OPTO10002 Optics: From Rainbows to Digital Imaging

Credit Points:	12.50
Level:	1 (Undergraduate)
Dates & Locations:	2011, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus. Lectures, tutorials, practical classes and multimedia classes.
Time Commitment:	Contact Hours: 30 x one hour lectures, 6 x one hour tutorials, 6 x three hour practical classes and 12 x one hour multimedia classes during the semester Total Time Commitment: Estimated total time commitment of 120 hours
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	None
Non Allowed Subjects:	Students may only gain credit for one of # OPTO10002 Optics: From Rainbows to Digital Imaging # 655-101 Optical Systems (prior to 2003) # 655-102 Optical Systems (prior to 2004) # 655-202 Optical Systems (prior to 2006).
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. This subject requires all students to actively and safely participate in laboratory activities. 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 Larry Abel
Contact:	**Email: label@unimelb.edu.au (mailto:label@unimelb.edu.au)**
Subject Overview:	This subject introduces students to the concept of light as waves of electromagnetic energy radiation; how it is generated and measured, how this energy propagates through space over time, and how optical elements are used to bend and otherwise manipulate light to achieve important real-world applications. Students will have the opportunity to gain appreciation of light transmission through optical fibres, leading to a discourse covering the field of optical communications. The fundamentals of light refraction and optical systems will be introduced and developed in lectures and by interactive web-based multimedia modules. By participating in the laboratory exercises, students will be offered the opportunity to gain practical skills and a solid understanding of optical imaging which forms the basis of modern digital camera systems. Digital image capture and image compression technologies will be covered, as will both old and new display technologies including virtual reality systems using LCD and plasma screens. The subject covers the latest approaches to high resolution imaging problems including the use of confocal microscopy systems for 3D imaging of biological samples. The fast-growing field of adaptive optics is introduced in the context of improving astronomical telescope observation and also as the latest technologies to correct the eye's optical imperfections, including modern contact lens design and laser-surgical therapy approaches.
Objectives:	The aim of this subject is to introduce students to interesting topics of contemporary optical science, and provide them with the concepts and practical tools that are fundamental to a working knowledge in the field. The topics of light generation, refraction, imaging and digital image manipulation are introduced gradually, in interesting contexts using minimal mathematics - they stand alone but also provide the foundations on which to build knowledge in advanced subjects.

Assessment:	Six practical assignments due during semester (20%); two multiple-choice tests, held mid and late semester, of 30 minutes each (7.5% each); a 3-hour written examination in the examination period (65%).
Prescribed Texts:	None
Recommended Texts:	# G Smith and D A Atchison, *The Eye and Visual Optical Instruments*. Cambridge University Press, 1997. # M H Freeman and C C Hull, *Optics*. Butterworth-Heinemann (ed. 11), 2004. # D S Falk, D R Brill and D G Stork, *Seeing the Light: optics in nature, photography, color, vision, and holography*. Harper & Row, New York, 1986.
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/2011/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2011/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2011/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2011/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:	Apart from learning specific skills as applicable to optical processes, students will be exposed to processes of critical thinking about how scientific problems are approached and solved. Set assignments require students to explore diverse avenues of information collection including internet and library resources, and to synthesise this information in a scientific manner. The practical tasks provide students opportunity to work collaboratively with fellow students, under time constraints that develop and challenge students time and resource management skills.
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 Course(s):	Bachelor of Optometry Bachelor of Science
Related Majors/Minors/ Specialisations:	Science credit subjects* for pre-2008 BSc, BASc and combined degree science courses