MECH2001

Engineering Dynamics

Session 2, In person-scheduled-weekday, North Ryde 2023

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit convener and Lecturer
Salman Jalalifar
salman.jalalifar@mq.edu.au
Contact via Email
3 Management Drive (3MD), Room 144
Tuesdays 2-3 PM & Wednesdays 11AM-12 PM

Credit points
10

Prerequisites
(MECH1001 or ENGG150 or ENGG1050) and (MATH1020 or MATH1025 or MATH136 or MATH133)

Corequisites

Co-badged status

Unit description
The unit examines Newton's laws in the context of engineering dynamics. The unit leads students to an understanding of Newton's laws as applied to the effect of force on solids in engineering. The unit initially examines the issues of work and energy, with a focus on impulse, momentum and impact. The unit assesses the roles of particle kinematics, particle kinetics, rigid body dynamics, plane kinematics and plane kinetics.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications

ULO2: Apply mathematical skills to solve engineering dynamics problems

ULO3: Build problem-solving skills for a range of real-world engineering dynamics applications

ULO4: Develop effective communication skills through written reports and group work

activity

General Assessment Information

Student Responsibilities

Be familiar with University policy and College procedures and act in accordance with those policies and procedures.

It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term.

The student is to perform the required due diligence for their assessment grade and rectify as soon as possible upon finding any errors.

Late Assessment Submission Penalty

From 1 July 2022, Students enrolled in Session-based units with written assessments will have the following university standard late penalty applied. Please see https://students.mq.edu.au/study/assessment-exams/assessments for more information.

Unless a Special Consideration request has been submitted and approved, **a 5% penalty (of the total possible mark)** will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at **11:55 pm**. A 1-hour grace period is provided to students who experience a technical concern.

For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for Special Consideration.

Practical Component

Attendance of practical classes is mandatory before submitting the lab report. Lab reports submitted without attending the practical session will get a grade of ‘0’ even if the assessment is submitted by the due date. A special consideration request must be submitted and approved if any student is unable to attend a practical session to organize alternative arrangements.

Resubmission option

Resubmission of any assessment task is not allowed under any circumstances.

Notifications

Formal notification of assessment tasks, grading rubrics, and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Report and Assignment Tasks

Assignment Problems will be posted on iLearn at least one week before their submission date. Assignment solutions will be posted within a week after the submission date. Submissions will not be accepted once the solution is posted.

Assignment submissions and plagiarism policies

All assignments and reports must be submitted electronically through iLearn (in pdf format). Submissions will undergo plagiarism checkers using the Turnitin software and any work deemed to have a 30% or higher similarity score may incur an academic penalty. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below.

Submissions are expected to be typed set in a logical layout and sequence. Markers WILL NOT grade poorly organized or illegible scans or drafts. The expected workload includes the preparation of final copies and clear diagrams.

Grading and passing requirements for unit

For further details about grading, please refer below to the policies and procedures section.

In order to pass this unit, a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

The unit will be graded according to the Macquarie University Grading policy. The following grades will be used according to the listed numerical range:

ASSESSMENT GRADES AND STATUS

GRADE	RANGE	STATUS ('Standard Grade' in AMIS)	DESCRIPTION
HD	85-100	Pass	Provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality, insight, or creativity in identifying, generating, and communicating competing arguments, perspectives or problem-solving approaches; critical evaluation of problems, their solutions, and their implications; creativity in the application as appropriate to the program.

D	75-84	Pass	Provides evidence of integration and evaluation of critical ideas, principles, and theories, distinctive insight, and ability in applying relevant skills and concepts in relation to learning outcomes. There is a demonstration of frequent originality or creativity in defining and analyzing issues or problems and providing solutions; and the use of means of communication appropriate to the program and the audience.
CR	65-74	Pass	Provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is a demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the program.
P	50-64	Pass	Provides sufficient evidence of the achievement of learning outcomes. There is a demonstration of understanding and application of fundamental concepts of the program; routine argumentation with acceptable justification; communication of information and ideas adequately in terms of the conventions of the program. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
F	0-49	Fail	Does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing, or lacking communication of ideas in ways that give little attention to the conventions of the program.

Final Examinations

Final examinations will typically take place at the end of the semester. For further information, please refer to the Examination Timetable website on www.mq.edu.au

If you receive special consideration for the final exam, a supplementary exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practice-based task on weekly tutorials	12%	No	Week 3, 5, 7, 9, 11, 13
Assignments	20%	No	Week 6 and Week 12
Lab report	18%	No	Week 9, 11, 13
Final Exam	50%	No	TBA

Practice-based task on weekly tutorials

Assessment Type [1]: Participatory task
Indicative Time on Task [2]: 15 hours
Due: **Week 3, 5, 7, 9, 11, 13**
Weighting: **12%**

Practice-based task every fortnight, six problems, 2 marks each

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem-solving skills for a range of real-world engineering dynamics applications

Assignments

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **Week 6 and Week 12**
Weighting: **20%**

Two assignments on problem-solving activity, 10% each.

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem-solving skills for a range of real-world engineering dynamics applications

Lab report

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 21 hours
Due: **Week 9, 11, 13**
Weighting: **18%**

Lab report for each laboratory-based activity on week 5, 8 and 13

On successful completion you will be able to:

- Build problem-solving skills for a range of real-world engineering dynamics applications
- Develop effective communication skills through written reports and group work activity

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 35 hours
Due: **TBA**
Weighting: **50%**

Final Examination to be conducted at the end of the semester.

On successful completion you will be able to:

- Develop an understanding of Newton's laws applied to the effect of force on solids in engineering applications
- Apply mathematical skills to solve engineering dynamics problems
- Build problem-solving skills for a range of real-world engineering dynamics applications

---

[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

Primary Text: Vector Mechanics for Engineers: Dynamics - 10th Edition in SI Units by Beer, Johnston, and Cornwell.

Supporting Text: Mechanics for Engineers: Dynamics - 13th Edition by R. C. Hibbeler and K. B. Yap

The technology used and required: All course-related materials, lecture slides, SGTA problems, and assignments will be posted in ilearn. Students are required to check ilearn

on a regular basis.

Unit Schedule

Week	Lecture Topic	Key topics to be covered		Tutorial/ Lab session	Assessments
1	Kinetics of Particles: Newton's Second Law	Concepts of Kinetics, Linear Momentum, Free Body Diagrams		No Tutorial and lab	
2	Kinetics of Particles: Energy and Momentum Methods	Principle of Work and Energy, Conservation of Energy, Principle of Impulse and Momentum, Impact		Tutorial only	
3	Systems of Particles	Moment, Angular Momentum, Newton's law applied to Systems of particles, Work - Energy and Impulse - Momentum principles applied to Systems of Particles		Tutorial only	Practice-Based Task 1 due
4	Kinematics of Rigid Bodies - Part 1	Rigid bodies, Types of motion in Rigid bodies, General Plane Motion, Calculating velocities in Rigid bodies			
5	Kinematics of Rigid Bodies - Part 1	Rigid bodies, Types of motion in Rigid bodies, General Plane Motion, Calculating velocities in Rigid bodies		Tutorial and Lab session	Practice-Based Task 2
6	Kinetics of Rigid Bodies -1 and MATLAB Intro	Equations defining the rotation of a rigid body, General Plane motion, Absolute and Relative velocity in Plane motion		Tutorial only	Assignment 1 due
7	Kinetics of Rigid Bodies - 2	Equations defining the rotation of a rigid body, General Plane motion, Absolute and Relative velocity in Plane motion		Tutorial and lab session	Practice-Based Task 3 due
8	3D Kinetics Practice Problems	Impulse and Momentum of Rigid body in Three Dimensions, Kinetic Energy of Rigid Body in Three Dimensions, Motion of a Gyroscope		Tutorial and Lab session	
9	Mechanical Vibrations 1	Introduction to Vibration, Free vibrations of particles, Simple harmonic motion, Simple Pendulum		Tutorial only	Practice-Based Task 4, Lab Report 1 due
10	Mechanical Vibrations 2	Damped Vibrations, Forced Vibrations		Tutorial only	
11	Mechanical Vibrations 3	Degree of Freedom, Linear and Non-linear Springs, Vibration of Continuous System		Tutorial only	Practice-Based Task5, Lab Report 2 due
12	Mechanical Vibrations 4	Case Studies and Practice Problems, Coulomb Damping, Hysteretic Damping		Tutorial only	Assignment 2 due
13	Review	Review of the unit		Tutorial and Lab Session	Practice-Based Task 6, Lab Report 3 due

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Engineers Australia Competency Mapping

EA Competency Standard	Unit Learning Outcomes

Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	1, 2, 3, 4
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	1, 2, 3, 4
	1.3 In-depth understanding of specialist bodies of knowledge	
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	1, 2, 3, 4
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	1, 2, 3, 4
	2.2 Fluent application of engineering techniques, tools and resources.	
	2.3 Application of systematic engineering synthesis and design processes.	
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	4
	3.2 Effective oral and written communication in professional and lay domains.	4
	3.3 Creative, innovative and pro-active demeanour.	
	3.4 Professional use and management of information.	4
	3.5 Orderly management of self, and professional conduct.	4
	3.6 Effective team membership and team leadership	4