PHYC20011 Electromagnetism and Optics

Credit Points:	12.5
Level:	2 (Undergraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus. Please Note: This subject is a transitional subject that is available only to students that have already successfully completed one of PHYC20009 or PHYC20010. All other students wishing to undertake Level 2 Physics should select from the subjects PHYC20012, PHYC20013, PHYC20014 and PHYC20015.
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 170 hours
Prerequisites:	One of **Subject** / **Study Period Commencement:** / **Credit Points:** PHYC10001 Physics 1: Advanced — Semester 1 — 12.50 PHYC10003 Physics 1 — Semester 1 — 12.50 PHYC10005 Physics 1: Fundamentals — Semester 1 — 12.50 Plus one of **Subject** / **Study Period Commencement:** / **Credit Points:** PHYC10002 Physics 2: Advanced — Semester 2 — 12.50 PHYC10004 Physics 2: Physical Science & Technology — Semester 2 — 12.50 PHYC10006 Physics 2: Life Sciences & Environment — Semester 2 — 12.50 Plus **Subject** / **Study Period Commencement:** / **Credit Points:** MAST20009 Vector Calculus — Semester 1, Semester 2 — 12.50 (MAST20009 can be taken concurrently)
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Student Support and Engagement Policy, academic requirements for this subject are articulated in the Subject Overview, Learning Outcomes, Assessment and Generic Skills sections of this entry. It is University policy to take all reasonable steps to minimise the impact of disability upon academic study, and reasonable adjustments will be made to enhance a student's participation in the University's programs. Students who feel their disability may impact on meeting the requirements of this subject are encouraged to discuss this matter with a Faculty Student Adviser and Student

	Equity and Disability Support: http://services.unimelb.edu.au/disability</p>
Coordinator:	Assoc Prof Harry Quiney
Contact:	**Email: PHYC20011@physics.unimelb.edu.au (mailto:PHYC20011@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.
Learning Outcomes:	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%. Three written assignments requiring a total of up to 9 hours of work outside class time during the semester (15% in total) A 3-hour written examination in the examination period (65%)
Prescribed Texts:	E Purcell, Electricity and Magnetism, 3rd ed., Cambridge University Press
Recommended Texts:	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/2016/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2016/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2016/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2016/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 Majors/Minors/ Specialisations:	Physics Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED