PHYC20011 Electromagnetism and Optics

Credit Points:	12.50
Level:	2 (Undergraduate)
Dates & Locations:	2010, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus. Lectures, tutorials and practical laboratory classes.
Time Commitment:	Contact Hours: 3 x one hour lectures per week (total 27 lectures); 1 x one hour tutorial per week (total 9 classes); 1 x three hour laboratory class per week (total 6 classes). Total Time Commitment: Estimated total time commitment of 120 hours
Prerequisites:	One of # **640-111 Physics 1: Advanced (/view/2010/640-111)** # **640-131 Physics 1 (/view/2010/640-131)** # **640-171 Physics 1: Fundamentals (/view/2010/640-171)** Plus one of # **640-112 Physics 2: Advanced (/view/2010/640-112)** # **640-132 Physics 2: Physical Science & Technology (/view/2010/640-132)** # **640-172 Physics 2: Life Sciences & Environment (/view/2010/640-172)** Plus one of # **620-155 Calculus 2 (/view/2010/620-155)** # **620-158 Accelerated Mathematics 2 (/view/2010/620-158)** Plus one of # **620-156 Linear Algebra (/view/2010/620-156)** (may be taken concurrently) # **620-157 Accelerated Mathematics 1 (/view/2010/620-157)**
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students who have completed any of the following subjects cannot enrol in this subject for credit # 640-225 Electromagnetism & Relativity Advanced (prior to 2009) # 640-245 Electromagnetism & Relativity (prior to 2009)
Core Participation Requirements:	It is University policy to take all reasonable steps to minimise the impact of disability upon academic study and reasonable steps will be made to enhance a student's participation in the University's programs. This subject requires all students to actively and safely participate in laboratory activities. Students who feel their disability may impact upon their participation are encouraged to discuss this with the subject coordinator and the Disability Liaison Unit.
Coordinator:	Assoc Prof Robert Scholten
Contact:	**Email: c640215@physics.unimelb.edu.au (mailto:c640215@physics.unimelb.edu.au)**
Subject Overview:	This subject extends knowledge of the fundamental principles of electromagnetism, introducing Maxwell's equations in differential form, and key topics in optics. Electromagnetism topics include the electric field (e.g. Gauss's law in integral and differential form, scalar potential and gradient, Poisson and Laplace equations), the magnetic field (e.g. Ampere's law in integral and differential forms), Maxwell's equations in vacuum (integral and differential forms), Maxwell's equations in matter (polarization, electric displacement, magnetic vector potential), time-varying

	electric and magnetic fields (Maxwell's equations in general form, wave equations for E and B, plane electromagnetic wave, Poynting vector). Optics topics include an introduction to Fourier optics, Fourier transforms in 1 and 2D, Dirac delta function and comb, discrete Fourier transforms and the sampling theorem, convolution, cross and autocorrelation. Fresnel and Fraunhofer diffraction are treated explicitly and a description of polarized light with methods of producing and controlling polarisation.
Objectives:	To challenge students to expand their knowledge of fundamental physics principles and develop their capacity to: # explain the physical basis of Maxwell's equations and solve and analyse simple problems in electromagnetism by applying Maxwell's equations; # explain Fraunhofer and Fresnel diffraction and solve and analyse simple problems in optics using Fourier transforms and related analytical tools. # acquire and interpret experimental data and perform computer modelling.
Assessment:	Ongoing assessment of practical work during the semester including:log-book record keeping and participation (10%)a written report of up to 2,000 words (10%) Satisfactory completion of practical work is necessary to pass the subject, including attendance and submission of work for at least 80% of workshop sessions, together with a result for assessed work of at least 50%.One written test with a total duration of up to 30 minutes, held mid semester (5%)Two written assignments requiring a total of up to 8 hours of work outside class time during the semester (10% in total)A 3-hour written examination in the examination period (65%)
Prescribed Texts:	R H Good, Classical Electromagnetism, Saunders E Hecht, Optics 4th edn, Addison-Wesley
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2010/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2010/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2010/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2010/B-MUS)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	A student who completes this subject should be able to: # explain their understanding of physics principles and applications lucidly, both in writing and orally; # acquire and interpret experimental data and design experimental investigations; # participate as an effective member of a group in tutorial discussions, laboratory and study groups; # think independently and analytically, and direct his or her own learning; # manage time effectively in order to be prepared for regular practical and tutorial classes, tests, the examination and to complete assignments.
Notes:	This subject is available for science credit to students enrolled in the BSc (both pre-2008 and new degrees), BASc or a combined BSc course.
Related Course(s):	Bachelor of Science