School of Physics

Course Outline 2021

PHYS1111

FUNDAMENTALS OF PHYSICS

School of Physics

Faculty of Science

Term 1, 2021

Faculty of Science - Course Outline

1. Information about the Course

NB: Some of this information is available on the UNSW Handbook[1]

Year of Delivery	*2021*
Course Code	*PHYS1111*
Course Name	*Fundamentals of Physics*
Academic Unit	*School of Physics*
Level of Course	*1*
Units of Credit	*6UOC*
Session(s) Offered	*Term 1, Term 3*
Assumed Knowledge, Prerequisites or Co-requisites	*none*
Hours per Week	*Approximately 14 hours per week. Note that this course is predominantly online this term so this time is spent watching videos, completing experiments, answering tutorial problems and completing assessment. The time spent watching videos is about 3 hours, and the rest is self-directed study and investigations.*
Number of Weeks	*10 weeks*
Commencement Date	15th February 2021
Grading	This course uses standard university grading.
Component	**Details**
Lectures	*These are available online from links on Moodle. There are 2-3 hours of lecture material each topic. Approximately one topic is covered each week.* *The lecture material was developed for PHYS1110, Everyday Physics, an online course that covers the same topics as PHYS1111.*
Activities/Experiments	*There are four experimental activities to complete at home (with common household materials) and three face-to-face experiments (with online options available). These activities aim to familiarizes you with the content of the course and teach you about good experimental design.*
Tutorial problems	*Each topic will have approximately 10 tutorial problems available for you. These are to give you practice using the content of the lectures to solve the types of problems you will get in the online quizzes.*
Online quizzes	*Every two weeks you will have an online quiz due. This evaluates your ability to solve problems based around the content from the previous two weeks. You will have half an hour to complete each*

[1] UNSW Online Handbook: http://www.handbook.unsw.edu.au

	quiz. These quizzes will be available Thursday 8-9 PM or Friday 2-3 PM.
Special Details	*You will be expected to acquire the materials that are needed for each of the activities. It is assumed that these are materials found around most homes. The materials needed for each week are listed below so that you can gather them in advance if you think they may be difficult for you to find.* *Investigation 1: A kettle, a measuring jug, stopwatch, a thermometer is optional.* *Investigation 2: ramp (plank of wood/large piece of cardboard on stack of books), a protractor, a box and some heavy objects that fit in it, kitchen scales* *Investigation 3: earphones, frequency generator (download for free from internet), ruler, jug of water, tube from paper towel* *Investigation 4: transparent rectangular container of water, protractor, ruler, pencil, bucket*

2. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenor		*Prof. Tim Duty*	*t.duty@unsw.edu.au*	*Email to arrange a time*
Additional Teaching Staff	Lab director	*A. Prof. Rajib Rahma*	*rajib.rahman@unsw.edu.au*	
	Other Support Staff	*Zofia Krawczyk* *Tom Dixon (lab)*	z.krawczyk-bernotas@unsw.edu.au thomas.dixon@unsw.edu.au	*Email to arrange a time*

3. Course Details

Course Description (Handbook Entry)	This is an introductory level course in physics for students from all disciplines. The course will cover the methods of Physics, including the following topics: the description of motion; forces and momentum; the dynamics of particles; kinetic and potential energy; the conservation of energy; temperature and thermal equilibrium; specific and latent heat; thermal energy; fluids and fluid flow; oscillations and simple harmonic motion; waves, wave reflection, refraction and interference; the wave nature of light; electric fields and charge; electric potential and energy; electric currents; magnetism; electromagnetic induction and Faraday's law; early quantum theory and models of the atom; nuclear physics and radioactivity; nuclear energy. Note: There is no Assumed Knowledge for this course. It also serves as a suitable introduction to Physics for students whose Program requires them to take PHYS1121 or PHYS1131 but who do not have the recommended level of Assumed Knowledge for these courses.
Course Aims	This course will serve as a phenomenological introduction to physics. It aims to introduce students to physical concepts that are relevant to everyday life. Starting from basic phenomena the course will introduce students to thermodynamics, properties of fluids, basic mechanics, electricity and magnetism, waves, nuclear physics, optics and astronomy.
Student Learning Outcomes	At the conclusion of this course students should be able to: ○ State, using words and equations, the fundamental principles of classical mechanics, thermal physics, waves, electric and magnetic fields, simple electrical circuits and atomic and nuclear physics. ○ Apply these fundamental principles to solve conceptual problems. ○ Solve quantitative problems by identifying and then solving the relevant equations. ○ Recognise that physics is an experimental science, conduct experiments, analyse the outcomes, including reliable estimates of uncertainties in the measurements.
Relationship to Other Courses within the Program	This is a stand-alone course as it is not a required course of any program.
Syllabus	**Topic 1: How does a street lamp work?** • Electric charges • Electric currents • Conductors, insulators and semi-conductors • Ohm’s law • Series and parallel circuits • Electric power • The photoelectric effect (quantum mechanics) **Topic 2: Why does your kettle boil?** • Heat is the transfer of energy • Mechanisms of energy transfer through heat: convection, conduction and radiation • Specific and latent heat • Special properties of water

	• Experimental techniques: planning an investigation, risk analysis, straight line graphs, uncertainties
	Topic 3: How does a hot air balloon work?
	• Density • Ideal gasses and the ideal gas law • Gravity, weight and buoyancy • Archimedes's principle • Air resistance • Melting iceberg
	Topic 4: What decides how fast a river flows?
	• Pressure and how it changes with depth • Ideal fluid flow • Bernoulli's equation • Viscosity • Flow of blood around the body
	Topic 5: What makes a car go and stop?
	• Work and Energy conversions from fuel to kinetic energy • Newton's 3rd Law and the 2nd & 3rd kinematic equations • Projectile motion • Friction • Impulse, momentum, collisions, and ABS brakes • Circular motion
	Topic 6: How does a speed camera work?
	• Waves, resonance, and reflection • Standing waves, interference, and consonance • The Doppler effect • Relative motion • How an ultrasound scan works • Pitch, loudness and timbre
	Topic 7: How do glasses (spectacles) work?
	• Electromagnetic spectrum • Reflection and refraction of light • Ray optics, convex vs concave • The human eye and colour vision • Experimental techniques: Ray tracing
	Topic 8: How does a compass (navigational instrument) work?
	• Magnetic fields • The Earth's magnetic field • Electromagnetism
	Topic 9: How does a nuclear power plant work?
	• Nuclear fusion and fission • Properties of radionuclides and medical applications • Energy transformations • Generators • AC and DC electricity • Transformers
	Topic 10: Why do stars shine?
	• Nuclear reactions in stars • Law of universal gravitation • Blackbody radiation • Electromagnetic radiation and the Doppler effect

4. Rationale and Strategies Underpinning the Course

Teaching Strategies	This course will be predominantly online. Each week the students will have videos to view that will look at the physics behind a variety of phenomena. Students will be encouraged to ask and answer questions on a discussion board to develop their understanding of these topics and issues. At four times during the course students will have an investigation where they will use equipment from around the home to conduct an investigation. This will introduce students to the experimental nature of physics. Students will submit a short report about their investigation to a teaching assistant. There will be three experiments that students complete in the first year physics lab with assistance from a demonstrator. Each week tutorial questions with solutions will be provided for students to develop skills at solving quantitative physics problems. These skills will be assessed four times during the course in a topic test on Moodle.
Rationale for learning and teaching in this course	This course aims to engage students with issues relevant to everyday life in order to make them intrinsically motivated to learn physics. It is hoped that by introducing physics in this way students will realise how important physics is to the world around them and will start viewing the world in a manner similar to a scientist with a sense of inquiry. The experimental part of the course should give them skills to investigate material outside the course in a scientific manner.
Rationale for assessment in this course	Physics is an experimental science, as such experiments feature heavily in the assessment. There are four experiments students conduct at home with common household equipment and three experiments students complete in class (with an online option available). These experiments contribute 30% of the total mark. To give students practice answering quantitative and conceptual questions throughout the course there are short (half hour) fortnightly quizzes with two questions. At the end of the course there is a final exam worth 50% of the mark from the course. This is ensures students can apply what they have learnt to answering unseen questions.

5. Course Schedule

Week	Question of the week (addressed in videos and tutorial sets)	Assignment and Submission dates (see also 'Assessment Tasks & Feedback')
Week 1	How does a street light work?	
Week 2	Why does your kettle boil? And How does a hot air balloon work?	Quiz 1: topics 1 and 2
Week 3	What determines how fast a river flows?	Investigation 1: Specific heat
Week 4	What makes a car go and stop?	Quiz 2: topics 3 and 4 Experiment 1: Projectile motion HECs Census date: 14th March
Week 5	How does a speed camera work?	Investigation 2: Friction
Week 6	Flex week: Use to catch up or get ahead.	
Week 7	How do glasses work?	Quiz 3: topics 5 and 6 Experiment 2: Electrostatic field plotting
Week 8	How does a compass work?	Quiz 4: topics 7 and 8 Investigation 3: Speed of sound
Week 9	How does a nuclear power plant work?	Experiment 3: Magnetic fields
Week 10	Why do stars shine?	Quiz 5: topics 9 and 10 Investigation 4: Refractive index of water

6. Assessment Tasks and Feedback

Task	Knowledge & abilities assessed	Assessment Criteria	% of total mark	Date of		Feedback		
				Release	Submission[2]	WHO	WHEN	HOW
Experiments	Be able to investigate the physics behind a phenomenon and develop skills associated with good experimental technique	Lab assessments are pass/fail. Marking rubric can be found on the Moodle site for the course. *Note that online labs will not be marked without a selfie of the student with the equipment included in the report.*	4.3 % × 7	At start of course	At home experiments due 11:59 PM Sunday at end of weeks: 3, 5, 8, and 10 In class experiments in scheduled lab time weeks: 4, 7 and 9	*Demonstrator*	At home experiments Monday one week after submission. In class experiments marked during class	*Comments and rubric in Turnitin[3] for at home experiments, rubric and discussions with demonstrator for in class experiments*
Online quizzes[4]	Recognize the quantitative nature of physics and be able to solve problems	Students need to correctly perform calculations and solve problems based on lecture materials	4 % × 5	25-26/02/21 11-12/03/21 01-02/04/21 08-09/04/21 22-23/04/21 8 PM Thursday and 2 PM Friday	Half an hour after start of quiz or at end of hour available, whichever comes first.	Lecturer	*Marks and feedback available immediately after quiz closes*	*Marks and feedback provided in Moodle quiz.*
Final Exam (online)	Be able to solve problems based on the content covered in this course	Students will receive marks for correctly answering questions	50%	Held during exam period, 30th Apr-13th May		Lecturer	Mark included in final grade	

[2] All times and dates are given for Australian Eastern Standard Time (AEST, Sydney). If a student is submitting from overseas it is their responsibility to check that they submit it by the due time. In class experiments run on a fortnightly schedule, students will be assigned to either the first or second group on Moodle, at home experiments due the weeks in class experiments are not due.
[3] Feedback will only be given for reports properly submitted through Turnitin. If a student has an issue with submission and submits via email then feedback will not be given.
[4] Each quiz is 30 minutes long. The quiz will be available for 1 hour at Thursday 8-9 PM and Friday 2-3 PM AEST. You can only sit the quiz at one of these times. In order to get the full half hour for the quiz you should not start the quiz in the final half hour it is available. It is your responsibility to assure that you have access to a stable internet connection for the duration of the quiz.

7. Additional Resources and Support

Text Books	Physics: 11th Edition, Cutnell & Johnson (Wiley), Australia Custom Edition, ISBN: 978-1-119-56179-8 The library has an ebook version of this text which can be accessed for free.
Course Manual	Will be available on Moodle
Recommended Internet Sites	Will be made available on Moodle

8. Required Equipment, Training and Enabling Skills

Equipment Required	Investigation 1: A kettle, a measuring jug, stopwatch, a thermometer is optional. Investigation 2: Ramp (plank of wood/large piece of cardboard on stack of books), a protractor, a box and some heavy objects that fit in it, kitchen scales Investigation 3: Earphones, frequency generator (download for free from internet), ruler, jug of water, tube from paper towel Investigation 4: Transparent rectangular container of water, protractor, ruler, pencil, bucket
Enabling Skills Training Required to Complete this Course	ELISE It is highly recommended that you complete the Moodle module on academic integrity before submitting assessment for this course. Plagiarism and contract cheating have been a problem with previous cohorts. These cases have been found and acted upon. Please ensure that you are aware of the university's expectations around academic integrity.

9. Course Evaluation and Development

Student feedback is gathered periodically by various means. Such feedback is considered carefully with a view to acting on it constructively wherever possible.

This course is running in a very different format this term than in previous terms due to the shift online. Please provide feedback during the course. Either email the course convener or give your feedback to the course representatives who will meet regularly with teaching staff to discuss how the course is going.

10. Administration Matters

Expectations of Students	Even though this course is completely online the assumption is that students will spend the same amount of time working on it as a face-to-face first year physics course. Students should spend approximately eight hours a week engaging with the online materials and a similar amount of time in self-directed study of the subject.		
Assignment Submissions	All submission times are in Australian Eastern Standard Time (AEST, Sydney). There is a 25% penalty for each day the investigations are late. This is applied using the time Moodle shows the assignment was submitted (in Turnitin). Students should submit well in advance of the submission deadline as the Moodle can slow down due to heavy usage at the due time. **If a student experiences any difficulty submitting an assignment through Moodle they must email a copy of the assignment to t.duty@unsw.edu.au before the assignment is due, with a report of what went wrong (so that we can fix it). This applies to viewing assignments or submitting them to the Workshop tool as well (for peer review).** Each of the quizzes will be available for two one-hour intervals at 8-9 PM on Thursday, and 2-3 PM on Friday AEST. By starting the quiz, you are acknowledging that you are well enough to sit it. You will only be able to sit each quiz once. It is your responsibility to assure that you have access to a stable internet connection for the duration of the quiz. The quiz will be available for 30 minutes or until the end of the one-hour time interval, whichever comes first. The quiz is to be taken individually; having assistance from someone else is a form of academic misconduct. If you are not able to submit one of the assessments for reasons beyond your control you should submit a special consideration request with supporting documentation.		
Occupational Health and Safety[5]	OH&S is very important. You must complete and abide by a risk assessment for each of the investigations you conduct, including the one for your final report.		
Assessment Procedures UNSW Assessment Policy[6]	The UNSW special consideration information can be found here: https://student.unsw.edu.au/special-consideration		
Equity and Diversity	Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or http://www.equity.unsw.edu.au/disabil.html, http://www.studentequity.unsw.edu.au/). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.		
Student Complaint Procedure[7]	**School Contact**	**Faculty Contact**	**University Contact**
	A. Prof. Elizabeth Angstmann First year Physics Director e.angsmtann@unsw.edu.au Or Prof. Adam Micolich, Director of Teaching, Physics adam.micolich@unsw.edu.au	Deputy Dean Education A. Prof. Alison Beavis a.beavis@unsw.edu.au	Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar. Telephone 02 9385 8515, email studentcomplaints@unsw.edu.au University Counselling and Psychological Services[8] Tel: 9385 5418

[5] UNSW OHS Home page
[6] UNSW Assessment Policy
[7] UNSW Student Complaint Procedure
[8] University Counselling and Psychological Services

11. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.[9] *At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.*

Further information about academic integrity and plagiarism can be located at:

- *The Current Students site* student.unsw.edu.au/plagiarism*, and*
- *The ELISE training site* subjectguides.library.unsw.edu.au/elise

The Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: student.unsw.edu.au/conduct*.*

[9] International Centre for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.