PHYC20012 Quantum and Thermal Physics

Credit Points:	12.5
Level:	2 (Undergraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 48 hours comprising 36 hours of lectures and 12 hours of tutorials. Total Time Commitment: 170 Hours
Prerequisites:	One of:

Subject	Study Period Commencement:	Credit Points:
PHYC10001 Physics 1: Advanced	Semester 1	12.5
PHYC10003 Physics 1	Semester 1	12.5
PHYC10005 Physics 1: Fundamentals	Semester 1	12.5

And one of:

Subject	Study Period Commencement:	Credit Points:
PHYC10002 Physics 2: Advanced	Semester 2	12.5
PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.5
PHYC10006 Physics 2: Life Sciences & Environment	Semester 2	12.5

And one of:

Subject	Study Period Commencement:	Credit Points:
MAST10006 Calculus 2	Semester 1, Semester 2	12.5
MAST10009 Accelerated Mathematics 2	Semester 2	12.5

And one of (may be taken concurrently):

Subject	Study Period Commencement:	Credit Points:
MAST10007 Linear Algebra	Summer Term, Semester 1, Semester 2	12.5
MAST10008 Accelerated Mathematics 1	Semester 1	12.5

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 Jeffrey Mccallum, Prof David Jamieson
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Subject Overview:	This subject surveys the foundations of Thermal Physics and Classical Mechanics and develops the fundamental principles of Quantum Mechanics. Topics in Thermal Physics include the kinetic theory of gases, the classical laws of thermodynamics, temperature, work, heat, chemical thermodynamics and chemical potential, heat engines, refrigerators, Gibbs and Helmholtz free energies and phase changes. Topics in Classical Mechanics include a review of Newton's Laws, the Principle of Least Action, Lagrange's equations, Hamilton's equations and the Legendre transform. These principles will be illustrated by application to the simple harmonic oscillator. Topics in Quantum Physics include the inadequacies of Classical Physics, matter waves and quantum behaviour, one-dimensional quantum systems, expectation values, observables, operators, quantum tunnelling, and the quantization of three-dimensional systems.
Learning Outcomes:	To challenge students to expand their knowledge of the fundamental physical principles that underpin the behaviour of matter from microscopic to macroscopic length scales and to develop their capacity to: # discuss the key observations and events that led to the development of quantum mechanics from a foundation of thermal physics and classical mechanics; # discuss the fundamental principles of quantum mechanics and the critical aspects of quantum theory that distinguish it from the classical theories of thermodynamics and mechanics; # apply the principles of thermal, classical and quantum physics to the analysis of simple physical, chemical or mechanical problems.
Assessment:	Three written assignments requiring a total of up to twenty-four hours of work outside class time during the semester to be submitted and assessed early, mid and late semester (30%, 10% for each assignment). A three hour written examination during the examination period (70%).
Prescribed Texts:	Serway, Moses and Moyer, Modern Physics 3rd Ed. Brooks/Cole-Thomson Learning, 2005 D V Schroeder, An Introduction to Thermal Physics, Addison-Wesley Longman.
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; # Describe the experimental and observational basis of the physical principles presented in the subject, both in writing and orally; # Participate as an effective member of a group in tutorial discussions and study groups; # Think independently and analytically and direct his or her own learning;

	# Manage time effectively in order to be prepared for regular tutorial classes, tests, the examination and to complete assignments.
Related Majors/Minors/ Specialisations:	Physics Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED