MCEN90009 Dynamics of Machines

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2015, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures, 12 hours of tutorials Total Time Commitment: 200 hours
Prerequisites:	

Subject	Study Period Commencement:	Credit Points:
MCEN30016 Mechanical Dynamics	Semester 1	12.50

Corequisites:	None
Recommended Background Knowledge:	NA
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
Coordinator:	Assoc Prof Denny Oetomo
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Subject Overview:	**AIMS** The subject aims to provide the understanding of rigid body dynamics, extending from the pre-requisite subject: MCEN30016 Mechanical Dynamics. The study will concentrate on the continuous motion as well as collision of rigid bodies (impact). Kinematics of rigid bodies will be discussed with focus on the deeper understanding of constraints, degrees of freedom, generalised coordinates, absolute velocities in different reference frames. Kinetics will extend the understanding of Newton-Euler approach in multi-body mechanisms and the concepts of Virtual Work and Virtual Displacement, kinetic energy function, potential energy function, leading to the introduction of the Lagrange Equation for the derivation of the equation of motion. Collision of rigid bodies is modelled using the Impulse Momentum Principal. **INDICATIVE CONTENT** # Kinematics: Constraints, mobility, generalised coordinates, degrees of freedom. Multi-body Newton Euler approach. # Analytical Mechanics: virtual work, virtual displacement, generalised force, impressed forces and constraint forces, kinetic and potential energies, Lagrange equations of motion, kinetic energy function, potential energy function. # State-space representation of mechanical dynamics: Equation of Perturbation, Stability of systems at equilibrium points. # Numerical techniques: solution of mathematical models. # Collisions of unconstrained and constrained rigid bodies.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILOs)** Having completed this unit the student is expected to be able to:

	1 Formulate physical and mathematical models for three-dimensional dynamic analysis of mechanical systems 2 Solve the mathematical models by means of analytical and numerical methods and assess stability of their solutions 3 Gain fundamental understanding of momentum and energy based derivation of dynamics equations governing the motion of mechanical systems.
Assessment:	• Four written assignments (10% each), each requiring 10 - 13 hours of work.• One 3-hour end-of-semester examination (60%) Hurdle requirement: Students will need a mark of at least 50% in the exam to pass this subject. All assessments are associated with Intended Learning Outcomes 1-3.
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 completion of the subject students should have the following 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 # Ability to communicate effectively, with the engineering team and with the community at large # Capacity for lifelong learning and professional development.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. Students will also complete four assignments which will reinforce the material covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture notes and lecture slides. The subject LMS site also contains worked solutions for all the tutorials, while assignment problems will be discussed in the lecture after submission.
Related Majors/Minors/ Specialisations:	B-ENG Mechanical Engineering stream Master of Engineering (Mechanical with Business) Master of Engineering (Mechanical) Master of Engineering (Mechatronics)