COURSE OUTLINE

MEC304 Engineering Dynamics

School: School of Science, Technology and Engineering

2025 | Semester 1

UniSC Sunshine Coast
UniSC Moreton Bay

BLENDED LEARNING

Most of your course is on campus but you may be able to do some components of this course online.

Please go to usc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

Within mechanical engineering the understanding of how object move and interact is fundamental to the design of engineering systems. This course introduces students to the concepts of Newtonian mechanics on which the field of engineering dynamics is founded. The course features an application-based treatment in order for students to be able to readily assimilate the theory and concepts introduced.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous weekly learning material	2hrs	Week 1	13 times
Seminar – On campus	1hr	Week 1	3 times
Tutorial/Workshop 1 – On campus	2hrs	Week 1	10 times
Laboratory 1 – On campus	2hrs	Week 7	5 times

1.3. Course Topics

Topics may include:

- Revision of rectilinear and curvilinear motion
- Kinematics of a particle
- Relative motion
- Kinetics of a particle
- Kinematics of a rigid body
- Mass moment of inertia
- Kinetics of a rigid body

2. What level is this course?

300 Level (Graduate)

Demonstrating coherence and breadth or depth of knowledge and skills. Independent application of knowledge and skills in unfamiliar contexts. Meeting professional requirements and AQF descriptors for the degree. May require pre-requisites where discipline specific introductory or developing knowledge or skills is necessary. Normally undertaken in the third or fourth full-time study year of an undergraduate program.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...	GRADUATE QUALITIES MAPPING Completing these tasks successfully will contribute to you becoming...	PROFESSIONAL STANDARD MAPPING * Competencies from multiple Professional Bodies (see below) *
1 Explain basic kinematics concepts: displacement, velocity and acceleration (and their angular counterparts) to describe the motion of points, objects and systems of groups of objects.	Knowledgeable	1, 1, 1.1.a, 1.1.a, 1.2.a, 1.2.a, 1.1, 1.1, 1.2, 1.2
2 Resolve dynamics problems through analysis and determine which concepts apply to apply an appropriate solution strategy considering practical constraints and real-world applications.	Creative and critical thinker	1, 1, 1.2.a, 1.2.a, 1.2, 1.2, 2, 2, 2.2, 2.2
3 Apply basic dynamics concepts: force, momentum, work and energy to e.g. machinery, vehicles, and structures.	Empowered	2, 2, 2.1.a, 2.1.a, 2.2.b, 2.2.b, 2.1, 2.1, 2.2, 2.2
4 Apply Newton's laws of motion and other basic dynamics concepts - the Work-Energy and Impulse-Momentum principles and the coefficient of restitution to understand the effect forces have upon objects and structures.	Empowered	2, 2, 2.1.a, 2.1.a, 2.2.b, 2.2.b, 2.1, 2.1, 2.2, 2.2

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 ENGINEERING TECHNOLOGIST COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.1.a	Knowledge and Skill Base - Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain: Engages with the technology domain at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of broadly-defined problems and engineering technology practice.
1.2.a	Knowledge and Skill Base - Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain: Fluently applies relevant investigation, analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the technology domain.
1.1	Knowledge and Skill Base: Systematic, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the technology domain.
1.2	Knowledge and Skill Base: Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the technology domain.
2	Elements of competency: Engineering Application Ability
2.1.a	Engineering Application Ability - Application of established engineering methods to broadly-defined problem solving within the technology domain: Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.
2.2.b	Engineering Application Ability - Application of engineering techniques, tools and resources within the technology domain: Understands the principles, limitations and accuracy of mathematical, physical or computational modelling.

CODE	COMPETENCY
2.1	Engineering Application Ability: Application of established engineering methods to broadly-defined problem solving within the technology domain.
2.2	Engineering Application Ability: Application of engineering techniques, tools and resources within the technology domain.
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.1.a	Knowledge and Skill Base - Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline: Engages with the engineering discipline at a phenomenological level, applying sciences and engineering fundamentals to systematic investigation, interpretation, analysis and innovative solution of complex problems and broader aspects of engineering practice.
1.2.a	Knowledge and Skill Base - Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline: Develops and fluently applies relevant investigation analysis, interpretation, assessment, characterisation, prediction, evaluation, modelling, decision making, measurement, evaluation, knowledge management and communication tools and techniques pertinent to the engineering discipline.
1.1	Knowledge and Skill Base: Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
1.2	Knowledge and Skill Base: Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
2	Elements of competency: Engineering Application Ability
2.1.a	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Identifies, discerns and characterises salient issues, determines and analyses causes and effects, justifies and applies appropriate simplifying assumptions, predicts performance and behaviour, synthesises solution strategies and develops substantiated conclusions.
2.2.b	Engineering Application Ability - Fluent application of engineering techniques, tools and resources: Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.
2.2	Engineering Application Ability: Fluent application of engineering techniques, tools and resources.

5. Am I eligible to enrol in this course?

Refer to the UniSC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

MTH104 or MTH202

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

MEC205

5.4. Specific assumed prior knowledge and skills (where applicable)

Not applicable

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

Some questions used in the previous year's assessment will be peer-reviewed in Week 3's tutorial.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Quiz/zes	Individual	40%	One hour per quiz	Throughout teaching period (refer to Format)	Online Assignment Submission with plagiarism check
All	2	Written Piece	Individual	30%	2000 words	Week 9	Online Assignment Submission with plagiarism check
All	3	Examination - Centrally Scheduled	Individual	30%	2 hours	Exam Period	Online Assignment Submission with plagiarism check

All - Assessment Task 1: Online Quizzes

GOAL:	This is an ongoing introductory task that ensures you have a firm foundation in dynamics principles and applications. You will explain basic kinematics concepts - displacement, velocity and acceleration (and their angular counterparts) as they relate to real engineering problems. You will then apply basic dynamics concepts - force, momentum, work and energy to solve problems.
PRODUCT:	Quiz/zes
FORMAT:	Submission week: 3-12
CRITERIA:	

No.		Learning Outcome assessed
1	Accuracy of the explanation and/or numerical result.	1 3 4
2	Application of dynamics concepts	1 2 3 4

GENERIC SKILLS:	Problem solving, Applying technologies, Information literacy

All - Assessment Task 2: Assignment

GOAL:	The assignment is designed to evaluate your knowledge of dynamics concepts and to demonstrate the use of standard methods to analyse and solve dynamics problems. Assessment Criteria: 1 Accuracy of the application of dynamics concepts; 2 Identification and verification of the system being analysed using sketches and modelling; 3 Appropriate solution strategy; 4 Communication of results"
PRODUCT:	Written Piece
FORMAT:	Written piece.
CRITERIA:	

No.		Learning Outcome assessed
1	Accuracy of the application of dynamics concepts.	2 3 4
2	Identification and verification of the system being analysed using sketches and modelling.	1 2
3	Appropriate solution strategy.	2
4	Communication of results	1 2

GENERIC SKILLS:	Communication, Problem solving, Applying technologies, Information literacy

All - Assessment Task 3: Final Examination

GOAL:	The final exam is designed to evaluate your sound knowledge of dynamics concepts and for you to demonstrate that you can use standard methods to analyse dynamic systems.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	Written exam Assessment Criteria: 1 Accuracy of the explanations of basic dynamics concepts; 2 Application of the dynamics concepts; 3 Appropriate solution strategy; 4 Communication of results"
CRITERIA:	

No.		Learning Outcome assessed
1	Accuracy of the explanations of basic dynamics concepts.	
2	Application of the dynamics concepts.	
3	Appropriate solution strategy.	
4	Communication of results.	

GENERIC SKILLS:

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	R. C. Hibbeler	0	Engineering Mechanics: Dynamics in SI Units, Global Edition	14	Pearson

8.2. Specific requirements

N/A

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training for students, and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

The final mark is in the percentage range 47% to 49.4%
The course is graded using the Standard Grading scale
You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate:
- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: 07 5430 1168 or using the SafeZone app. For general enquires contact the SafeUniSC team by phone 07 5456 3864 or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call 07 5430 1226 or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the Learning Advisers web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to Student Hub, email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, AccessAbility Services can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to Student Hub, email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The Student Charter sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au