School of Physics

Course Outline 2022

PHYS1110

EVERYDAY PHYSICS

School of Physics

Faculty of Science

Term 1, 2022

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	2022
Course Code	PHYS1110
Course Name	Everyday Physics
Academic Unit	School of Physics
Level of Course	1
Units of Credit	6UOC
Session(s) Offered	Term 1, Term 2, Term 3
Assumed Knowledge, Prerequisites or Co-requisites	None
Hours per Week	Approximately 14 hours per week. Note that this course is fully online, so this time is spent watching videos, completing experiments, answering tutorial problems and completing assessments. 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	14th February 2022
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.
Activities/Experiments	Students must complete three experimental activities at home (with common household materials) during this course. These activities aim to familiarise you with the content of the course and teach you about good experimental design. You will use these skills for the final report at the end of the course.
Tutorial problems	Each topic has 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 exam. These problems are embedded into the lectures.
Practice quizzes	Every week you will have an optional practice quiz that you can do. This will help you to evaluate your ability to solve problems based around the content from the week and help you prepare for the exam.
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. • Kettle investigation: a kettle, a measuring jug, stopwatch, a thermometer is optional. • Friction investigation: ramp (plank of wood/large piece of cardboard on stack of books), a protractor, a box and some heavy objects that fit in it,

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

	kitchen scales. • Speed of sound investigation: earphones, frequency generator (download for free from internet), ruler, jug of water, tube from paper towel. • Refractive index investigation: transparent rectangular container of water, protractor, ruler, pencil, bucket. • Archimedes investigation: measuring jug, small bottle with a lid (you need to be able to completely submerge it in the measuring jug; traveling shampoo bottle may be appropriate), a camera, cooking salt (a few tablespoons), sand (or you could use even more cooking salt), scales (that can measure mass) • Magnetic fields investigation: Simulations from the PhET site (magnet and compass, and Faraday)

2. Staff Involved in the Course

Role	Name	Contact Details	Consultation Times	Queries
Facilitator	A/Prof. Clemens Ulrich	c.ulrich@unsw.edu.au	Email to arrange a time	Course content
Editor	Dr. Gareth Jay	g.jay@unsw.edu.au	Email to arrange a time	Administration
Teaching assistants	Will be announced on Moodle			Grading clarification
Other Support Staff	Zofia Krawczyk	z.krawczyk-bernotas@unsw.edu.au Room G06, OMB	Email to arrange a time	Administration

3. Course Details

Course Description (Handbook Entry)	This is a fully online course that looks at everyday applications of physics. No prior physics knowledge is required. The course will look at the physics behind several everyday phenomena. Physics topics addressed in this course include thermodynamics, properties of fluids, basic mechanics, electricity and magnetism, waves, nuclear physics, quantum physics, optics and astronomy. Basic experimental methods will be covered through simulations and simple experiments that can be conducted at home. The course will make use of Physclips. The course would form a good basic physics knowledge for students studying life sciences, medicine and business and for those planning to sit the Gamsat exam. This is a quantitative course using algebra and trigonometry but not calculus
Course Aims	This course serves 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 introduces 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: • Describe the physical principles behind everyday phenomena such as: How a kettle boils. What makes a car go? What makes a boat float? Why do stars shine? • Recognise the quantitative nature of physics and be able to solve simple problems. • Recognise that physics is an experimental science, and develop skills to conduct simple investigations and analyse the outcomes. • Be able to independently investigate physical principles behind a phenomenon that is of interest to the student.
Graduate Attributes Developed in this Course	
Graduate Attributes	**These learning outcomes have been associated with this graduate attribute:**
The skills involved in scholarly enquiry	a. Describe the physical principles behind everyday phenomena such as: How a kettle boils What makes a car go? What makes a boat float? Why do stars shine? b. Be able to independently investigate physical principles behind a phenomenon that is of interest to the student. c. Be aware of ethical issues surrounding nuclear power and the role an understanding of physics plays in the safety of everyday experiences such as the use of transportation.
The capacity for analytical and critical thinking and for creative problem-solving	a. Recognise the quantitative nature of physics and be able to solve simple problems. b. Recognise that physics is an experimental science, develop skills to conduct simple investigations and analyse the outcomes.

The ability to engage in independent and reflective learning	Be able to independently investigate physical principles behind a phenomenon that is of interest to the student.
Information literacy: the skills to appropriately locate, evaluate and use relevant information	Be able to independently investigate physical principals behind a phenomenon that is of interest to the student.
Relationship to Other Courses within the Program	This is a stand-alone course as it is not a required course of any program.
Syllabus **Complete at least 8 of these topics**	**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' 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?
	• Work and Energy conversions from fuel to kinetic energy • Newton's 3rd Law and the 2nd & 3rd kinematic equations • Projectile motion
	Topic 6: What makes a car stop?
	• Friction • Impulse, momentum, collisions • ABS brakes • Circular motion

	Topic 7: 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
	Topic 8: 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 9: How do musical instruments make sound?
	• Pitch, loudness • Oscillations and waves • Resonance • Standing waves • Interference
	Topic 10: How does a compass (navigational instrument) work?
	• Magnetic fields • The Earth's magnetic field • Electromagnetism
	Topic 11: 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 12: 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 fully online. Each week the students will have videos to view that will look at the physics behind a variety of phenomena. Related problems will follow the videos, giving students the opportunity to put their learning into practice. Students will be encouraged to ask and answer questions on a discussion board to develop their understanding of these topics and issues. At three 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. Each week practice quizzes and tutorial questions with solutions will be provided for students to develop skills at solving quantitative physics problems. These skills will be assessed during the exam. At the end of the course students will choose a phenomenon of interest to themselves (from a list or with permission from the lecturer or tutor). They will then write a report/essay about the physics behind the phenomenon. They will receive feedback from their peers on their report before submitting it to a tutor for marking.
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	As this course aims to get students thinking about physics taking place in the world around them, the capstone assessment for the course is a final report where students perform an experiment they have designed to test an aspect of physics they find interesting. To help students prepare for this task there are three investigations with decreasing levels of scaffolding for students to complete throughout the course. These experiments contribute 30% of the total mark. Before submitting their final report, students submit a draft report and then peer review five peers' draft reports. Peer review gives students the opportunity to see other students' work, to learn about new branches of physics, and to receive useful feedback before submitting the final version of their report. Students will be marked on the quality of the feedback they give their peers. The final report and peer review exercise forms 30% of the mark for the course. The final 40% of the mark from the course comes from answering quantitative quiz questions in an exam. This will ensure that students planning on sitting the GAMSAT exam have practiced these skills. There will be 12 questions in the final exam, one on each topic. Students may answer as many of these as they wish. The highest 8 question marks will count towards the grade for the course. This means there is a slight advantage in studying some additional topics if you choose to do so.

5. Course Schedule

To complete the minimum requirements for this course, you must complete 8 of the available 12 topics, if you wish you may do more than 8 topics. Most topics require prerequisite topics as outlined below. It is recommended that you complete one topic per week. Note that you may complete any number of topics at any level. There will be one question on each topic in the final exam; you may answer as many of these as you want, the marks from the highest 8 will count towards your grade.

You are also required to complete 3 investigations over the course of the term due in weeks 3, 6, and 9 in any order that you wish. Topics that have associated investigations are highlighted below. Note that you must complete the topic for the associated investigation to become available on Moodle.

Level 1 topics	Topic 1: How does a street lamp work?	Topic 5: What makes a car go?	Topic 7: How does a speed camera work?
Level 2 topics	Topic 2: Why does your kettle boil? Investigation: Specific heat of water (Prerequisite: How does a street lamp work?)	Topic 6: What makes a car stop? Investigation: Friction (Prerequisite: What makes a car go?)	Topic 8: How do glasses (spectacles) work? Investigation: Refractive index of water (Prerequisite: How does a speed camera work?)
Level 3 topics	Topic 3: How does a hot air balloon work? (Prerequisite: Why does your kettle boil?)	Topic 10: How does a compass work? (Prerequisite: What makes a car stop?)	Topic 9: How do musical instruments make sound? Investigation: Speed of sound (Prerequisite: How do glasses work?)
Level 4 topics	Topic 4: What decides how fast a river flows? Investigation: Archimedes Principle (Prerequisite: How does a hot air balloon work?)	Topic 11: How does a nuclear power plant work? Investigation: Magnetic fields (Prerequisite: How does a compass work?)	
Level 5 topics		Topic 12: Why do stars shine? (Prerequisites: How does a nuclear power plant work? AND How does a speed camera work? AND How does a hot air balloon work?)	

We recommend that you write the name of the topic you intend to study each week into this table. Make sure that you complete the pre-requisite topics before the topic selected in each week.

Week	**Topic (addressed in videos and tutorial sets)**	**Assignment and Submission dates (see also 'Assessment Tasks & Feedback')**
Week 1	Topic	
Week 2	Topic	
Week 3	Topic	Investigation 1
Week 4	Topic	HECS Census date: Sunday 13th March 2022
Week 5	Topic	
Week 6	Flexibility week	Investigation 2 Final report proposal
Week 7	Topic	Draft of final report
Week 8	Topic	Peer review of final report draft
Week 9	Topic	Investigation 3
Week 10		Final report due
Exam period		Exam (time/date TBA)

6. Assessment Tasks and Feedback

Task	Knowledge & abilities assessed	Assessment Criteria	% of total mark	Date of		Feedback		
				Release	Submission[2]	WHO	WHEN	HOW
Lab Reports	Be able to investigate the physics behind a phenomenon and develop skills associated with good experimental technique	Marking rubric can be found on the Moodle site for the course. *Note that labs will not be marked without a selfie of the student with the equipment included in the report.*	10 % × 3	At start of course	06/03/22 27/03/22 17/04/22 At 11:59 PM	Tutor	14/03/22 04/04/22 25/04/22	*Comments and rubric in Turnitin*[3]
Final Report[4]	Describe and investigate the physics behind an everyday phenomenon selected by you. Develops skills in designing and conducting an experiment. Peer review will develop your ability to interpret reports and give useful feedback.	This task has four parts: 1. Submit proposal on your group discussion forum 2. Submit a draft of your report 3. Peer review five reports 4. Submit your final report[5]	1% 1% 8% 20%	At start of course At start of course Day after submission Day after peer review submission	27/03/22 03/04/22 10/04/22 24/04/22 At 11:59 PM	Tutor Peers Tutor Tutor	Within 7 days of post 11/04/22 18/04/22 09/05/22	Comment on your forum post Through workshop tool Marks in Moodle *Comments and rubric in Turnitin*[6]
Final exam	Recognize the quantitative nature of physics and be able to solve problems: Choose 8 of 12 problems to answer	Students need to correctly perform calculations and solve problems based on lecture materials	40%	Exam period	Exam period	Lecturer	After release of results	Via email on request

[2] All times and dates are given for Sydney time (AEST or AEDT depending on time of year). If a student is submitting from overseas, it is their responsibility to check the due time.
[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] If students do not submit a draft report for their peers to give feedback on by 11:59 PM, then they will not have access to peer's work to grade and so will miss out on these 9% of marks for the course. No extensions are possible on this due to the nature of the peer review tool. Peer review involves giving as well as getting feedback. The marks students receive from your peers do not count towards the final grade for the subject.
[5] Marking rubric can be found at on the Moodle site for this course, this mark is for the final version of the report submitted to Turnitin. 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.

7. Additional Resources and Support

Textbooks	No prescribed text
Course Manual	Will be made available on Moodle
Required Readings	Will be made available on Moodle
Additional Readings	If students want a textbook for the course (not required), the book "Physics" 10e by Cutnell and Johnson covers the physics in this course. It can also be bought directly from the publisher (http://www.wileydirect.com.au/buy/physics-10th-edition/) at a discount (over the bookshop price). The library has an ebook version of this text, which can be accessed for free.
Recommended Internet Sites	Will be made available on Moodle

8. Required Equipment, Training and Enabling Skills

Equipment Required	Kettle investigation: a kettle, a measuring jug, stopwatch, a thermometer is optional. Friction investigation: 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. Speed of sound investigation: earphones, frequency generator (download for free from internet), ruler, jug of water, tube from paper towel. Refractive index investigation: transparent rectangular container of water, protractor, ruler, pencil, bucket. Archimedes investigation: measuring jug, small bottle with a lid (you need to be able to completely submerge it in the measuring jug; traveling shampoo bottle may be appropriate), a camera, cooking salt (a few tablespoons), sand (or you could use even more cooking salt), scales (that can measure mass) Magnetic fields investigation: Simulations from the PhET site (magnet and compass, and Faraday)
Enabling Skills Training Required to Complete this Course	ELISE It is highly recommended that you complete the Moodle module on academic integrity before submitting assessments 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 outline conveys how feedback has helped to shape and develop this course.

Mechanisms of Review	Last Review Date	Comments or Changes Resulting from Reviews
myExperience	Nov 2013	Following recommendations from students, the equations covered in each video are now presented below the video in the lecture "books" on Moodle. Students receive bonus mark for reflecting on feedback for first investigation, many students unaware of amount of feedback given by tutors.
	July 2014	Investigation 6 updated, observations of night sky replaced with a simulation.
	Nov 2014	Videos moved onto YouTube, makes them easier to download.
	April 2017	The glasses topic was updated, videos made shorter and more of them.
	Aug 2020	Students requested synchronous sessions for the course, which were implemented. These were well received and were retained.
Other	T1 2019	The university went to three terms. The course was converted from twelve topics to ten topics.
	T2 2019	The course underwent a digital uplift. Introductory videos have been made as well as a set of course notes. The quiz system has also been updated. In semester 2 2018 numerous students were found to have used a contract cheating agency to create reports that they submitted as their own. These students were found and many of them were suspended from the university. To decrease the likelihood of this occurring again students are now required to submit a picture of themselves with the equipment they used for each experiment. The quizzes will only be available for a short window each fortnight.
	T2 2021	The course has undergone a restructure, where students have 12 topics available but need to complete a minimum of 8 during the course. This equates to approximately 1 topic per week, allowing for flexibility week and a study week at the end of term.

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 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. The draft of the final report must be submitted by the due time. At this time the workshop tool will stop accepting submissions. It is not possible to submit your draft report or feedback to peers late. **If a student experiences any difficulty submitting an assignment through Moodle they must email a copy of the assignment to the course facilitator 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).** By starting the exam, you are acknowledging that you are well enough to sit it. You will only be able to sit the exam once. It is your responsibility to assure that you have access to a stable internet connection for the duration of the exam. The exam 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[7]	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[8]	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). 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[9]	**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[10] Tel: 9385 5418

[7] UNSW OHS Home page
[8] UNSW Assessment Policy
[9] UNSW Student Complaint Procedure
[10] 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.[11] *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*.*

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