PHYS140

Physics IA

S1 Day 2019

Dept of Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff
Laboratory Convener
Helen Pask
Contact via phys140@mq.edu.au
7 Wally's Walk 2.707
By appointment

100-level Laboratory Officer
Danny Cochran
Contact via phys140@mq.edu.au
14 Sir Christopher Ondaatje Ave 122
By appointment

Convener and Lecturer
Judith Dawes
Contact via phys140@mq.edu.au
7 Wally's Walk 2.708
By appointment

PHYS140 Convener Team
For all inquiries
PHYS140@mq.edu.au

100 level lab scientific officer
James Wood
Contact via phys140@mq.edu.au
14 Sir Christopher Ondaatje Ave 122

Tutor
Daniel Terno
7 Wallys Walk 2.715
by arrangement

Tutor
Andrew Lee
by arrangement

Orsola De Marco
orsola.demarco@mq.edu.au

Credit points 3	
Prerequisites (HSC Mathematics Band 4-6 or Extension 1 Band E2-E4 or Extension 2) or MATH130 or MATH123(HD) or WFMA003	
Corequisites	
Co-badged status	
Unit description This unit, together with PHYS143, gives an overview of physics, which aims to discover and understand the fundamental laws of nature and use them to explain the phenomena that occur in the universe. This unit includes a broad range of topics suitable for engineering students or those majoring in any of the sciences. Students are introduced to the central topics of classical physics, the physics that describes what we observe in day-to-day life, namely the mechanical and electrical behaviour of matter. Newton's laws and concepts of momentum, energy and charge conservation, are used with contact forces, gravitational forces, and electrical forces to describe the world, including understanding basic electronic circuits. The language of physics is mathematics, and much of what physics has to say can be described using straightforward algebra and calculus from the HSC Mathematics course. This provides a quantitative and usefully different perspective to topics than may be encountered in units of study in biology, chemistry or earth sciences. Regular guided laboratory work enables students to develop experimental skills, investigating 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, 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 measure and 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 demonstrate foundational learning skills including active engagement in their learning process.

General Assessment Information

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the interval between the regular exam period and the start of the next session. 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. You can check the supplementary exam information page on FSE101 in iLearn (bit.ly/FSESupp) for dates, and approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

If you are given a second opportunity to sit the final examination as a result of failing to meet the minimum mark required, you will be offered that chance during the same supplementary examination period and will be notified of the exact day and time after the publication of final results for the unit.

Assessment Tasks

Name	Weighting	Hurdle	Due
Quizzes	25%	No	In class
Laboratory sessions	20%	Yes	At the end of each lab
Mid-term exam	10%	No	At the end of the exam
Final exam	45%	Yes	At the end of the exam
Weekly class participation	0%	Yes	full class each week

Quizzes

Due: **In class**
Weighting: **25%**

In weeks 2-6 and 8-13, during your problem-solving classes, you will answer a paper-based quiz.

The questions for the quiz will be based on material presented and discussed during the previous week's lectures. The in-class quiz is closed book. You will have 15 minutes to answer your in-class quiz questions. These quizzes will be marked and returned with feedback. If you have missed your scheduled in-class quiz, due to unforeseen circumstances, you should apply for special consideration.

Please bring a suitable (non-programmable) scientific calculator to all problem-solving classes, not your mobile phone. The mid-semester and final exams will also require the use of scientific calculators.

We require effective participation in problem-solving classes, entailing a focused work effort and attendance for the full session. If you do not participate effectively in a given week, for example arriving late or leaving the class early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz.

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, 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 demonstrate foundational learning skills including active engagement in their learning process.

Laboratory sessions

Due: **At the end of each lab**
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. The **first lab session is in week 1** and includes work health and safety information. You will be assigned to lab groups and your computer access will be checked. Week 1 labs must be attended regardless of whether you have enrolled in previous Physics units. **Week 1 attendance is mandatory.** The remaining 9 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 2-10. You will find the pre-lab activities in the Laboratory resources section of iLearn. Your pre-lab work will account for some of the marks for each lab session.

If you miss a session or fail an activity, you must complete a **"Request to schedule a make-up laboratory session"** form that you can find on iLearn.

Catch-up classes for lab activities will be held in weeks 12 and 13 on Monday 4-7 pm, Wednesday 12-3 pm, Wednesday 3-6 pm, Thursday 4-7 pm in each week. No other catch-up classes will be offered. You must request permission to attend one of these classes in order to catch up a lab that you have missed.

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 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 measure and 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 demonstrate foundational learning skills including active engagement in their learning process.

Mid-term exam

Due: **At the end of the exam**
Weighting: **10%**

A mid-session exam will be held in the Problem-solving classes in 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.

If you cannot attend the examination please email phys140@mq.edu.au as soon as you can. If you miss the examination due to unforeseen circumstances, you may apply for special consideration. There will be a catch-up mid-session exam at a later date, advertised on iLearn (the catch-up exam is likely going to be during the mid-semester break). There will only be **one** mid-session exam catch-up opportunity.

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, 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: **At the end of the exam**
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 examination at the time and place designated in the University Examination Timetable (a link will be posted on iLearn).

The final examination will be two hours long and will cover all content in the unit, with an emphasis on that in weeks 5-13. The examination is closed book. A resource sheet of relevant equations and physical constants will be provided. The use of calculators in examinations for this unit is permitted but, in accordance with the Science Faculty's policy, calculators *with a full alphabet* on the keyboard are not allowed.

The final examination is a hurdle requirement. You must obtain a mark of at least 40% in the final exam to be eligible to pass the unit. If your mark in the final examination is between 30% and 39% inclusive, you may be a given a second and final chance to attain the required level of performance; the mark awarded for the second exam towards your final unit mark will be capped at 40%, and you will be allowed to sit the second exam only if this mark would be sufficient to pass the unit overall.

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the week of July 15-26 2019. 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.

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, 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.

Weekly class participation

Due: **full class each week**
Weighting: **0%**
This is a hurdle assessment task (see assessment policy for more information on hurdle assessment tasks)

Students must participate meaningfully and actively in at least 9 problem-solving classes, including submitting the quiz for that class.

The class material covers the previous week's lecture material, so that the class material and the quiz in week 2 concern the lectures from week 1, for example. The week 1 class concerns vectors and standard maths. Vectors are an important concept needed for lectures in week 2. There is a quiz in week 1 classes which will not be included in the final grade calculation.

The class quiz each week is on material from that same week's class. The list of problems will be made available on ilearn in advance and you are recommended to attempt the questions and read the textbook in preparation for the problem-solving classes.

On successful completion you will be able to:
- Students will demonstrate foundational learning skills including active engagement in their learning process.

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 PHYS140. For any inquiry please use this e-mail address:

phys140@mq.edu.au

instead of using people's personal e-mails. This will ensure 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 text book as we will be following it closely and you will find it an invaluable resource while working on 'assigned problems' in PHYS140.

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.

Lectures, tutorials and laboratory sessions

This unit consists of three different formal types of activity:

1. Lectures, in which new material is presented, discussed and illustrated by examples and demonstrations.

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, and **lecture attendance is compulsory**. 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 PHYS140 – no subject in physics stands on its own.

2. Weekly problem-solving classes

In problem-solving classes, examples illustrating the material are presented for discussion (with fellow classmates and teachers) and problem-solving methods are practised. Classes in weeks 2-6 and 8-13 will include a 15 minute quiz, based on the earlier questions in that class and the lecture material from the previous week. Problem-solving classes form an important learning component of PHYS140 and are therefore compulsory. **We require effective participation in problem-solving classes entailing a focused work effort and attendance for the full session. If you do not participate effectively in a given week, for example arriving late or leaving the class early without extenuating circumstances, it will be grounds for receiving a score of zero for that week's quiz.**

3. Laboratory sessions

During laboratory sessions you will develop skills in making measurements of physical phenomena and in the interpretation of collected data. **Laboratory classes are compulsory and students who do not attend all laboratory classes will be deemed to have failed to satisfactorily meet the learning outcomes of the unit and will therefore receive a failing grade.**

Lecture, laboratory and class times - See more detailed unit guide provided in iLearn or your timetable.

Unit Schedule

Lectures:

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

• Mechanics, Prof. Orsola De Marco, Weeks 1-7: Chapters 1-12, 15 (Extended 10th edition)

• Electricity, Prof Judith Dawes, Weeks 8-13: Chapters 21-27 (Extended 10th edition)

Lecture times are on Tuesday at 12-1 pm and Wednesday at 2-3 pm.

Laboratory sessions:

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

Problem-solving classes:

Each student will attend 12, 2-hour long classes, starting in week 1. Note that there is a mid-semester exam held during the classes in week 7.

Learning and Teaching Activities

Lectures

Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.

Problem-solving classes

Each student will attend a two-hour problem-solving class each week. Students will work in groups on a selection of questions pertaining to material discussed in the lectures of the previous week. During class time in weeks 2-6 and 8-13 each student answers a 15-minute quiz based on class material discussed in the previous week. This quiz is assessed (see Assessment). During the first week's class, since there is no material already from the previous week, questions based on maths assumed knowledge and units and orders of magnitude will be discussed and a quiz completed, but these marks will not contribute to the final grade. This enables us to explain the format of the quiz.

Laboratory

Ten three-hour laboratory classes will be held during the semester. The first is an introductory session. It is held in Week 1, and no pre-lab work is required. It includes important safety information and therefore attendance is mandatory. Students cannot 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. These 10 sessions are assessed and are also a "hurdle assessment". Please see assessment part of this Unit Guide.

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). 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.)*

Undergraduate students seeking more policy resources can visit the 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).

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 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 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

If you are a Global MBA student contact 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/.

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, 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.

Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
- Each student will attend a two-hour problem-solving class each week. Students will work in groups on a selection of questions pertaining to material discussed in the lectures of the previous week. During class time in weeks 2-6 and 8-13 each student answers a 15-minute quiz based on class material discussed in the previous week. This quiz is assessed (see Assessment). During the first week's class, since there is no material already from the previous week, questions based on maths assumed knowledge and units and orders of magnitude will be discussed and a quiz completed, but these marks will not contribute to the final grade. This enables us to explain the format of the quiz.
- Ten three-hour laboratory classes will be held during the semester. The first is an introductory session. It is held in Week 1, and no pre-lab work is required. It includes important safety information and therefore attendance is mandatory. Students cannot 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. These 10 sessions are assessed and are also a "hurdle assessment". Please see assessment part of this Unit Guide.

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.
- 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 measure and record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.

Assessment task

- Laboratory sessions

Learning and teaching activity

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
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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:

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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- 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 demonstrate foundational learning skills including active engagement in their learning process.

Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam
- Weekly class participation

Learning and teaching activities

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
- Each student will attend a two-hour problem-solving class each week. Students will work in groups on a selection of questions pertaining to material discussed in the lectures of the previous week. During class time in weeks 2-6 and 8-13 each student answers a 15-minute quiz based on class material discussed in the previous week. This quiz is assessed (see Assessment). During the first week's class, since there is no material already from the previous week, questions based on maths assumed knowledge and units and orders of magnitude will be discussed and a quiz completed, but these marks will not contribute to the final grade. This enables us to explain the format of the quiz.

- Ten three-hour laboratory classes will be held during the semester. The first is an introductory session. It is held in Week 1, and no pre-lab work is required. It includes important safety information and therefore attendance is mandatory. Students cannot 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. These 10 sessions are assessed and are also a "hurdle assessment". Please see assessment part of this Unit Guide.

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.

This graduate capability is supported by:

Learning outcomes

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- 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.

Assessment tasks

- Quizzes
- Laboratory sessions

- Mid-term exam
- Final exam

Learning and teaching activities

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
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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.

This graduate capability is supported by:

Learning outcomes

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- Students will be able to analyse the description of a physical problem, 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.
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Learning and teaching activities

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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, 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 measure and record experimental data, display data graphically, analyse data, and present their conclusions in a clear, concise, and systematic manner.

Assessment tasks

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

Learning and teaching activities

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
- Each student will attend a two-hour problem-solving class each week. Students will work in groups on a selection of questions pertaining to material discussed in the lectures of the previous week. During class time in weeks 2-6 and 8-13 each student answers a 15-minute quiz based on class material discussed in the previous week. This quiz is assessed (see Assessment). During the first week's class, since there is no material already from the previous week, questions based on maths assumed knowledge and units and orders of magnitude will be discussed and a quiz completed, but these marks will not contribute to the final grade. This enables us to explain the format of the quiz.

- Ten three-hour laboratory classes will be held during the semester. The first is an introductory session. It is held in Week 1, and no pre-lab work is required. It includes important safety information and therefore attendance is mandatory. Students cannot 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. These 10 sessions are assessed and are also a "hurdle assessment". Please see assessment part of this Unit Guide.

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.
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- 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.

Assessment tasks

- Laboratory sessions
- Mid-term exam
- Final exam

Learning and teaching activities

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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.

Assessment task

- Laboratory sessions

Learning and teaching activity

- Two hours of lectures per week are provided where a lecturer explains the material, gives examples in the form of movies, practical problems, demos, and engages the classroom with dynamic quizzes (not marked). Lectures are recorded, but listening to the recording and reading the book is not a good substitute to attending lectures.
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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.

Assessment task

- Laboratory sessions

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Changes from Previous Offering

Additional textbook resources available on ilearn to support students' self-study for all chapters

Small adjustments to the assessment tasks

Changes to delivery of group problem-solving classes

Improvements to laboratory approach and style

Graduate capabilities

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:

Learning outcome

- 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.

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 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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- 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.

Assessment tasks

- Tutorial quizzes
- Mid-session Exam
- Laboratory Work
- Final Examination

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.

Assessment tasks

- Tutorial quizzes
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- Final Examination

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This graduate capability is supported by:

Learning outcome

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

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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 outcome

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

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 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.

Assessment tasks

- Tutorial quizzes
- Laboratory Work

- Final Examination

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.

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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Assessment tasks

- Tutorial quizzes
- Mid-session Exam
- Laboratory Work
- Final Examination

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.

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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