

PHYC20011 Electromagnetism and Optics

Credit Points:	12.50																														
Level:	2 (Undergraduate)																														
Dates & Locations:	2012, 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:	<p>One of</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC10001 Physics 1: Advanced</td> <td>Semester 1</td> <td>12.50</td> </tr> <tr> <td>PHYC10003 Physics 1</td> <td>Semester 1</td> <td>12.50</td> </tr> <tr> <td>PHYC10005 Physics 1: Fundamentals</td> <td>Semester 1</td> <td>12.50</td> </tr> </tbody> </table> <p>Plus one of</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC10002 Physics 2: Advanced</td> <td>Semester 2</td> <td>12.50</td> </tr> <tr> <td>PHYC10004 Physics 2: Physical Science & Technology</td> <td>Semester 2</td> <td>12.50</td> </tr> <tr> <td>PHYC10006 Physics 2: Life Sciences & Environment</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table> <p>Plus</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>MAST20009 Vector Calculus</td> <td>Semester 1, Semester 2</td> <td>12.50</td> </tr> </tbody> </table> <p>(MAST20009 can be taken concurrently)</p>	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	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	Subject	Study Period Commencement:	Credit Points:	MAST20009 Vector Calculus	Semester 1, Semester 2	12.50
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MAST20009 Vector Calculus	Semester 1, Semester 2	12.50																													
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:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/																														

Coordinator:	Assoc Prof Robert Scholten
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.
Objectives:	To challenge students to expand their knowledge of fundamental physics principles and develop their capacity to: <ul style="list-style-type: none"> # 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:	R H Good, Classical Electromagnetism, Saunders
Recommended Texts:	E Hecht, <i>Optics</i> 4th edn, Addison-Wesley
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: <ul style="list-style-type: none"> # Bachelor of Arts (https://handbook.unimelb.edu.au/view/2012/B-ARTS) # Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2012/B-COM) # Bachelor of Environments (https://handbook.unimelb.edu.au/view/2012/B-ENVS) # Bachelor of Music (https://handbook.unimelb.edu.au/view/2012/B-MUS) <p>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.</p>
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: <ul style="list-style-type: none"> # 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:	Science credit subjects* for pre-2008 BSc, BAsC and combined degree science courses Science-credited subjects - new generation B-SCI and B-ENG. Core selective subjects for B-BMED.