CVEN90017 Earthquake Resistant Design of Buildings

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
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 (Lectures: 30 hours per semester; Workshops and Tutorials: 18 hours per semester) Total Time Commitment: 200 hours
Prerequisites:	Admission into the MC-ENG Master of Engineering **or** 746ST Master of Engineering Structures **OR**

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

Corequisites:	None
Recommended Background Knowledge:	Knowledge gained in the following subject will assist in learning:

Subject	Study Period Commencement:	Credit Points:
CVEN90026 Extreme Loading of Structures	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
Coordinator:	Assoc Prof Helen Goldsworthy
Contact:	Associate Professor Helen Goldsworthy **helenmg@unimelb.edu.au (mailto:helenmg@unimelb.edu.au)**
Subject Overview:	**AIMS** This subject introduces the fundamental concepts and practice of earthquake resistant design of buildings from an international perspective, incorporating consideration of design in regions of low to moderate seismicity such as Australia and in regions of high seismicity. The design of economically and environmentally feasible structures that can successfully withstand the forces and displacements generated by severe ground motions is a challenge demanding the best in structural engineering art and science. This subject builds on knowledge of Risk Analysis, Engineering Mathematics, Dynamics, and Structural Theory and Design to allow candidates to work as a supervised graduate engineer in this specialised area of practice. **INDICATIVE CONTENT**

	Topics covered include plate tectonics and seismicity, structural response to earthquake ground motions, design philosophy and design applications to buildings, assessment and retrofitting of existing buildings, and performance of non-structural components and building contents.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1 Describe seismicity of the world and the role of plate tectonics 2 Accurately interpret response spectra presented in the different formats including the Acceleration-Displacement Response Spectrum (ADRS) diagram for quantifying potential seismic hazards on infrastructure 3 Accurately interpret performance limit states 4 Undertake seismic design and assessment of building structures using both the force-based methods and displacement-based methods including the Capacity Response Spectrum Method and the Substitute-Structure Method. The implementation of measures to improve environmental sustainability will be discussed in relation to design 5 Employ capacity design principles and the concept of strength hierarchies to ensure that the structure responds to an earthquake in the desirable way. Apply this concept to the design of a range of structural systems for buildings including moment resisting frames of reinforced concrete, steel and composite construction, reinforced concrete structural walls, and concentric or eccentrically braced steel frames 6 Select and apply the appropriate energy dissipation or base-isolation device for mitigating seismically induced damage to a building 7 Predict damage to un-reinforced masonry buildings and identify the vulnerable features 8 Assess existing building structures and provide plans for their effective retrofitting 9 Assess seismic performance of vulnerable buildings and components in regions of low and moderate seismicity taking into account the effects of soil resonance and identify effective means of retrofitting 10 Assess seismic performance of non-structural components and building contents and identify effective measures to mitigate potential damage.
Assessment:	Two assignments and a mid-semester test, due in approximately weeks 5, 8 and 11 One individual assignment (10%) approximately 1000 word, requiring approximately 10-13 hours work. Intended Learning Outcomes (ILOs) 2 and 9 are addressed in this assignment One 50 minute test (10%). ILOs 1, 3 to 6 are addressed in the test One assignment (10%) students will work in a team of 2/4 students. Approximately 2000 words, each member committing to approximately 10-13 hours of work. ILOs 3, 4 and 5 are addressed in this assignment One 3-hour written, closed book, end of semester, examination (70%). ILOs 1 - 10 are addressed in this exam. Hurdle Requirement: A pass in the end of semester examination is required to pass the subject
Prescribed Texts:	None
Recommended Texts:	M.J.N. Priestley, G.M. Calvi & M.J Kowalsky 2007 *Displacement-based Seismic Design of Structures* IUSS Press
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 commitment to them # Capacity for lifelong learning and professional development.
Notes:	**LEARNING AND TEACHING METHODS**

	Lectures are used to convey basic information and design concepts. Lectures are supplemented with embedded tutorials and with workshop problems, all of which reinforce the students' understanding of basic design principles. **INDICATIVE KEY LEARNING RESOURCES** Recommended text: Priestley, M.J.N., Calvi, G.M., and Kowalsky, M.J., Displacement-Based Seismic Design of Structures, IUSS Press, 2007 FEMA Guidelines Australian Standard: Standards Australia, AS1170.4, Minimum Design Actions, Part 4: Earthquake Loads **CAREERS / INDUSTRY LINKS** Guest lecture by a professional seismologist. Students access seismic records, design standards and guidelines that are the basis of industry practice.
Related Course(s):	Doctor of Philosophy - Engineering Master of Engineering Structures Master of Philosophy - Engineering
Related Majors/Minors/ Specialisations:	Master of Engineering (Civil) Master of Engineering (Structural)