CVEN90018 Structural Dynamics and Modelling

Credit Points:	12.50
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2010, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 3 hours of lectures/week. 12 hours of workshops/semester. Total 48 hours Total Time Commitment: 120 hours per semester
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	# 421-679 Advanced Structural Analysis commences 2011 OR # 421-503 Structural Theory and Design 2 commences 2011 OR **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 Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry. The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/
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Subject Overview:	This subject introduces students to the fundamental concepts of structural dynamics and finite element modelling and teaches students the basic skills of undertaking structural analysis in a practical engineering context. Topics covered include: introduction to finite element formulations for in-plane (membrane) stress analysis, three-dimensional stress and plate bending stress; use of finite element modelling packages; the response analyses of single-degree-of-freedom systems, discrete multi-degree-of-freedom systems and distributed mass (continuous) systems in conditions of natural vibrations and forced excitations; numerical time-step integration techniques; excitation simulation techniques, simultaneous equation solution and reduction techniques; optimal modelling techniques, frequency domain analyses and processing of time-series data. Skills acquired from the various topics outlined above will be integrated and applied to a number of case studies.
Objectives:	At the end of this subject students should be able to # Implement the modelling of the response of single-degree-of-freedom (SDOF) systems to pulse and harmonic excitations

	# Describe and apply the concepts of viscous damping, hysteretic damping, coulomb damping (by friction) and equivalent damping # Implement time domain simulations of time histories of elastic responses # Implement the modelling of the response of discrete lumped mass multi-degree-of-freedom (SDOF) systems involving the use of the participation factor, effective modal mass and modal coefficients based on the principles of modal superposition # Implement the Rayleigh method in the dynamic analysis of structural systems with distributed mass # Obtain classical solutions for the dynamic response behaviour of single-degree-of-freedom (SDOF) systems based on harmonic excitations and common idealised forms of transient excitations # Implement on spreadsheets time-step integration procedures for analysing the response of SDOF systems to a range of transient excitations including earthquake excitations, and collation of the response output to produce elastic response spectra of different formats # Implement the synthesis of excitation time series including artificial accelerograms using existing software and seismological models, taking into account filtering effects of the soil medium and secondary linear systems # Implement on spreadsheets the response analyses of simple discrete MDOF systems using principles of modal superposition # Use finite element modelling packages to perform dynamic response analysis to a variety of dynamic loading options # Use finite element modelling packages to perform dynamic mode identification of principal modes of vibration of a variety of modelled structural systems # Transform data from time-domain to frequency domain in the form of Fourier Amplitude/ Phase spectra and Power spectra, and apply linear transformation # Describe experimental modal analysis and its application in engineering practices
Assessment:	One three hour end of semester examination (70%)2 x 1000 word assignments, the first due in week 8, the second due towards the end of semester (30%)
Prescribed Texts:	None
Recommended Texts:	Dynamics of Structures Anil Chopra
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 # Ability to conduct an engineering project # Ability to communicate effectively, with the engineering team and with the community at large # Understanding of professional and ethical responsibilities, and commitment to them # Capacity for lifelong learning and professional development
Related Course(s):	Graduate Certificate in Engineering (Environmental Engineering) Master of Engineering Structures Master of Engineering Structures Postgraduate Certificate in Engineering