

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	PHYS1131
Course Name	Higher Physics 1A
Academic Unit	School of Physics
Level of Course	1
Units of Credit	6UOC
Terms Offered	Term 1, Term 2, Term 3
Assumed Knowledge, Prerequisites or Co-requisites	Assumed Knowledge : HSC Physics and Mathematics Extension 1 or equivalent. If you have not reached this level of physics and mathematics you may wish to take PHYS1111 Fundamentals of Physics before enrolling in this course. <i>MATH1131 or MATH1141 or MATH1151 or MATH1011 are co-requisites</i>
Hours per Week	<i>It is expected that students will spend 12 hours per week studying this course. All material will be delivered online.</i>
Number of Weeks	10 weeks
Commencement Date	14 th February 2022
Grading	This course will use SY grading
Component	Details
Lectures	In lectures you will be introduced to new material, shown demonstrations and examples of how to solve problems. You will then make use of this to solve relevant problems. You can choose between four online asynchronous (web stream) lectures each week or four hours of synchronous online lectures.
OTH classes	You enrol in either a two-hour face-to-face session that takes place most weeks or a one-hour online session. In these sessions, you will practice solving problems and have the opportunity to ask questions. While online we will run these as one hour synchronous sessions.
Laboratories	This term the course has eight laboratory experiments with an online option. During laboratory activities you will collect data, design experiments and make use of the theories covered in lectures.
Homework booklet	Additional practice questions with video solutions are provided in the homework sets. <i>These are optional</i> . Relevant problems are identified in the web stream lectures.
Online quizzes	Every week you will have an online quiz due. The questions are pulled randomly from a bank of questions. You can try these quizzes as many times as you want. Your highest mark counts. There are

¹ UNSW Online Handbook: <http://www.handbook.unsw.edu.au>

	four questions in each quiz, based on the lecture material covered the previous week. You will also have quizzes during weeks 7 and 10 pulled from this same question bank.
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2. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenor		<i>A. Prof. Elizabeth Angstmann</i>	e.angstmann@unsw.edu.au	Email to arrange a time
Additional Teaching Staff	Lecturers Wk 1-4 and web stream Wk 5, 7-9	<i>A. Prof. Elizabeth Angstmann</i> Prof. Alex Hamilton Prof. Chris Tinney	e.angstmann@unsw.edu.au alex.hamilton@unsw.edu.au c.tinney@unsw.edu.au	
	Lab director	<i>A. Prof. Rajib Rahman</i>	rajib.rahman@unsw.edu.au	
	Other Support Staff	<i>Zofia Krawczyk</i> Tom Dixon (lab)	z.krawczyk-bernotas@unsw.edu.au thomas.dixon@unsw.edu.au	

3. Course Details

Course Description (Handbook Entry)	<p>This course provides an introduction to Physics. It is a calculus based course. The course is examined at two levels, with Physics 1A being the lower of the two levels.</p> <p>Mechanics: particle kinematics in one dimension, motion in two and three dimensions, particle dynamics, work and energy, momentum and collisions, rotational motion.</p> <p>Thermal physics: temperature, kinetic theory and the ideal gas, heat and the first law of thermodynamics.</p> <p>Waves: oscillations, wave motion, sound waves.</p> <p>Assumed Knowledge : HSC Physics and Mathematics Extension 1 or equivalent. If you have not reached this level of physics and mathematics you may wish to take PHYS1111 Fundamentals of Physics before enrolling in this course.</p>
Course Aims	<p>This course gives an introduction to mechanics, thermal physics and waves, and to the techniques of analysis and problem solving in the physical world. With its companion subject (Physics 1B, Higher Physics 1B or (Special) Higher Physics 1B), this constitutes a broad introduction to physics. This background supports higher level study in physics and engineering.</p>
Student Learning Outcomes	<p>By the end of this course students should be able to:</p> <ul style="list-style-type: none">• Analyse motion in two dimensions using vectors. Apply Newton's laws of motion to objects undergoing uniform translational or rotational acceleration.• Analyse problems involving friction and the forces and deformations described by Hooke's law• Explain the difference between kinetic and potential energy and use the law of conservation of energy and the work-energy theorem to solve mechanics problems.• Apply the conservation laws of momentum and energy to solve mechanics problems, including problems involving collisions, extended objects and their centres of mass.• Apply the law of universal gravitation and Kepler's laws in combination with other laws covered in this course to describe, predict and explain the motion of satellites, planets, stars and galaxies.• Explain how energy conservation is related to the first law of thermodynamics. Apply the first law to solve problems.• Recognise and solve problems relating to different thermodynamic processes, including adiabatic, isothermal, isobaric and isovolumetric processes. For cyclic processes, calculate changes in internal energy, work done and heat transferred in cycles.

	<ul style="list-style-type: none"> • Describe different heat transfer mechanisms and calculate the amount of heat transferred in different processes. • Identify physical systems that can be understood using models of simple harmonic oscillation and write down equations to describe this motion. • Write down and solve equations describing wave motion, and use these equations to explain physical phenomena such as (but not limited to) standing waves and interference. • Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.
Relationship to Other Courses within the Program	PHYS1121 is a pre requisite for PHYS1221, Physics 1B. Students need to score at least 65 in PHYS1121 to enroll in PHYS1231, Higher Physics 1B. Due to SY grading this terms flexibility will be show with this requirement. If you do need PHYS1231 you should enroll in PHYS1131.

4. Rationale and Strategies Underpinning the Course

<p>Teaching Strategies</p>	<p>Students will be introduced to new ideas and concepts during lectures. These include demonstrations, discussions of applications and examples of how to solve problems. Students are encouraged to actively participate during lectures as this has been shown to lead to better learning outcomes. The lectures are set up as Moodle quizzes to give students the opportunity to practice using new skills and knowledge. During the OTH classes students practice solving problems and have the opportunity to ask for clarification of anything they are unsure of.</p> <p>Laboratory exercises give students the opportunity to practice and apply important skills such as calculating uncertainties.</p>
<p>Rationale for learning and teaching in this course</p>	<p>Many studies have shown that students learn effectively by solving problems (see Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. <i>Psychological Science in the Public Interest</i>, 14(1), 4-58. for example). After being presented with new concepts and ideas students are given many opportunities to solve problems including in the lab, problem solving worksheets and online quizzes.</p>
<p>Rationale for assessment</p>	<p>The Dunlosky et. al. meta-analysis showed that the best study techniques students could use to prepare for an exam was to practice answering a lot of questions over the course. The assessments for this course have been designed with this in mind. Students are given weekly quizzes with an unlimited number of attempts to ensure that they are confident answering questions on course material. These same questions are then used under invigilated conditions to give students practice answering questions under exam conditions and ensure academic integrity is maintained.</p> <p>The final exam is used to ensure that students are able to solve problems quickly and correctly. The material covered in this course is foundational to many higher year physics and engineering courses so an ability to quickly recall and use skills are vital.</p> <p>Labs are also assessed, as physics is an experimental science, students need to be able to conduct measurements to test models.</p>

5. Course Schedule

Week	Scheduled activities and recommended allocation of time	Assignment, Submission dates time needed (see also 'Assessment Tasks & Feedback')
Week 1	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Complete the lab safety induction and lab skills exercise online.</p> <p>Start quiz 1</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in the OTH class as well as 2 hours starting the lab skills exercise. You should also spend 4 hours reviewing lecture material and attempting problems.</i></p>	<p>11 hrs</p> <p>Complete lab skills exercise, lab safety exercise.</p>
Week 2	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Complete and submit the pendulum at-home lab (online), or the equilibrium of rigid bodies lab (in-person).</p> <p>Complete quiz 1, start quiz 2</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, and 2 hours in the lab and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p>	<p>Online Quiz 1 due Monday 11:59 PM</p> <p>Complete homework set 1 (no need to submit)</p> <p>Complete Lab 1</p> <p>14 hrs</p>

<p>Week 3</p>	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Complete and submit the friction at-home lab (online), or the static friction lab (in-person).</p> <p>Complete quiz 2, start quiz 3.</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, as well as 2 hours completing the lab exercise and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p>	<p>Complete Lab 2</p> <p>Online Quiz 2 due Monday 11:59 PM</p> <p>Complete homework set 2 (no need to submit)</p> <p>14 hrs</p>
<p>Week 4</p>	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Complete the collisions online lab via Moodle (online), or the collisions and car crashing lab (in-person).</p> <p>Complete quiz 3, start quiz 4.</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, as well as 2 hours completing the lab exercise and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p> <p>Sunday at the end of this week is the HECs census date. Drop the course by this time if you do not want to pay for it.</p>	<p>Complete Lab 3.</p> <p>Online Quiz 3 due Monday 11:59 PM</p> <p>Complete homework set 3 (no need to submit)</p> <p>14 hrs</p>

Week 5	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Complete the rotational inertia online lab via Moodle (online), or the rotational inertia in-person lab (in-person).</p> <p>Complete quiz 4 (though it is due next week).</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, as well as 2 hours completing the lab exercise and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p>	<p>Complete Lab 4.</p> <p>Online Quiz 4 due Monday 11:59 PM</p> <p>14 hrs</p>
Week 6	<p><i>Flexibility week: Use this week to catch up and get ahead.</i></p>	<p>10 hrs</p>
Week 7	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Attend and complete the specific and latent heat lab (in-person), or complete and submit the kettle at-home lab (online).</p> <p>Complete the class test</p> <p>Complete quiz 5, start quiz 6.</p> <p><i>This week you should spend 4 hours on lecture content, as well as 2 hours completing the lab exercise and 1 hour preparing for it and 1 hour in the OTH class. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems and an hour doing the class test.</i></p>	<p>Complete Lab 5</p> <p>Online Quiz 5 due Monday 11:59 PM</p> <p>Class test 1</p> <p>Complete homework set 4 (no need to submit)</p> <p>14 hrs</p>
Week 8	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Attend and complete the ideal gas law lab (in-person) or complete the ideal gas law online lab via Moodle (online).</p> <p>Complete quiz 6, start quiz 7.</p>	<p>Complete Lab 6</p> <p>Online Quiz 6 due Monday 11:59 PM</p> <p>14 hrs</p>

	<p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, as well as 2 hours completing the lab exercise and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p>	
Week 9	<p>Complete web stream lectures assigned for this week and the associated problems or attend the synchronous lectures. Attend the OTH class.</p> <p>Lab: Attend and complete the linear oscillatory motion lab (in-person) or complete the linear oscillatory motion online via Moodle (online).</p> <p>Complete quiz 7, start quiz 8.</p> <p><i>This week you should spend 4 hours on lecture content, 1 hour in OTH class, as well as 2 hours completing the lab exercise and 1 hour preparing for it. You should also spend 6 hours reviewing lecture material and attempting problems, including the quiz problems.</i></p>	<p>Complete Lab 7</p> <p>Online Quiz 7 due Monday 11:59 PM</p> <p>Complete homework set 5 (no need to submit)</p> <p>14 hrs</p>
Week 10	<p>No lectures this week. There is an OTH class.</p> <p>Complete quiz 8.</p> <p>Complete class test 2</p> <p>Lab: Attend and complete the standing waves in a tube lab (in-person) or complete and submit the speed of sound at-home lab (online).</p> <p><i>This week you should 2 hours completing the lab exercise and 1 hour preparing for it and 1 hour in your OTH class. You should also spend 7 hours reviewing lecture material and attempting problems, including the quiz problems and an hour on the class test.</i></p>	<p>Complete Lab 8</p> <p>Online Quiz 8 due Monday 11:59 PM</p> <p>Class test 2</p> <p>Complete homework set 6 (no need to submit)</p> <p>11 hrs</p>
Stu vac	<p>Spend 20 hours revising material. The best way to prepare for an exam is to take past exam papers under simulated test conditions. Exam papers and solutions are available on Moodle.</p>	<p>20 hrs</p>
Total time for course:		150 hrs

6. Assessment Tasks and Feedback

Task	Knowledge & abilities assessed	Assessment Criteria	% of total mark	Date of		Feedback		
				Release	Submission ²	WHO	WHEN	HOW
Experiments	Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.	Labs for this term will be marked on a pass/fail basis. Marking rubric can be found on the Moodle site for the course. In-Person Labs will be marked by your demonstrator. At-home labs will be marked to a rubric converted to a pass/fail (70% or above = pass). Online labs are automatically marked and are converted to a pass/fail (70% or above = pass).	2.5 % × 8 = 20%	At start of course	Marked during your lab time. Online labs are due Sunday 11:59 PM at end of the week.	<i>Demonstrator</i>	At home experiments Monday one week after submission. In class experiments marked during class. Online experiments immediately.	<i>Comments and rubric in Turnitin³ for at home experiments, rubric and discussions with demonstrator for in class experiments. Automatically for online experiments.</i>
Online quizzes	Recognise the quantitative nature of physics and be able to solve simple problems – tests entire syllabus of this course	Students need to correctly perform calculations and solve problems	1.25 % × 8 = 10% 10% 10%	1 week prior to due date Week 7 Week 10	11:59 PM Monday most weeks from week 2	These quizzes use a question bank. Every week you will have a quiz to complete at home. You may attempt this as many times as you wish. Your highest mark will count. At the end of each attempt, you will receive feedback on how to answer any questions you answered incorrectly. In weeks 7 and 10 you will have a 40-minute 4 question quiz drawn from the same question banks. These are available 9 AM Monday – 5 PM Friday during the assigned week.		
Final exam	Recognise the quantitative nature of physics and be able to solve simple problems – tests entire syllabus of this course	Students need to correctly perform calculations and solve problems	50 %	You can view your exam timetable on myUNSW. This is a 2-hour exam. This will be an online exam.				

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.

7. Additional Resources and Support

Text Books	Halliday, D., Resnick, R., & Walker, J. (2018). Fundamentals of Physics, John Wiley & Sons. 11E ANZ edition Note: the library has an eBook subscription to this. The link is provided on the Moodle site. Alternatively, the book can be purchased from the publisher here: https://www.wileydirect.com.au/buy/fundamentals-of-physics-11th-australia-new-zealand-edition/
Course Manual	Laboratory notes will be provided on Moodle. If you are attending face-to-face labs you need to buy a lab book from the bookshop or print your own copy of the notes to bring to class.
Required Readings	Lecture notes provided on Moodle.
Additional Readings	Most calculus based introductory physics text books are suitable. Physics Vol 1 by Serway, Jewett, Wilson and Wilson is an example of one of these.
Recommended Internet Sites	Will be made available on Moodle

8. Required Equipment, Training and Enabling Skills

Equipment Required	Access to a computer to complete online quizzes. There are suitable computers in the UNSW library.
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.

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.

The School of Physics has a course representative for each course. These will be elected at the start of the course. You can give anonymous feedback to your course representative to be passed onto the lecturers and convener.

Changes for term 3 based on feedback from previous terms are that students have the choice between synchronous and asynchronous lectures. We have also set up the Moodle course in a week-by-week format rather than by component of the course.

Mechanisms of Review	Last Review Date	Comments or Changes Resulting from Reviews
Major Course Review		New web stream lectures for mechanics were introduced in term 1 2021, new web stream lectures for thermal and waves are being introduced in term 2 2021.
myExperience		In 2018 the assessment of this course was changed based on student feedback. The final exam is now worth 50% (down from 70%). There are two invigilated quizzes each worth 10%. In semester 2 2018 the questions in the in class tests were categorised based on difficulty (as judged from past student performance) based on feedback that some students received harder questions than others.
Other		In term 1 2019 students requested that the due time for the at home quizzes be moved from 9 PM to 11:59 PM on Sundays. This has been changed. In 2019 students requested two two-hour lectures rather than four one-hour lectures. This was changed for 2020. When the course moved predominantly online many changes were needed. Based on student feedback from the end of 2020, synchronous OTH classes are now timetabled.

10. Administration Matters

Expectations of Students	There is an assumption that students will spend 150 hours in total working on course materials for this course. Recommended allocations of this time are outlined in the table on pages 6-9.		
Special consideration	<p>If a student suffers a misadventure and misses an online quiz or lab they should apply for special consideration through myUNSW, this will require evidence to support the claim such as a doctor's certificate. For the at home quizzes this certificate needs to cover at least three days while the quiz was available.</p> <p>The UNSW special consideration information can be found here: https://student.unsw.edu.au/special-consideration</p>		
Laboratory exemptions	In some circumstances, students may have previously completed and passed the laboratory component of this course but failed to complete the course. In this case, students may be eligible for a laboratory exemption if they have completed the course in the past 3 years. Students may apply by emailing the laboratory director (CC lab support) or by completing an application on Moodle.		
Assessment submission	<p>All submission times are in Australian Eastern Standard Time (AEST, Sydney). Students should submit well in advance of the submission deadline as the Moodle can slow down due to heavy usage at the due time.</p> <p>If a student experiences any difficulty submitting a lab report through Moodle they must email a copy of the lab to thomas.dixon@unsw.edu.au before lab is due, with a report of what went wrong (so that we can fix it).</p>		
Occupational Health and Safety⁴	Make sure you follow the instructions about the laboratory exercises to ensure you conduct the exercises safely.		
Assessment Procedures⁵	The UNSW assessment policy can be found here: https://www.gs.unsw.edu.au/policy/documents/assessmentpolicy.pdf		
Equity and Diversity	<p>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.studentequity.unsw.edu.au/).</p> <p>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.</p>		
Student Complaint Procedure⁶	School Contact	Faculty Contact	University Contact
	<p>A. Prof Elizabeth Angstmann First year Physics Director e.angsmann@unsw.edu.au</p> <p>Or</p> <p>Prof. Adam Micolich Director of Teaching, Physics adam.micolich@unsw.edu.au</p>	<p>Deputy Dean Education A. Prof. Alison Beavis a.beavis@unsw.edu.au</p>	<p>Student Conduct and Appeals Officer (SCAO) within the Office of the Pro-Vice-Chancellor (Students) and Registrar.</p> <p>Telephone 02 9385 8515, email studentcomplaints@unsw.edu.au</p> <p>University Counselling and Psychological Services⁷ Tel: 9385 5418</p>

⁴ [UNSW OHS Home page](#)

⁵ [UNSW Assessment Policy](#)

⁶ [UNSW Student Complaint Procedure](#)

⁷ [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.⁸ 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.

⁸ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.