials, entailing a focussed work effort and attendance for the full session. If you do not participate effectively in a given week, for example, leaving the tutorial early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz, and that quiz will then not count towards passing the hurdle requirement.

Laboratory sessions

Ten three-hour laboratory classes will be held during the semester. During laboratory sessions you will develop skills in making measurements of physical phenomena and in the interpretation of collected data. Labs are a hurdle assessment - see details in the assessment section. The first is an introductory session. It is held in Week 1, and no prelab work is required. It includes lab group assigning, computer access and important safety information and therefore attendance is mandatory. Students can’t attend their 2nd Laboratory session until they have completed the first. During the laboratory sessions students will engage in practical exercises to develop their experimental skills and to further their understanding of the physics concepts.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

Results

Results shown in *iLearn*, 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.

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 improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- Students will be able to analyse the description of a physical problem, be able to break the problem into component parts relating to different areas of physics, identify known quantities and apply mathematical models to arrive at a numerical value for an unknown quantity.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.
- Students start to acquire the skills required to investigate real-world problems, and interpret how numerical data and predictions relate to the physical world.
- Students will be able to design experiments to measure or investigate physical phenomena

Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

- Three hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos. Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures. Attending lectures is an important part of studying physics since it allows you to gain an insight into the subject matter that reading the textbook alone cannot provide. The lecturers can explain the concepts from several points of view, can point out and explain the most important aspects of the material and, very importantly, can illustrate

the relationships and connections between the different concepts that are studied in PHYS143 – no subject in physics stands on its own.

- Each student will attend one hour a week of tutorial class. Tutorials are group activities, comprising approximately 20 students and one tutor. Four tutorial questions pertaining material discussed in the lectures of the previous week, are provided and are discussed and solved in a group setting. In tutorials examples illustrating the material are presented for discussion (with fellow classmates and tutors) and problem solving methods are practiced. Tutorials in weeks 2-13 will include a 10-minute quiz, based on one of the assigned problems issued the previous week. Tutorials form an important learning component of PHYS143 and are therefore compulsory. We require effective participation in tutorials, entailing a focussed work effort and attendance for the full session. If you do not participate effectively in a given week, for example, leaving the tutorial early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz, and that quiz will then not count towards passing the hurdle requirement.
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Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
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problems based on this analysis, and interpret how numerical results relate to the physical world.
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Assessment task

- Laboratory sessions

Learning and teaching activity

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Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

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Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

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Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

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Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

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Learning outcomes

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Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- Students will be able to analyse the description of a physical problem, be able to break the problem into component parts relating to different areas of physics, identify known quantities and apply mathematical models to arrive at a numerical value for an unknown quantity.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.
- Students will be able to record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.
- Students will be able to design experiments to measure or investigate physical phenomena

Assessment tasks

- Quizzes
- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

- Three hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos. Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures. Attending lectures is an important part of studying physics since it allows you to

gain an insight into the subject matter that reading the textbook alone cannot provide. The lecturers can explain the concepts from several points of view, can point out and explain the most important aspects of the material and, very importantly, can illustrate the relationships and connections between the different concepts that are studied in PHYS143 – no subject in physics stands on its own.

- Each student will attend one hour a week of tutorial class. Tutorials are group activities, comprising approximately 20 students and one tutor. Four tutorial questions pertaining material discussed in the lectures of the previous week, are provided and are discussed and solved in a group setting. In tutorials examples illustrating the material are presented for discussion (with fellow classmates and tutors) and problem solving methods are practiced. Tutorials in weeks 2-13 will include a 10-minute quiz, based on one of the assigned problems issued the previous week. Tutorials form an important learning component of PHYS143 and are therefore compulsory. We require effective participation in tutorials, entailing a focussed work effort and attendance for the full session. If you do not participate effectively in a given week, for example, leaving the tutorial early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz, and that quiz will then not count towards passing the hurdle requirement.
- Ten three-hour laboratory classes will be held during the semester. During laboratory sessions you will develop skills in making measurements of physical phenomena and in the interpretation of collected data. Labs are a hurdle assessment - see details in the assessment section. The first is an introductory session. It is held in Week 1, and no prelab work is required. It includes lab group assigning, computer access and important safety information and therefore attendance is mandatory. Students can’t attend their 2nd Laboratory session until they have completed the first. During the laboratory sessions students will engage in practical exercises to develop their experimental skills and to further their understanding of the physics concepts.

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Students will be able to explain Physics concepts, within the topics listed in the unit

guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.
- Students will be able to record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.
- Students will be able to identify sources of uncertainty in physical measurements, be able to propagate these uncertainties through calculations, and express results in a meaningful way.
- Students will be able to design experiments to measure or investigate physical phenomena

Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

- Three hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos. Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures. Attending lectures is an important part of studying physics since it allows you to gain an insight into the subject matter that reading the textbook alone cannot provide. The lecturers can explain the concepts from several points of view, can point out and explain the most important aspects of the material and, very importantly, can illustrate the relationships and connections between the different concepts that are studied in PHYS143 – no subject in physics stands on its own.
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Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcomes

- Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.
- Students will be able to design experiments to measure or investigate physical phenomena

Assessment task

- Laboratory sessions

Learning and teaching activity

- Three hours of lectures per week are provided where a lecturer explains the material,

gives examples in the form of movies, practical problems, demos. Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures. Attending lectures is an important part of studying physics since it allows you to gain an insight into the subject matter that reading the textbook alone cannot provide. The lecturers can explain the concepts from several points of view, can point out and explain the most important aspects of the material and, very importantly, can illustrate the relationships and connections between the different concepts that are studied in PHYS143 – no subject in physics stands on its own.

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Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- Students will be able to explain Physics concepts, within the topics listed in the unit guide, in terms of their underlying physical principles, and describe them in terms of concise mathematical models.
- Students will be able to analyse real-world problems, be able to develop physical problems based on this analysis, and interpret how numerical results relate to the physical world.
- Students will be able to design experiments to measure or investigate physical phenomena

Assessment task

- Laboratory sessions

Learning and teaching activity

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