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	*PHYS1221*
Course Name	*Physics 1B*
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	PHYS1121 is a prerequisite *MATH1231 or MATH1241 or MATH1251 are co-requisites*
Hours per Week	*Students are expected to spend around 14 hours per week on this course. There is a two hour lab each week.*
Number of Weeks	*10 weeks*
Commencement Date	14th February 2022
Grading	This course uses standard grading (HD, DN, CR, PS, FL)
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. *These are optional*. 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

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

	as many times as you want. Your highest mark counts. There are 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.

2. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenor		*A. Prof. Elizabeth Angstmann*	*e.angstmann@unsw.edu.au*	Email to arrange a time
Additional Teaching Staff	Lecturers Wk 1-4 Wk 5, 7-9 web stream wk 1-4,9 5, 7-8	 Prof. Sarah Brough Prof. Oleg Sushkov *A. Prof. Elizabeth Angstmann* *Dr Kate Jackson*	 s.brough@unsw.edu.au *sushkov@unsw.edu.au* *e.angstmann@unsw.edu.au* *kate.jackson1@unsw.edu.au*	
	Lab director	*A. Prof. Rajib Rahman*	*rajib.rahman@unsw.edu.au*	
	Other Support Staff	*Zofia Krawczyk* Tom Dixon (lab)	z.krawczyk-bernotas@unsw.edu.au thomas.dixon@unsw.edu.au	

3. Course Details

Course Description (Handbook Entry)	This is the second of the two introductory courses in Physics. It is a calculus based course. The course is examined at two levels, with Higher Physics 1B being the higher of the two levels. While the same content is covered as Physics 1B, Higher Physics 1B features more advanced assessment, including separate problem solving workshops. Electricity and Magnetism: electrostatics, Gauss's law, electric potential, capacitance and dielectrics, magnetic fields and magnetism, Ampere's and Biot-Savart law, Faraday's law, induction and inductance. Physical Optics: light, interference, diffraction, gratings and spectra, polarization. Introductory quantum theory and the wave nature of matter. Introductory solid state and semiconductor physics: simple energy band picture.
Course Aims	This course gives an introduction to electromagnetism, optics and modern physics, and to the techniques of analysis and problem solving in the physical world. With its companion subject (Physics 1A, Higher Physics 1A or Higher Physics 1A (Special)), this constitutes a broad introduction to physics. This background supports higher level study in physics and engineering.
Student Learning Outcomes	By the end of this course students should be able to: • Use Coloumb's law and Gauss's law to calculate electric fields for configurations of charges, use these electric fields to calculate electric potentials. Compare and contrast electric fields to gravitational fields covered in Physics 1A. • Be able to state the definition of capacitance and use this definition with equations for electric field and voltages to calculate the capacitance of different geometries. • Calculate the electrostatic and magnetic fields produced by moving charges in a variety of configurations using the Laws of Biot-Savart and Ampère. Relate electric and magnetic fields using Faraday's law; use this to calculate induced currents and voltages. • Use equations to describe and explain properties of electromagnetic waves (such as wavelength, frequency, intensity, power and radiation pressure) and relate these to electric and magnetic fields and the speed of light. • Use equations and diagrams to solve advanced problems about electromagnetic waves related to polarisation, interference and diffraction. • Discuss and explain (qualitatively and quantitatively) the key observations and events that led to the development of quantum mechanics. • Be able to state the Schrödinger equation and use it to calculate energy levels in the simple case for a particle in a box.

	• Relate emission and absorption spectra to the energy change of electrons between states in an atom, calculate the energy levels of electrons in Hydrogen like atoms, relate this to quantum mechanical laws. • Describe and explain the physics relating modern devices and technologies including semiconductors, transistors, LEDs and solar cells. • Recognise that physics is an experimental science, have skills to plan and conduct experiments and analyse the outcomes and present the results in a variety of formats, include reliable estimates of the uncertainty in measurements.
Relationship to Other Courses within the Program	PHYS1121 is a pre requisite for PHYS1221, Physics 1B

4. Rationale and Strategies Underpinning the Course

Teaching Strategies	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. Laboratory exercises give students the opportunity to practice and apply important skills such as calculating uncertainties.
Rationale for learning and teaching in this course	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. Psychological Science in the Public Interest, 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.
Rationale for assessment	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. 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. Labs are also assessed, as physics is an experimental science, students need to be able to conduct measurements to test models.

5. Course Schedule

Week	Scheduled activities and recommended allocation of time	Assignment, Submission dates time needed (see also 'Assessment Tasks & Feedback')
Week 1	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the lab safety induction online. Start online quiz 1. *This week you should spend 4 hours on lecture content, 1 hour in the OTH class as well as 1 hours completing the lab safety exercise and reviewing the upcoming work. You should also spend 5 hours reviewing lecture material and attempting problems.*	11 hrs Complete lab safety exercise.
Week 2	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete and submit the Charge of an Electron online lab, or Charge of an Electron in-person lab. Complete quiz 1, start quiz 2. *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.*	Online Quiz 1 due Monday 11:59 PM Complete homework set 1 (no need to submit) Complete Lab 1 14 hrs

Week 3	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete and submit the Electrostatic Field Plotting Lab (online), or the Electrostatic Field Plotting in person lab. Complete quiz 2, start online quiz 3 *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.*	Complete Lab 2 Online Quiz 2 due Monday 11:59 PM Complete homework set 2 (no need to submit) 14 hrs
Week 4	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the Capacitors online lab, or the Capacitors in-person lab. Complete quiz 3, start online quiz 4 *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.* **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.**	Complete Lab 3. Online Quiz 3 due Monday 11:59 PM Complete homework set 3 (no need to submit) 14 hrs

Week 5	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the Magnetic Fieldsonline lab, or the Magnetic Fields in-person lab Complete quiz 4 (though it is due next week). *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.*	Complete Lab 4. Online Quiz 4 due Monday 11:59 PM 14 hrs
Week 6	*Flexibility week: Use this week to catch up and get ahead.*	10 hrs
Week 7	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the Faraday's Law Online Lab or the Faraday's Law in-person lab. Complete the class test Complete quiz 5, start online quiz 6. *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.*	Complete Lab 5 Online Quiz 5 due Monday 11:59 PM Class test 1 Complete homework set 4 (no need to submit) 14 hrs
Week 8	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the Diffraction Gratings Online lab, or the Diffraction Gratings and Spectroscopy in-person lab. Complete quiz 6, start quiz 7	Complete Lab 6 Online Quiz 6 due Monday 11:59 PM 14 hrs

	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.	
Week 9	Complete web stream lectures assigned for this week and the associated problems or attend the online synchronous lectures. Attend the OTH class. Lab: Complete the Microwave Optics Online lab or the Microwave Optics in-person lab Complete quiz 7, start quiz 8 *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.*	Complete Lab 7 Online Quiz 7 due Monday 11:59 PM Complete homework set 5 (no need to submit) 14 hrs
Week 10	No lectures this week. There is an OTH class. Complete quiz 8 Complete class test 2 Lab: Complete the Photoelectric Effect lab online lab or the Photoelectric Effect in-person lab. *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.*	Complete Lab 8 Online Quiz 8 due Monday 11:59 PM Class test 2 Complete homework set 6 (no need to submit) 11 hrs
Stu vac	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.	20 hrs
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 are rated pass/fail by your demonstrator. 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.	*Demonstrator*	At home experiments Monday one week after submission. In class experiments marked during class. Online experiments immediately.	*Comments and rubric in Turnitin[3] for at home experiments, rubric and discussions with demonstrator for in class experiments. Automatically for online experiments.*
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 % x 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 manual will be handed to you in the first lab class. All material is available on Moodle.
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
Computer Laboratories or Study Spaces	Room 201A in the old main building is available for group or individual study.

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		
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 term 1 2019 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 has been changed for 2020.

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	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. The UNSW special consideration information can be found here: https://student.unsw.edu.au/special-consideration		
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	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. **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).**		
Occupational Health and Safety[4]	Make sure you follow the instructions about the laboratory exercises to ensure you conduct the exercises safely.		
Assessment Procedures[5]	The UNSW assessment policy can be found here: https://www.gs.unsw.edu.au/policy/documents/assessmentpolicy.pdf		
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.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[6]	**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[7] Tel: 9385 5418

[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.