421-614 Structural Dynamics and Modelling

Credit Points:	12.500
Level:	Graduate/Postgraduate
Dates & Locations:	2008, This subject commences in the following study period/s: Semester 2, - Taught on campus.
Time Commitment:	Contact Hours: 36 hours; Non-contact time commitment: 120 hours Total Time Commitment: Not available
Prerequisites:	None
Corequisites:	None
Recommended Background Knowledge:	None
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:	Helen Goldsworthy
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: finite element formulations for in-plane (membrane) stress analysis, three-dimensional stress and plate bending stress; introduction to 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.
Assessment:	One 3-hour written exam (70%) and two written assignments of 1,000 words each (2 x 15%). The two assignments are due at the end of weeks 8 and 14 respectively.
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:	On successful completion, students will be able to: # estimate the basic dynamic properties of discrete multi-degree-of-freedom (MDOF) systems or distributed mass systems using the eigen solution approach or Rayleigh method as appropriate; # 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; # transform data from time-domain to frequency domain in the form of Fourier Amplitude/ Phase spectra and Power spectra, and apply linear transformation; # select the appropriate form of structural analysis model at varying levels of complexity to suit different modelling objectives; # use finite element modelling packages to perform linear static analyses of plane stress/ plane strain problems, plate bending, and three-dimensional solid body stress analyses, and combinations thereof; # use finite element modelling packages to perform dynamic mode identification of principal modes of vibration of a variety of modelled structural systems; # use finite element modelling packages to perform dynamic response analysis to a variety of dynamic loading options.
Related Course(s):	Master of Engineering Structures