MCEN30016 Mechanical Dynamics

Credit Points:	12.5
Level:	3 (Undergraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 1, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 36 hours of lectures, up to 12 hours of tutorials and 4 hours of laboratory sessions. Total Time Commitment: 170 hours
Prerequisites:	**Postgraduate students:** Admission into the MC-ENG Master of Engineering (Mechanical) (Mechanical with Business) or (Mechatronics). **Undergraduate students:**

Subject	Study Period Commencement:	Credit Points:
ENGR20004 Engineering Mechanics	Summer Term, Semester 1, Semester 2	12.50

AND either

Subject	Study Period Commencement:	Credit Points:
MAST20029 Engineering Mathematics	Summer Term, Semester 1, Semester 2	12.50

OR

both of the following subjects

Subject	Study Period Commencement:	Credit Points:
MAST20009 Vector Calculus	Semester 1, Semester 2	12.50
MAST20030 Differential Equations	Semester 2	12.50

Corequisites:	Note: MAST20030 Differential Equations may be taken concurrently.

Recommended Background Knowledge:

Subject	Study Period Commencement:	Credit Points:
PHYC10003 Physics 1	Semester 1	12.50
PHYC10004 Physics 2: Physical Science & Technology	Semester 2	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:	**AIMS** This subject is concerned with the three-dimensional dynamics of rigid bodies, and with the modelling of a variety of mechanical devices as linear time-invariant systems, and the calculation of their responses in the time and frequency domains. **INDICATIVE CONTENT** Electro-mechanical dynamics and modelling - # System analysis: Poles and zeros, Bode plots and 1st and 2nd order system responses # Modelling of mechanical, thermal, fluid and electrical systems # Vibrations # Generators and motors. Mechanical Dynamics and Modelling - # Non-inertial coordinate system (translational, rotational, general) # Directional cosines # Angular velocity (Coriolis statement) and angular acceleration in non-inertial frame # Velocity and acceleration of particle in non-inertial frame # Velocity and acceleration of a rigid body in non-inertial frame # Kinetics of system of particles and rigid body (revision) extended to 3D # Inertia tensor (in different non-inertial-frames) and principle axis # Parallel axis theorem.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILOs)** Having completed this subject the student is expected to have the skills to - 1 Derive mathematical models of mechanical and electro-mechanical systems 2 Perform basic system analysis of mechanical systems using tools in time and frequency domains 3 Derive equations of motion considering dynamics of rigid bodies in 3-D 4 Analyse vibrations of higher order systems.
Assessment:	Four written assignments (7.5% each), requiring approximately 7-10 hours of work each (30% in total) One 3 hour end of semester written examination (70%). All ILOs are addressed in the examination, assignments and practical sessions.
Prescribed Texts:	None
Breadth Options:	This subject potentially can be taken as a breadth subject component for the following courses: # **Bachelor of Arts (https://handbook.unimelb.edu.au/view/2016/B-ARTS)** # **Bachelor of Commerce (https://handbook.unimelb.edu.au/view/2016/B-COM)** # **Bachelor of Environments (https://handbook.unimelb.edu.au/view/2016/B-ENVS)** # **Bachelor of Music (https://handbook.unimelb.edu.au/view/2016/B-MUS)** You should visit **learn more about breadth subjects (http://breadth.unimelb.edu.au/breadth/info/index.html)** and read the breadth requirements for your degree, and should discuss your choice with your student adviser, before deciding on your subjects.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees
Generic Skills:	On completion of this subject, students should have developed the following skills -

	# The ability to apply knowledge of science and engineering fundamentals. # The ability to undertake problem identification, formulation, and solution. # The ability to utilise a systems approach to complex problems and to design and operational performance. # The ability to undertake problem identification, formulation, and solution.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures, tutorials, and labs that will feature discussion on subject materials, extended by student centred interactive activities in workshops. Students will also complete four assignments, which will reinforce the materials covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture slides. The subject LMS site also contains worked solutions for all tutorials and problems, while assignment problems will be discussed in the lecture after submission. **CAREERS / INDUSTRY LINKS** A one-hour long external presentation followed by questions and answer session is planned.
Related Majors/Minors/ Specialisations:	Science-credited subjects - new generation B-SCI and B-ENG. Selective subjects for B-BMED