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	*PHYS1241*
Course Name	*Higher Physics 1B (Special)*
Academic Unit	*School of Physics*
Level of Course	*1*
Units of Credit	*6UOC*
Session(s) Offered	*Term 2*
Assumed Knowledge, Prerequisites or Co-requisites	Assumed Knowledge : PHYS1131 or PHYS1141 *MATH1231 or MATH1241 or MATH1251 are co-requisites*
Hours per Week	*4 hours lectures per week, 2 hour problem solving workshop, 2 hour lab. It is expected that students will spend an additional 7 hours per week solving problems.*
Number of Weeks	*10 weeks*
Commencement Date	31st May
Component	**Details**
Lectures (LEC)	*In lectures you will be introduced to new material, shown demonstrations and examples of how to solve problems. Lectures are 4 hours per week. Check your timetable for times. Lectures are face-to-face.*
Laboratories (LAB)	*This course has 8 weeks of laboratory exercises. 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.*
Problem Solving workshops (OTH)	*In Problem Solving Workshops you will practice solving problems. You will be expected to actively participate in these classes.*

[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. Adam Micolich*	adam.micolich@unsw.edu.au	Email to arrange a time
Additional Teaching Staff	Lecturers	*Dr Jan Hamann* *Prof. Dane McCamey*	*jan.hamann@unsw.edu.au* *dane.mccamey@unsw.edu.au*	Email to arrange a time
	Lab director (and problem solving workshop convener)	*A. Prof. Rajib Rahman*	*rajib.rahman@unsw.edu.au*	Email to arrange a time
	Other Support Staff	*A. Prof. Elizabeth Angstmann* *Zofia Krawczyk* Tom Dixon (lab)	e.angstmann@unsw.edu.au z.krawczyk-bernotas@unsw.edu.au thomas.dixon@unsw.edu.au	Email to arrange a time

3. Course Details

Course Description (Handbook Entry)	This course is designed for Physics majors and all students taking an Advanced Science program that includes Physics. PHYS1241 is the 'companion' course to PHYS1131 Higher Physics 1A or PHYS1141 Higher Physics 1A (Special), available in S1. The topics covered in PHYS1241 are: 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 of nature of matter. Introductory solid state and semiconductor physics: simple energy band picture. Special relativity: inertial reference frames, length contraction, time dilation, equivalence of mass and energy. There is also a laboratory course covering material relevant to lectures.
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 (Special) Higher Physics 1A), this constitutes a broad introduction to physics. This background supports higher level study in physics.
Student Learning Outcomes	By the end of this course students should be able to: • Use Coulomb's law and Gauss's law to calculate electric fields for configurations of charges, and 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 voltage 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, which is then used 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. • 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	PHYS1131 or 1141 or a 65 or above in PHYS1121 is a prerequisite for this course. PHYS1221/1231/1241 is a prerequisite for higher year physics subjects.

4. Rationale and Strategies Underpinning the Course

Teaching Strategies	In lectures students will be presented with the material that they need to learn. These lectures will include descriptions of the content, demonstrations and problems related to the material to be learnt. They will be shown methods of solving problems. Students will also attend problem solving workshops. Students will solve problems and present their solutions to the class. Students will attend a 2-hour laboratory session each week. This session will teach them about experimental methods and measurement uncertainties and will be directly related to the content being covered in lectures. Students will write up and hand in their own, individual laboratory notebooks. In addition to the time spent in class students will have access to online materials such as prework tests and videos for the labs and PHYSCLIPS to help them better understand the material.
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 can 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 is vital. Labs are also assessed, because 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)	Assignment and Submission dates (see also 'Assessment Tasks & Feedback')
Week 1	Two 2 hour lectures	
Week 2	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Faraday ice pail	Online quiz 1
Week 3	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Electrostatic field plotting	Online quiz 2
Week 4	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Capacitors	Online quiz 3 Hand in lab manual for marking at end of lab. The exercise from weeks 2-3 will be marked
Week 5	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Magnetic fields and the slinky coil	
Week 6	No classes, flexibility week	Online quiz 4
Week 7	Two 2 hour lectures 2 hour problem solving workshop, test will be in first hour. 2 hour lab, Faraday's law	Class test 1 Online quiz 5
Week 8	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Microwave optics and spectrometry	Online quiz 6 Hand in lab manual for marking at end of lab. The exercise from weeks 4, 5, 7 will be marked
Week 9	Two 2 hour lectures 2 hour problem solving workshop 2 hour lab, Microwave optics and spectrometry	Online quiz 7
Week 10	2 hour problem solving workshop, test will be in first hour 2 hour lab, Microwave optics and spectrometry	Class test 2 Online quiz 8

		Hand in lab manual for marking at end of the week. The exercise from weeks 8-10 will be marked.

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	Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.	Prelab checks that you are prepared for the lab. See rubric in lab manual for how lab books will be marked.	Prelab 2%	One week prior to lab	Start of lab time	Moodle	Immediately (1 week afterwards for long answers)	Through Moodle
			Experiment write ups 18%	Start of course	Lab time weeks 4, 8, end of week 10	Demonstrator	Lab the following week	Rubric with comments
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% 15% 15%	1 week prior to due date Week 7, OTH class Week 10 OTH class	11:59 PM Sunday at ends of 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 four question quiz drawn from the same question banks during your problem solving workshop.		
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	40 %	This is a 2-hour face-to-face exam.				

7. Additional Resources and Support

Text Books	Halliday, D., Resnick, R., & Walker, J. (2018). Fundamentals of Physics, John Wiley & Sons. 11th Aus/NZ 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	You will be given a homework booklet, laboratory manual and laboratory book for this course.
Required Readings	Lecture notes provided on Moodle.
Additional Readings	Most calculus based introductory physics textbooks are suitable. Physics Vol. 1 by Serway, Jewett, Wilson and Wilson is 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 course did not run in 2020 as it was not possible to have face-to-face classes.

Mechanisms of Review	Last Review Date	Comments or Changes Resulting from Reviews
Major Course Review	2019 2021	Course ran in 10 weeks for the first time. Some topics have been removed to fit better into 9 weeks
myExperience	2019	Students did not like having assignments, they requested online quizzes instead. This has been implemented for 2021
Other		

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.		
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		
Assessment submission	All submission times are in Australian Eastern Standard Time (AEST, Sydney). There is a 25% penalty for each day the lab reports are late.		
Occupational Health and Safety[2]	Make sure you follow the instructions about the laboratory exercises to ensure you conduct the exercises safely.		
Assessment Procedures[3]	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[4]	**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[5] Tel: 9385 5418

[2] UNSW OHS Home page
[3] UNSW Assessment Policy
[4] UNSW Student Complaint Procedure
[5] University Counselling and Psychological Services

UNSW Academic Honesty 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.[6] *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.

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