640-611 Quantum Field Theory

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2009, This subject commences in the following study period/s: Semester 1, - Taught on campus.
Time Commitment:	Contact Hours: 36 hours comprising 3 one-hour lectures/week Total Time Commitment: Not available
Prerequisites:	A third-year subject in quantum mechanics equivalent to 640-321 Quantum Mechanics (Advanced) or 640-341 Quantum Mechanics. A third-year subject in electrodynamics equivalent to 640-323 Electrodynamics (Advanced) or 640-343 Electrodynamics (can be taken concurrently) or 640-383 Electrodynamics; 640-610 Quantum Mechanics (usually to be taken concurrently).
Corequisites:	None
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 participation are encouraged to discuss this with the subject coordinator and the Disability Liaison Unit.
Coordinator:	Dr Nicole Bell
Subject Overview:	This subject introduces quantum field theory, the combination of quantum mechanics and relativity that explains the fundamental structure of matter and the physics of the early universe. The course has an emphasis on quantum electrodynamics. Specific topics will include an introduction to classical field theory, the Euler-Lagrange equations and Noether’s theorem; the Dirac and Klein-Gordon equations; the quantisation of free scalar, Dirac and vector fields; covariant perturbation theory, the Smatrix and Feynman diagrams; the computation of elementary processes in quantum electrodynamics.
Objectives:	The objectives of this subject are: # to introduce the basic ideas of quantum field theory; # to understand how quantum mechanics and special relativity combine to produce realistic theories of particle creation and annihilation; # to develop calculational techniques to at least the level of tree-level Feynman diagrams for quantum electrodynamics; # to provide the foundation for more advanced studies in quantum field theory.
Assessment:	Two assignments totalling up to 36 pages of written work (20%), one due mid-semester and the other late-semester, plus a 4-hour end-of-semester written examination (80%).
Prescribed Texts:	Nil.
Recommended Texts:	Nil.
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	At the completion of this subject, students should have gained the ability to:

	# analyse a problem by applying fundamental laws in a sophisticated context; # apply abstract concepts to real-world situations; # solve relatively complicated problems using approximations; # participate as an effective member of a group in discussions and collaborative assignments; # manage time effectively in order to be prepared for group discussions and undertake the assignments and exam.
Related Majors/Minors/ Specialisations:	R05 RP Master of Science - Physics