School of Physics

Course Outline 2021

PHYS9130

ELECTROMAGNETISM FOR TEACHERS

School of Physics

Faculty of Science

Term 2, 2021

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	*PHYS9130*
Course Name	*Electromagnetism for Teachers*
Academic Unit	*School of Physics*
Level of Course	*Postgraduate*
Units of Credit	*6UOC*
Term(s) Offered	*Term 2*
Assumed Knowledge, Prerequisites or Co-requisites	*PHYS9110 and PHYS9120 are pre-requisites* *Calculus (3 unit mathematics) is required*
Hours per Week	*12 hours per week*
Number of Weeks	*10 weeks*
Commencement Date	*31st May 2021*
Component	**Details**
Lectures	*These are available online through OpenLearning. Lectures consist of short videos followed by questions and activities.*
Experiments	*You will conduct experiments at home/school and write them up for submission. You will need to adapt the experiment to suit the equipment you have access to.*
Tutorial problems	*Each topic will have 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 final examination. These can be found through the OpenLearning lessons*
Online discussions	You will be expected to contribute to online discussions in OpenLearning throughout the course.

[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		*Kate Jackson*	*kate.jackson1@unsw.edu.au* *Room G61G, OMB* *School of Physics*	*Email to arrange a time*
Additional Teaching Staff	Lecture developer	*Ingrid Mendes*	2017 Visiting teaching fellow	
	Other Support Staff	Jo Bosben (contact Jo for administrative matters)	j.bosben@unsw.edu.au	

3. Course Details

Course Description (Handbook Entry)	This is an online course covering electromagnetism. Lecture material and tutorial problems will be presented online. This is the third course in the graduate certificate for physics teachers. This course will teach students about electromagnetism. Electromagnetism is the branch of physics concerned with studying interactions between electrically charged particles. In this course students will learn about electrical circuits containing resistors, capacitors and inductors. They will use Gauss's law to find electric fields and electric potentials around symmetric charge distributions. They will learn how to define and calculate capacitance. The course will also look at magnetic fields and magnetic inductance. Electromagnetic waves and optics will be considered. **Assumed Knowledge:** Students need to be able to differentiate and integrate polynomials to complete this course. A good understanding of HSC level extension 1 mathematics is recommended.
Course Aims	This course aims to give students a solid foundation in electromagnetism. After undertaking this course students should be confident in their ability to present electromagnetism to high school students. Students will be able to solve problems involving charges, circuits and electromagnetic waves. They will be introduced to Maxwell's equations in the integral form and be able to use these to solve problems involving moving and static charges. Students will be able to plan experiments and carry them out.
Student Learning Outcomes	By the end of this course students should be able to: 1. Calculate, measure and relate electric current, voltage, capacitance, inductance, power and resistance for different circuit configurations. 2. Describe and use equations to solve problems about basic concepts underpinning electricity and magnetism such as potential and field. 3. Use Gauss's law to calculate electric fields for simple configurations, use these electric fields to calculate electric potentials. 4. State the definition of capacitance and use this definition with equations for electric field and voltages to calculate the capacitance of different arrangements of charge and the charge distribution on different combinations of capacitors. 5. Calculate the electrostatic and magnetic fields produced by static and moving charges in a variety of simple configurations. 6. Relate electric and magnetic fields using Faraday's law; use this to calculate induced currents and voltages. 7. 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. 8. Use equations and diagrams to solve problems about electromagnetic waves related to polarization, interference and diffraction. 9. Describe similarities and differences between fields and forces covered in this course and the mechanics course studied previously,

	appreciate that Maxwell's equations united the concepts of electricity and magnetism into one coherent theory. 10. Recognise that physics is an experimental science, have skills to plan and conduct experiments and analyse the outcomes, include estimates of the uncertainty in measurements.
Relationship to Other Courses within the Program	This course is a pre-requisite for PHYS9140 in the Graduate Certificate in Physics for Science Teachers.

4. Rationale and Strategies Underpinning the Course

This course will be predominantly online. Each week the students will have a series of videos to view that will cover some aspects of electromagnetism. Videos will include the presentation of theory, demonstrations and worked examples. Students will have a set of tutorial problems to solve each week to check that they are able to apply the theory presented to them to solve problems. They will have access to solutions and a discussion board if they need assistance with this.

Every three weeks students will complete an online quiz to ensure they are keeping up with and able to apply the material covered in lectures.

Students will complete experiments at school, this will familiarise them with experiments that they can use with their students.

5. Course Schedule

Week (starts on)	Work through (watch videos, answer tutorial questions, try activities) the module on:	Assignment and Submission dates (see also 'Assessment Tasks & Feedback')
Week 1 31st May	Electrostatics	
Week 2 7th June	Electric Potential	
Week 3 15th June	Electric Current	
Week 4 21st June	Power and Energy	Online test 1 due Sunday HECs census date 27th June
Week 5 28th June	Magnetism	Experiment 1 due Sunday
Week 6 5th July	Induction	
Week 7 12th July	Electromagnetic waves	Online test 2 due Sunday
Week 8 19th July	Optics and Polarization	Experiment 2 due Sunday
Week 9 26th July	Interference	
Week 10 2nd August	Diffraction	Online test 3 due Sunday Experiment 3 due Sunday

6. Assessment Tasks and Feedback

Task	Knowledge & abilities assessed	Assessment Criteria	% of total mark	Date of		Feedback		
				Release	Submission[2]	WHO	WHEN	HOW
Online tests	Assesses ability to solve problems based on first five learning outcomes	Students need to correctly perform calculations and recall a few facts	6.67 % × 3 = 20%	18/06/21 9/07/21 30/07/21	27/06/21 18/07/21 08/08/21 At 11:59 PM	*Automated through Moodle*	*Immediately after quiz closes*	*Marks on Moodle and video solutions*
Experiments and experiment reports	Be able to investigate the physics behind phenomenon and develop skills associated with good experimental technique	Will be given at the end of each exercise.	3 × 10% = 30%	31/05/21 28/06/21 19/07/21	04/07/21 25/07/21 08/08/21 At 11:59 PM	Course staff	12/07/21 02/08/21 16/08/21	Through rubric on Turnitin
Final exam	Be able to solve problems based on the content covered in this course	Students will receive marks for correctly answering questions	50%	Held during exam period, 13th - 26th August		Convener	Mark included in final grade	

[2] All times and dates are given for Sydney. If a student is submitting from overseas, it is their responsibility to check that they submit it by the due time.

7. Additional Resources and Support

Textbooks	Halliday, D., Resnick, R., & Walker, J. (2014). Fundamentals of Physics, John Wiley & Sons. Note: the library has an eBook subscription to this. The link is provided on the Moodle site. The book can be purchased from the publisher here: http://www.wileydirect.com.au/buy/fundamentals-of-physics-10th-edition/
Course Manual	Experiments will be available through OpenLearning
Required Readings	All required resources made available through OpenLearning
Additional Readings	Most calculus based introductory physics textbooks 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 and OpenLearning

8. Required Equipment, Training and Enabling Skills

Equipment Required	Calculator School laboratory equipment will be needed for the experiments. If you do not have access to this, please let us know so that we can mail appropriate equipment to you. It is preferable to use your own equipment so that you have activities you can complete with your classes.
Enabling Skills Training Required to Complete this Course	3 unit mathematics: need to be able to use trigonometry, logarithms, vectors and calculus

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
Major Course Review		This course ran for the first time in 2018.
myExperience[3]		
Other		Lab exercises have been updated for 2020 based of 2019 feedback.

[3] UNSW myExperience

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 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 Sydney times. There is a 25% 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 Moodle can slow down due to heavy usage at the due time. **If a student experiences any difficulty submitting an assignment through Moodle, they must email a copy of the assignment to kate.jackson1@unsw.edu.au before assignment is due, with a report of what went wrong (so that we can fix it).** If there are special circumstances causing a student to miss a deadline, they should apply for special consideration through myUNSW, a doctor's certificate or other suitable documentation will be needed. All assignments need to be typed.		
Occupational Health and Safety[4]	Is very important. You must complete and abide by a risk assessment for each of the investigations you conduct.		
Assessment Procedures **UNSW Assessment Policy**[5]	The School of Physics special consideration policy can be found here: https://www.physics.unsw.edu.au/current-students/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 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 Or Dr Gavin Edwards Associate Dean (Undergraduate Programs) g.edwards@unsw.edu.au Tel: 9385 6125	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.