PHYS130

Foundations of Physics

S2 Day 2016

Dept of Physics and Astronomy

Contents

General Information

Unit convenor and teaching staff
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Credit points
3

Prerequisites
MATH130 or HSC Mathematics Band 4

Corequisites

Co-badged status

Unit description
This unit is an introduction to basic physics for students who did not take HSC physics or who need to improve their understanding and facility in physics before progressing to more advanced physics units (either PHYS140/PHYS143 or PHYS106/PHYS107). The unit provides an introduction to the techniques by which the basic physical phenomena of our world and universe are described and understood. The material covers the concepts of vectors and the description of motion using Newton's Laws, electrical and magnetic forces and phenomena, elementary atomic structure and introductory quantum physics. A mathematical approach to physics is central but the content is covered without the use of calculus in preparation for further 100-level units which do use calculus. An emphasis is placed on developing problem-solving skills by which physical problems are mapped to mathematical representations which can then be solved to understand the system. These skills include the development of abilities in interpreting visual representations of physical data.

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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.
>
> Students will understand how real-world problems can be interpreted by physical models.

General Assessment Information

Macquarie University uses a standards-based assessment system.This unit has a hurdle requirement, specifying a minimum standard that must be attained in an aspect of the unit. To pass this unit you must obtain a mark of at least:

50% in the unit overall

as well as

at least 40% in at least 8 of the 12 weekly quizzes

Assessment Tasks

Name	Weighting	Due
Tutorial quizzes	30%	Tutorial class
Mid-session Exam	20%	Friday 9 September 12-1 pm
Final Examination	30%	See Examination Timetable
Group project	20%	weeks 11 and 12

Tutorial quizzes

Due: **Tutorial class**
Weighting: **30%**

During each tutorial, in weeks 2-13, you will work on a set of *assigned problems* based on that 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 12) will contribute a total of 30% to 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.

On successful completion you will be able to:

- Students will be able to explain Physics concepts concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.

Mid-session Exam

Due: **Friday 9 September 12-1 pm**
Weighting: **20%**

A mid-session exam worth 20% of the final grade will be held in the 12-1 pm lecture time slot on Friday 9th September i.e. the end of week 6. 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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.

Final Examination

Due: **See Examination Timetable**
Weighting: **30%**

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 is worth 30% of the final grade.

The final examination will be two hours long and will include all content from the unit, with an emphasis on the later material. 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 Faculty 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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.

Group project

Due: **weeks 11 and 12**
Weighting: **20%**

The purpose of the group project is to stimulate students to learn how to apply the physics within the unit to real world situations that occur in everyday life. Students (in groups of 3 or 4), will work in collaboration with the lecturers to identify a suitable “explorer project” whose physical operation is closely related to one or more of the topics covered in the unit. The group will research this explorer project, either through a basic construction/exploration, or via pre-constructed equipment available within the Department, or via a computer simulation. The group will write a short report explaining how their explorer project demonstrates some of the physical principles taught in the unit. Each student in the group will also write an individual reflection on how they use problem-solving skills for analysing that system. Each group will make a 10-minute presentation to the class based on their analysis during weeks 11 and 12 of the semester. Further details will be available during the semester. Each student's individual reflection will be 10% of their final mark. The group report will be 5% of the final mark for each student, and the group presentation will be 5% of the final mark. In total, the group project is worth 20% of the final mark.

On successful completion you will be able to:

- Students will be able to explain Physics concepts concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.
- Students will understand how real-world problems can be interpreted by physical models.

Delivery and Resources

Unit Textbook

Khan Academy. www.khanacademy.org

Unit Reference

An additional reference for this unit is "Fundamentals of Physics" by Halliday, Resnick, & Walker, Extended 10th edition. This is the textbook for PHYS140 and PHYS143. Print versions are available from the Co-Op bookshop 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. Because we do demonstrations and problem solving in our physics lectures, we recommend that you attend the lectures. The online resources are good for review and revision.

The use of calculators during tutorials, when completing quizzes, in the in-session exam and in the final examination for this unit is usually necessary. In accordance with the Faculty 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 two 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. 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 in this unit.

2. Weekly tutorials, in which examples illustrating the material are presented for discussion (with fellow classmates and tutors) and problem-solving methods are practiced. Tutorials form an important learning component of PHYS130. During tutorials in weeks 2-13, we will hold a 10-minute quiz, based on one of the assigned problems issued the previous week.

Lecture and tutorial times - See your timetable.

Information

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

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, Prof Judith Dawes, Weeks 1-6:

• Electricity, Prof Jason Twamley, Weeks 7-12:

Week 13- revision.

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

Numeracy Centre

The numeracy centre is located in C5A225, and offers one-on-one or small class assistance with mathematics and statistics. Students are welcome to attend the drop-in centre or specially organised workshops.

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 with appropriate units.

- Students will understand how real-world problems can be interpreted by physical models.

Assessment task

- Group project

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 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 with appropriate units.
- Students will understand how real-world problems can be interpreted by physical models.

Assessment tasks

- Tutorial quizzes
- Group project

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 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 with appropriate units.

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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple mathematical models.
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- Students will understand how real-world problems can be interpreted by physical models.

Assessment tasks

- Tutorial quizzes
- Mid-session Exam
- Final Examination
- Group project

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 concerning mechanics and electricity

in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.
- Students will understand how real-world problems can be interpreted by physical models.

Assessment tasks

- Tutorial quizzes
- Mid-session Exam
- Final Examination
- Group project

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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.
- Students will understand how real-world problems can be interpreted by physical models.

Assessment tasks

- Tutorial quizzes
- Mid-session Exam
- Final Examination

- Group project

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 concerning mechanics and electricity in terms of their underlying physical principles, and describe them in terms of simple 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 with appropriate units.
- Students will understand how real-world problems can be interpreted by physical models.

Assessment task

- Group project

Changes from Previous Offering

This is a new unit. We welcome your feedback as to how to improve it!