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	*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	17th February 2021
Grading	This course uses standard grading (HD, DN, CR, PS, FL) in term 3.
Component	**Details**
Online 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. There are four online asynchronous lectures each week.
Laboratories	This course has 8 laboratory experiments, on average one each week. In laboratory classes you will collect data, design experiments and make use of the theories covered in lectures. You will need to complete a prelab quiz before each experiment. There is an online option for students who cannot attend.
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 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 have a timed test during weeks 7 and 10. During these class tests exam rules apply.

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

2. Staff Involved in the Course

Staff	Role	Name	Contact Details	Consultation Times
Course Convenor		*Prof. Alexander Hamilton*	*alex.hamilton@unsw.edu.au* *Room 101, Old Main Building* *School of Physics*	Email to arrange a time
Additional Teaching Staff	Lecturers	*A. Prof. Elizabeth Angstmann* *Dr Kate Jackson*	*e.angstmann@unsw.edu.au* *kate.jackson1@unsw.edu.au*	
	Teaching assistants		There will be teaching assistants for synchronous help sessions. Times will be advertised on Moodle.	

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 will 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. In laboratory classes students will practice and apply important skills such as calculating uncertainties. Laboratory exercises will be related to material covered in lectures, giving students an opportunity to work through difficult concepts with their lab partner and laboratory demonstrator.
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 workshops 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 such as sketching a free body diagram 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 (check lecture, lab and problem solving workshop times on your timetable on myUNSW) and recommended allocation of time	Assignment and Submission dates (see also 'Assessment Tasks & Feedback')
Week 1	Complete the first four web stream lectures. *This week you should spend 6 hours on lecture content, you should also spend 4 hours reviewing lecture material and attempting problems. You should spend a couple of hours preparing for next week's lab: do the safety induction and the prelab.*	Complete the online Safety Induction for the lab 10 hrs
Week 2	Complete four web stream lectures. *This week you should spend 6 hours on lecture content.. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Online Quiz 1 Complete homework set 1 12 hrs
Week 3	Complete four web stream lectures. Laboratory class: Electrostatic field plotting *This week you should spend 6 hours on lecture content, as well as 2 hours in lab. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab Online Quiz 2 Complete homework set 2 14 hrs
Week 4	Complete four web stream lectures. Laboratory class: Capacitors *This week you should spend 6 hours on lecture content, as well as 2 hours in lab. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab Online Quiz 3 Complete homework set 3 14 hrs
Week 5	Complete four web stream lectures. Laboratory class: Magnetic fields and the slinky coil *This week you should spend 6 hours on lecture content, as well as 2 hours in lab. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab 14 hrs

Week 6	Flexibility week. Spend this week catching up on anything you are behind on or getting ahead. Prepare for the test next week.	Online Quiz 5 14 hrs
Week 7	Complete four web stream lectures. Laboratory class: Faraday's Law *This week you should spend 6 hours on lecture content, as well as 2 hours in lab and 1 hour doing your test. You should also spend 4 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab Online Quiz 5 Complete homework set 4 Class test 1 14 hrs
Week 8	Complete four web stream lectures. Laboratory class: Diffraction gratings and Spectroscopy *This week you should spend 6 hours on lecture content, as well as 2 hours in lab. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab Online Quiz 6 Complete homework set 5 14 hrs
Week 9	Complete four web stream lectures. Laboratory class: Microwave optics *This week you should spend 6 hours on lecture content, as well as 2 hours in lab. You should also spend 5 hours reviewing lecture material and attempting problems, including the quiz problems. You should spend one hour preparing for next week's lab.*	Lab Online Quiz 7 Complete homework set 6 14 hrs
Week 10	Laboratory class: The photoelectric effect *This week you should 2 hours in lab and 5 hours revising material and preparing for your class test (plus an hour doing the test).*	Lab Online Quiz 8 Class test 2 8 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	WHO	WHEN	HOW
Lab Exercises and prelab quizzes[2]	Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.	Each lab is marked on a pass/fail basis (Term 1 2021 only). Marking rubric for each exercise can be found in the laboratory manual.	2.9% × 7 = 20%	1 week prior to lab	Prelab quizzes before the start of your lab time, lab book at the end	*Demonstrator*	During lab	*Your demonstrator will talk to you*
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 PM Sunday at ends of each week 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.		
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. It will be online.				

[2] An online option is available for students who are unable to attend a face-to-face lab. These are due at 11:59 PM on Sunday AEST (Sydney time) at the end of the week the lab is scheduled for.

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, or can be collected ahead of time from room 103. 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.

Note: The course is running very differently in term 3 2020 due to the need to move online. The web stream lectures are new this term. Please let us know if you have suggested improvements.

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 150 hours in total working on course materials for this course. Recommended allocations of this time are outlined in the table on pages 6-8. It is expected that students attend all scheduled lab classes, if a student can not attend, they should submit the online lab by the end of the week the lab class is scheduled for.		
Special consideration	If a student misses a lab they should submit the online version by the end of the week the lab is scheduled. They only need to apply for special consideration if an extension is required. If a student suffers a misadventure and misses an online quiz 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. For the quizzes held in the lab the certificate needs to cover the day of the quiz. The UNSW special consideration information can be found here: https://student.unsw.edu.au/special-consideration		
Class tests	During the class tests exam rules apply. You can read about these here: https://student.unsw.edu.au/exam-rules		
Occupational Health and Safety[3]	Make sure you follow the instructions in the laboratory to ensure you conduct the exercises safely.		
Assessment Procedures[4]	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[5]	**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 (to commence early 2020) Or Dr Gavin Edwards Associate Dean (Undergraduate Programs) g.edwards@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[6] Tel: 9385 5418

[3] UNSW OHS Home page
[4] UNSW Assessment Policy
[5] UNSW Student Complaint Procedure
[6] 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.[7] *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*.*

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