ENGR20003 Engineering Materials

Credit Points:	12.5
Level:	2 (Undergraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 50 hours (Lectures: 3 hours per week; Tutorials: 12 hours per semester; Laboratory Session: 2 hours per semester) Total Time Commitment: 170 hours
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	Learning in this subject will be assisted by completion of **ONE** of the following subjects: For Bachelor of Science and Bachelor of Commerce students: **Subject** | **Study Period Commencement:** | **Credit Points:** ENGR10003 Engineering Systems Design 2 | Summer Term, Semester 2 | 12.50 For Bachelor of Environments students: From 2013 **Subject** | **Study Period Commencement:** | **Credit Points:** ENVS10009 Structural Environments | Semester 2 | 12.50 Or pre 2013 ENVS10003 Constructing Environments.
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
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Subject Overview:	**AIMS** The subject aims to provide knowledge about construction materials, their properties, manufacturing processes and key issues associated with their applications in structural engineering. The subject also introduces the relationships between the structure of a material and its properties.

	This subject must be taken early in the progression of training to be an engineer as it is a prerequisite of structural design subjects, and contributes valuable insights into the role of materials in other disciplines of engineering such as geotechnical engineering. It partners with ENGR20004 Engineering Mechanics to build a student's understanding of the way objects behave when load or deformations are applied to them. **INDICATIVE CONTENT** The subject is divided into three components: materials science; construction materials; and, mechanics of materials. In the material science component; basic concepts on inter-atomic bonding, microstructure of solids and generic material properties related to density, deformation, yield, ductility, fracture, toughness, susceptibility to corrosion and fatigue are introduced. In the construction materials component; the engineering applications of structural and light-gauge steel, concrete, masonry, timber, glass, fibre-glass and composites are covered. In the mechanics component; the basic concepts of stress-strain compatibility, composite actions, the concept of shear stress flow, basic two-dimensional stress analysis, strength and ductility and arching actions are covered.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO) / SUBJECT OBJECTIVES** On completion of this subject the student is expected to: 1 Describe atomic and crystalline structures, molecular composition and its influence on the physical properties of materials 2 Describe and interpret the phenomena of strength, deformation, ductility, failure mechanisms, fast fracture and fatigue as applied generically to all materials and be able to identify the key engineering implications with these phenomena 3 Describe the key features in the manufacturing/production, quality control, engineering applications, performance and safety issues associated with the commonly used engineering materials including steel, concrete, masonry, timber, polymers and composites, and be able to identify their engineering implications 4 Apply the concepts of stress-strain compatibility and complimentary shear stresses in achieving composite actions; identify realistic failure mechanisms in structures and make effective use of strength and ductility in engineering applications 5 Identify key considerations including those of costs, practicality, sustainability and the environment, health and safety in making engineering decisions on the choice and application of materials.
Assessment:	One 2-hour examination (70%) end of semester. Intended Learning Outcomes (ILOs) 1 to 5 are addressed in the examination One 50-minute test, mid-semester primarily to provide formative feedback (10%). ILO 4 is addressed in the mid semester test Two assignments totalling 2400 words, due mid and late semester (20%), requiring approximately 20-25 hours of work. ILO 1 is addressed in assignment 1. ILOs 2, 3 and 5 are addressed in assignment 2.
Prescribed Texts:	None
Recommended Texts:	# W.D. Callister Jr. Materials Science and Engineering: An Introduction. Wiley and Sons Inc. # D.R. Askeland. The Science and Engineering of Materials. Chapman & Hall # M.F. Ashby & D.R.H. Jones. Engineering Materials 1 & 2.
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:	# Ability to apply knowledge of science and engineering fundamentals # Ability to undertake problem identification, formulation, and solution # Understanding of social, cultural, global, and environmental responsibilities and the need to employ principles of sustainable development.

Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. In addition, students will undertake exercises to reinforce materials covered in the lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture slides and recommended reading materials. The subject LMS site also contains worked solutions for all tutorial problems. **CAREERS / INDUSTRY LINKS** Representatives of Galvanizers Association of Australia and other industry specialists will contribute to the teaching of the subject. Note: This subject is available for science credit to students enrolled in the BSc.
Related Course(s):	Master of Architectural Engineering
Related Majors/Minors/ Specialisations:	B-ENG Civil Engineering stream Civil (Engineering) Systems major Engineering Systems Environmental Engineering Systems major Environments Discipline subjects Master of Engineering (Civil with Business) Master of Engineering (Civil) Master of Engineering (Environmental) Master of Engineering (Structural) Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED