

MCEN30017 Mechanics & Materials

Credit Points:	12.5									
Level:	3 (Undergraduate)									
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.									
Time Commitment:	Contact Hours: 36 hours of lectures, 12 hours of tutorials and 12 hours of workshops. Total Time Commitment: 170 hours									
Prerequisites:	<p>Postgraduate students:</p> <ul style="list-style-type: none"> # Enrolment in the MC-ENG Master of Engineering (Mechanical), (Mechanical with Business) or (Mechatronics) <p>Undergraduate students:</p> <table border="1" data-bbox="387 685 1485 864"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>ENGR20004 Engineering Mechanics</td> <td>Summer Term, Semester 1, Semester 2</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	ENGR20004 Engineering Mechanics	Summer Term, Semester 1, Semester 2	12.50			
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ENGR20004 Engineering Mechanics	Summer Term, Semester 1, Semester 2	12.50								
Corequisites:	None									
Recommended Background Knowledge:	<p>It is recommended that the following subjects have been completed (or equivalent):</p> <table border="1" data-bbox="387 999 1485 1205"> <thead> <tr> <th>Subject</th> <th>Study Period Commencement:</th> <th>Credit Points:</th> </tr> </thead> <tbody> <tr> <td>PHYC10003 Physics 1</td> <td>Semester 1</td> <td>12.50</td> </tr> <tr> <td>PHYC10004 Physics 2: Physical Science & Technology</td> <td>Semester 2</td> <td>12.50</td> </tr> </tbody> </table>	Subject	Study Period Commencement:	Credit Points:	PHYC10003 Physics 1	Semester 1	12.50	PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.50
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PHYC10004 Physics 2: Physical Science & Technology	Semester 2	12.50								
Non Allowed Subjects:	None									
Core Participation Requirements:	<p><p>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.</p> <p>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></p>									
Coordinator:	Assoc Prof Jason Monty									
Contact:	Email: montyjp@unimelb.edu.au (mailto:montyjp@unimelb.edu.au)									
Subject Overview:	<p>AIMS</p> <p>This subject consists of three distinct and fundamentally related topics -</p> <ul style="list-style-type: none"> # An introduction to the fundamentals of materials science will be given on atomic structure and bonding, crystal structures and defects, elastic and plastic deformation, dislocations and strengthening and failed (fast fracture, fatigue and creep) # The mechanics of materials section will extend the concepts of material mechanical behaviour by detailing elastic/inelastic behaviour and introducing the concepts of stress and strain analysis. Topics covered may include the definition of principal stresses, plane 									

	<p>stress, plane strain, two-dimensional stress and strain analysis, torsion, pure bending, transverse loading, Mohr's circle, failure criteria, inelastic behaviour, residual stress</p> <p># This subject will also provide an introduction to finite element analysis (FEA) and its application for stress-strain analysis. Particular emphasis will be placed on the fundamental mechanisms by which materials fail under loading.</p> <p>INDICATIVE CONTENT</p> <p># Mechanics: the definition of principal stresses, plane stress, plane strain, two-dimensional stress and strain analysis, torsion, pure bending, transverse loading, Mohr's circle, failure criteria, inelastic behaviour, residual stress.</p> <p># Materials: atomic structure and bonding, crystal structures and defects, elastic and plastic deformation, dislocations and strengthening and failure (fast fracture, fatigue and creep).</p> <p># Finite element analysis (FEA): FEA procedure, application of FEA to discrete systems and continuous bodies.</p>
<p>Learning Outcomes:</p>	<p>INTENDED LEARNING OUTCOMES (ILOs)</p> <p>Having completed this subject the student is expected to be able to:</p> <ol style="list-style-type: none"> 1 Perform basic stress and strain analysis 2 Analyse mechanical behaviour of materials 3 Obtain simple mathematical and physical relationships between mechanics and materials 4 Describe various testing techniques for characterisation of mechanical behaviour of materials 5 Use the finite element method for performing a computer-based stress and strain analysis.
<p>Assessment:</p>	<p>One three-hour end of semester written examination (60%), assesses Intended Learning Outcomes (ILOs) 1 to 4. Attendance and participation in materials labs and submission of written assignments (15% total), weeks 3 and 5. ILOs 1 and 2 are addressed with the lab sessions. Attendance and participation in Finite Element Analysis (FEA) workshops, and one written assignment approximately 15 pages (20%). ILO 5 is addressed with these workshops sessions. One in class written test (FEA) (5%).</p>
<p>Prescribed Texts:</p>	<p>Callister WD Jr, Materials Science and Engineering.</p>
<p>Breadth Options:</p>	<p>This subject potentially can be taken as a breadth subject component for the following courses:</p> <p># Bachelor of Arts (https://handbook.unimelb.edu.au/view/2016/B-ARTS)</p> <p># Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2016/B-COM)</p> <p># Bachelor of Music (https://handbook.unimelb.edu.au/view/2016/B-MUS)</p> <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>
<p>Fees Information:</p>	<p>Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees</p>
<p>Generic Skills:</p>	<p>On completion of this subject, students should have developed the following generic skills -</p> <ul style="list-style-type: none"> • Ability to apply knowledge of science and engineering fundamentals • Ability to undertake problem identification, formulation, and solution • Ability to utilise a systems approach to complex problems and to design and operational performance • Ability to communicate effectively, with the engineering team and with the community at large
<p>Notes:</p>	<p>LEARNING AND TEACHING METHODS</p> <p>The subject is delivered through a combination of lectures, tutorials and laboratories. For e-learning, the lectures are recorded and made available to students through the University's online learning system.</p> <p>INDICATIVE KEY LEARNING RESOURCES</p> <p>A.P. Boresi and R. J. Schmidt, <i>Advanced Mechanics of Materials</i>.</p> <p>W. D. Callister, Jr., <i>Materials Science and Engineering - an Introduction</i>.</p>

	<i>Lecture Notes on LMS.</i>
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream Master of Engineering (Mechanical with Business) Master of Engineering (Mechanical) Master of Engineering (Mechatronics) Mechanical Systems Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED