CVEN90026 Extreme Loading of Structures

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	This subject is not offered in 2014.
Time Commitment:	Contact Hours: 48 hours, comprising of four hours of lectures/practical classes per week Total Time Commitment: 200 hours
Prerequisites:	# Admission to Master of Engineering (Structural Engineering) OR # Admission to Master of Engineering (Civil Engineering) OR # Admission to Master of Engineering Structures
Corequisites:	None
Recommended Background Knowledge:	Learning will be assisted by knowledge gained in the following subject:

Subject	Study Period Commencement:	Credit Points:
CVEN90049 Structural Theory and Design 2	Semester 1	12.50

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
Contact:	Associate Professor Nelson Lam **ntkl@unimelb.edu.au (mailto:ntkl@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject is aimed at teaching the scientific principles associated with extreme events including that of earthquakes, impact, blast and cyclonic wind and their effects on a structure. Students will also be trained to make effective use of state-of-the-art techniques in quantifying the effects of the design actions in order that suitable level of protection can be incorporated into the structure to counter an extreme event. At the conclusion of this subject students should be capable of modelling a variety of extreme loadings by employing advanced techniques. Students will also be able to apply the modelling methodologies to fulfil performance based design objectives. Improved proficiencies in countering extreme loading in the design of structures will achieve better economy and a more sustainable built environment. This subject builds on students' fundamental knowledge of engineering mathematics, mechanics and structural analysis. With frequency of extreme events increasing due to climate change, increased mass and speed of vehicles and terrorism, this subject provides graduates with specialist knowledge to work in the field of hazard reduction or avoidance under the guidance of a chartered engineer. **INDICATIVE CONTENT** Topics covered include Rayleigh Method for developing a simplified model of a structural element, hand calculation techniques for analysing the impact action of a solid object based on linear elastic and elasto-plastic behaviour of the structure, considerations for the conditions of contact and anomalies associated with contributions by the higher modes. Another major topic to be covered is the capacity spectrum method involving linear, or non-linear, static analysis for the assessment of a building structure subject to seismic actions. Other topics include the

	analysis of blast actions by hand calculations and phenomena associated with the aerodynamic actions of wind.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** Having completed this subject the student is expected to: 1 Demonstrate the ability to describe the effects of a range of extreme transient actions (including earthquake ground shaking, accidental impact, blast and strong wind) on a structure and their implications on structural design. 2 Use hand calculation methods to estimate the effects of the listed extreme transient actions and be able to correctly interpret results and identify their limitations. 3 Apply numerical techniques with the use of EXCEL spreadsheets as a generic tool to model the effects of transient actions on a building structure for benchmarking results generated from a commercial computational package. 4 Assess the output to these models to inform the design process for safety and serviceability, and apply the learnt analysis techniques to ensure compliance with performance based design criteria.
Assessment:	Two assignments, due in week 8 and late semester, each of no more than 1500 words (15% each). Assignment 1 assesses Intended Learning Outcome (ILO) 2, Assignment 2 assesses ILOs 3 and 4 One thirty minutes quiz in week 7 (5%). Assesses ILOs 1 and 2 A written three hour end-of-semester examination (65%). Assesses ILOs 1 and 2
Prescribed Texts:	None
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:	# 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 # Proficiency in engineering design # Capacity for creativity and innovation # Understanding of professional and ethical responsibilities, and a commitment to them
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. In addition, students will undertake miniature experiments to reinforce materials covered in the lectures and also a design exercise which involves applying the learnt techniques in solving problems that are likely to be encountered in practice. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture slides, recommended reading materials including selected journal publications and EXCEL spreadsheets showing examples of numerical simulations. **CAREERS / INDUSTRY LINKS** Representatives from the Victorian Division of the Institution of Structural Engineers will contribute to the teaching of the subject. In addition, a practising specialist in the field of aero-dynamics will also contribute to the teaching of the subject and give advice on the assignment exercises.
Related Course(s):	Master of Engineering Structures Master of Engineering Structures Master of Philosophy - Engineering Ph.D.- Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Civil) Master of Engineering (Structural)