PHYS140

Physics IA

S1 Day 2016

Dept of Physics and Astronomy

Contents

General Information

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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 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, electrical and magnetic behaviour of matter. Topics include: measurement and vectors; Newton's laws of motion; momentum and energy; gravitation; electric charge; electric field and potential; capacitance; simple direct-current circuits; the origin of magnetic fields; and electromagnetic induction. The language of physics is mathematics. Much of what physics has to say can be described using straightforward algebra and calculus from the HSC Mathematics course. This approach is taken. It gives a distinct advantage: 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 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.

General Assessment Information

Macquarie University uses a standards-based assessment system and, as such, satisfactory performance in **all** aspects of the unit assessment is required to pass the unit overall.

Assessment Tasks

Name	Weighting	Due
Tutorial quizzes	20%	Tutorial class
Mid-session Exam	15%	29 April 2016
Laboratory Work	20%	End of each Lab session
Final Examination	45%	See Examination Timetable

Tutorial quizzes

Due: **Tutorial class**
Weighting: **20%**

During the session, in weeks 2-12, you will be provided with a set of *assigned problems* based on the previous week's lecture topics. The week following, in your registered tutorial class, you

will complete a 10 minute quiz closely based on one of these assigned problems. These quizzes will be marked and returned with feedback. Your best 8 quiz scores (out of a possible 10) will contribute a total of 20% to your final mark.

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.
- 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.

Mid-session Exam

Due: **29 April 2016**
Weighting: **15%**

A mid-session exam will be held in the 11 am lecture time slot on Friday the 29th of April i.e. the end of week 7. This 50-minute exam will cover content from weeks 1-4 inclusive. Further details will be provided in lectures leading up to this date.

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.

- 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.

Laboratory Work

Due: **End of each Lab session**
Weighting: **20%**

The laboratory work is designed to introduce you to some of the basic skills and techniques that are used in experimental physical science, and forms an important component of your learning in PHYS140.

All your work must be recorded directly into your laboratory notebook, which we will supply to you. The laboratory manual will be suppled to you electronically through iLearn. More detailed instructions and advice will be provided in iLearn and in the laboratory.

Your laboratory notebook will be assessed by one of the demonstrators at the end of each session. Your laboratory notebook stays with the laboratory throughout the semester.

The laboratory component of the unit is compulsory and all experiments must be successfully completed to pass the unit overall. Only under exceptional circumstances will extra catch up sessions be organised; you are responsible for ensuring that you complete all experiments as required during your registered laboratory class.

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 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.

Final Examination

Due: **See Examination Timetable**
Weighting: **45%**

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable (http://www.timetables.mq.edu.au/exam/).

The final examination will be three hours long and will cover all content not already covered by the mid-session exam. 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.

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.
- 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.

Delivery and Resources

Unit Textbook

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 .

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.

Lectures and Tutorials

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. 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. Compulsory weekly tutorials, in which 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 have a 10 minute quiz at some point in them, based on one of the assigned problems issued the previous week. Tutorials form an important learning component of PHYS140 and are therefore compulsory. **Students who do not attend at least 10 tutorial classes will be deemed to have failed to satisfactorily meet the learning outcomes of the unit and will therefore receive a failing grade.**

3. 3-hour laboratory sessions, in which 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 and tutorial times - See more detailed unit guide provided in iLearn or your timetable.

Information

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

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.

Changes since the last offering of this unit

The laboratory component of PHYS140 has been the subject of a university learning and teaching grant and has as a consequence been redesigned. This has been done to progressively develop the important skills taught in the laboratory, and to explicitly explain what these skills are in the context of all laboratory work.

Unit Schedule

A more detailed week-by-week schedule will be placed on iLearn, however the basic format of the unit is that it is taught in two halves:

• Mechanics, Dr James Downes, Weeks 1-6: Chapters 1-13, 15 (Extended 10th edition)

• Electricity and Magnetism, Prof Mark Wardle, Weeks 7-12: Chapters 21-30 (Extended 10th edition)

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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.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 http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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.

Assessment tasks

- Tutorial quizzes
- Laboratory Work
- Final Examination

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

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.

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.
- 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
- Mid-session Exam
- Laboratory Work
- Final Examination

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.
- 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.

Assessment tasks

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

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 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.
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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 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.

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 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.