School of Engineering

MECH2360: Dynamics of Machines

Singapore PSB

Trimester 2 - 2024 (Singapore)

COURSE OUTLINE

OVERVIEW

Course Description

This is a calculus based course on the dynamics of mechanical systems. The course covers classical mechanics of systems involving point masses and rigid bodies in 2 and 3 dimensional space.

Academic Progress Requirements

Nil

Assumed Knowledge

MATH1110 Mathematics for Engineering, Science and Technology 1, and
MATH1120 Mathematics for Engineering, Science and Technology 2

Contact Hours

Singapore PSB

Lecture
Face to Face On Campus
3 hour(s) per week(s) for 13 week(s) starting Week 1

Tutorial
Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1

Unit Weighting

10

Workload

Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Singapore PSB
Associate Professor Chris Wensrich
Christopher.Wensrich@newcastle.edu.au
+61 2 4921 6203
Consultation: By Email

Teaching Staff

Lecturer: Lim Chong Lye

School Office

School of Engineering (Callaghan)
SENG-ADMIN@newcastle.edu.au
+61 2 4921 5798

SYLLABUS

Course Content

- Kinematics and kinetics of point masses in Cartesian, normal/tangential, and polar coordinate systems
- Newton's laws of motion
- Friction
- Work and energy
- Conservative systems
- Impulse and momentum
- Kinematics and kinetics of planar rigid bodies (including momentum and energy methods)
- An introduction to three-dimensional rigid body mechanics (3D kinematics, moment of inertia tensors and Euler's equations)

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Demonstrate a fundamental understanding of the dynamics of point masses and planar rigid body systems.

2. Solve problems as related to the dynamics of point masses and planar rigid body systems.

3. Explain the issues involved in three-dimensional rigid body dynamics.

4. Prepare documentation in the form of an engineering report.

Course Materials

Lecture Materials:

- Powerpoint slides for the entire course and dedicated course notes will be available on Canvas.

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Quiz 1	Week 7	Individual	35%	1, 2
2	Quiz 2	Week 12	Individual	35%	1, 2, 3
3	Engineering Report	Week 13	Individual	30%	1, 2, 4

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Quiz 1

Assessment Type	Quiz
Description	A 2 hour in-class quiz covering material from the first half of the course (Part 1: Point masses)
Weighting	35%
Length	2 hours
Due Date	Week 7
Submission Method	In Class
Assessment Criteria	Marks for questions will be weighted according to time taken/steps involved. Part marks will be awarded for correct working even if final answer is incorrect.
Return Method	In Class
Feedback Provided	Returned Work.
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Quiz 2

Assessment Type	Quiz
Description	A 2 hour in-class quiz covering material from the second half of the course (Part 2: Rigid body mechanics)
Weighting	35%
Length	2 hours
Due Date	Week 12
Submission Method	In Class
Assessment Criteria	Marks for questions will be weighted according to time taken/steps involved. Part marks will be awarded for correct working even if final answer is incorrect.
Return Method	Specific Location
Feedback Provided	Returned Work
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Engineering Report

Assessment Type	Report
Description	Students are to prepare an in-depth engineering report on a dynamic system as described in an assignment handout available on Canvas.
Weighting	30%
Due Date	Week 13
Submission Method	Online Hand-in via Turnitin
Assessment Criteria	As per assessment guidelines on Canvas.
Return Method	Online
Feedback Provided	Online
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit	Good standard indicating a high level of knowledge and

	(C)	understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Face to Face: Communication will be provided via face to face meetings or supervision.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:
https://policies.newcastle.edu.au/document/view-current.php?id=236

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	X	X	X	2
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	X	X	X	2
8	2.2. Fluent application of engineering techniques, tools and resources.				
9	2.3. Application of systematic engineering synthesis and design processes.				
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	X	X	X	2
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	X	X	X	2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	X	X	X	2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.				
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				

This course outline was approved by the Head of School on 1st May 2024. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.