640-245 Electromagnetism & Relativity

Credit Points:	12.500
Level:	Undergraduate
Dates & Locations:	2008, This subject commences in the following study period/s: Semester 2, - Taught on campus.
Time Commitment:	Contact Hours: 36 lectures and 12 1-hour tutorials Total Time Commitment: 120 hours
Prerequisites:	Physics 640-121 and 640-122 (or 640-141 and 640-142); one of mathematics 620-113, 620-123 or 620-143, or equivalent.
Corequisites:	Mathematics 620-231 or 620-233, or equivalent.
Recommended Background Knowledge:	None
Non Allowed Subjects:	None
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. Students who feel their disability may impact upon their active and safe participation in a subject are encouraged to discuss this with the relevant subject coordinator and the Disability Liaison Unit
Coordinator:	Dr C Chantler; Dr D N Jamieson
Subject Overview:	The electromagnetism section of this subject will introduce students to Maxwell's equations in differential form. These equations provide a unified understanding of electrical, magnetic and optical phenomena as well as playing a pivotal role in science and engineering. The other section of this subject will explore Einstein's Special Theory of Relativity and its role in explaining concepts such as motion, space, time and mass. Students completing this subject will be able to: # explain the physical basis behind Maxwell's equations and the basic principles of Einstein's theory of special relativity; # solve and analyse simple problems in electromagnetism by applying Maxwell's equations; and # apply the principle of special relativity to simple problems, including the analysis of collisions and other phenomena involving high-speed particles. In addition students will enhance their ability to: # participate effectively as part of a group in tutorials; and # plan effective work schedules and manage their time to meet the deadlines for submission of assessable work and prepare for tests and examinations. Content includes scalar and vector potentials; dielectric and magnetic materials: field vectors; boundary conditions; magnetic circuits; energy density of electric and magnetic fields; boundary value problems; and electromagnetic waves; inertial frames; Einstein's postulates; Lorentz transformations; modifications to kinematics and Newtonian mechanics; causality and the speed of light as the limiting speed; four-vector formulation; high energy collisions; experimental tests; and introduction to the equivalence principle and general relativity.
Assessment:	Tests totalling up to 2 hours and assignments totalling up to an equivalent of 3000 words during the semester (20%); a 3-hour written examination in the examination period (80%).
Prescribed Texts:	Classical Electromagnetism (R H Good), Saunders Spacetime Physics (E F Taylor and J A Wheeler), 2nd edn, Freeman

Breadth Options:	This subject is a level 2 or level 3 subject and is not available to new generation degree students as a breadth option in 2008. This subject or an equivalent will be available as breadth in the future. Breadth subjects are currently being developed and these existing subject details can be used as guide to the type of options that might be available. 2009 subjects to be offered as breadth will be finalised before re-enrolment for 2009 starts in early October.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Notes:	This subject is available for science credit to students enrolled in the BSc (pre-2008 degree only), BASc or a combined BSc course.