

# ENG102 Engineering Statics

School: School of Science, Technology and Engineering

2023 Semester 2

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](http://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

Statics is one of the critical foundations for understanding and progressing in mechanical and civil engineering. It enables you to analyse structural components found in buildings, bridges, machinery and hydraulics. You will learn principles and concepts related to rigid and deformable bodies, and apply these principles to analyse structures under various loads.

### 1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
<b>BLENDED LEARNING</b>			
<b>Tutorial/Workshop 1</b> – Online workshop	2hrs	Week 1	13 times
<b>Tutorial/Workshop 2</b> – On campus practical workshop	2hrs	Week 1	13 times
<b>Laboratory 1</b> – On campus - weeks 3, 6, 9	2hrs	Week 3	3 times

### 1.3. Course Topics

- Vectors, particles, and force systems
- External forces on 2D rigid bodies; transmissibility, moment, couples
- 2D free body diagrams and equilibrium of rigid bodies
- Pin properties, pin jointed frames, compound beams
- Qualitative analysis, method of joints, method of sections
- Equilibrium and analysis of pin jointed frame trusses
- Internal forces
- Center of gravity and mass, centroid
- Moment of inertia
- 3D force systems, equilibrium, and analysis

Course topics are subject to change

## 2. What level is this course?

100 Level (Introductory)

Engaging with discipline knowledge and skills at foundational level, broad application of knowledge and skills in familiar contexts and with support. Limited or no prerequisites. Normally, associated with the first 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	GRADUATE QUALITIES MAPPING	PROFESSIONAL STANDARD MAPPING *
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...	Engineers Australia Stage 1 Professional Engineer Competency Standards
1 Demonstrate and apply current knowledge of basic sciences, and fundamental engineering statics principles and concepts to structures in engineering design contexts	Knowledgeable	1.1, 1.2
2 Solve engineering statics problems and demonstrate fundamentals statics principles by testing and collecting data and dealing with sources of interference; using free body diagrams to represent structures subjected to various loads; interpreting and analysing these diagrams to calculate the resulting internal forces using established conventions to present sequenced solutions	Creative and critical thinker	1.3
3 Communicate to different audiences in different modes (written, visual and oral)	Empowered	3.2
4 Act professionally by functioning in teams	Ethical	3.6

#### \* Competencies by Professional Body

CODE	COMPETENCY
<b>ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS</b>	
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.
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
3.6	Professional and Personal Attributes: Effective team membership and team leadership.

### 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

(SCI107 and (MTH103 or MTH102) and enrolled in Program SC404, SC405, SC410, SC411 SC425)

#### 5.2. Co-requisites

Not applicable

#### 5.3. Anti-requisites

CV1501(USQ equivalent course)

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

Senior Maths C or equivalent is strongly recommended for ENG102. The following knowledge and skills are required throughout the course and must be learned or maintained as required: Construction and interpretation of graphs, Basic analytic geometry, Basic algebraic manipulations including solution of equations, Basic differential and integral calculus, Differentiation of simple functions, Chain rule and product rule for differentiation, Integration of simple functions, Matrix notation, Vector representation and basic operations, Dot product, Cross product, General concepts of space, matter and time, Measurement and SI units, Newton's law of gravitation and, Forces and Newton's laws of motion.

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

Each week throughout semester, students will be able to complete questions before and in tutorials which are similar to the questions they will have in the exam. Solutions to these questions will be discussed in the tutorials and will be available in Canvas. This gives students constant formative feedback on their understanding of the course material and progress during semester.

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	35%	1 hour each quiz	Throughout teaching period (refer to Format)	In Class
All	2	Report	Group	25%	3x 450 to 600 words each excluding diagrams & appendices	Throughout teaching period (refer to Format)	Assignment Box
All	3	Examination - Centrally Scheduled	Individual	40%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Review Quizzes

<b>GOAL:</b>	This task has been developed to provide you with clear and thorough examples of the types of problems engineers need to address in statics. You will apply fundamental knowledge of statics principles and concepts to solve problems about structures subjected to loads.
<b>PRODUCT:</b>	Quiz/zes
<b>FORMAT:</b>	<p>4 Quizzes, 60 minutes each, Week 3, 6, 9 and 12</p> <p>Short answer questions such as:                      interpreting symbols in free body diagrams                      labelling diagrams following conventions                      solving 2D &amp; 3D force systems involving calculations, sketching, etc.                      analysing structures (beams, frames, 2D and 3D structures) under different loads, requiring drawing a free body diagram to represent the structure, using a sequence of equations to calculate the unknown forces and/or drawing diagrams.</p> <p>Programmable calculators NOT permitted but scientific ones are. The use of mobile phones and tablets is not permitted. The quizzes will be open book, with both notes and textbook allowed</p>

CRITERIA:	No.	Learning Outcome assessed	
	1	Demonstrate and apply current knowledge of basic sciences, and fundamental engineering statics principles and concepts to structures in engineering design contexts	1
	2	Solve simple engineering statics problems by: using free body diagrams to represent structures subjected to various loads	2
	3	interpreting and analysing these diagrams to calculate the resulting internal forces using established conventions to present sequenced solutions	2
	4	Communicate to specialist audiences in written and visual modes to present solutions: terminology, nomenclature and units	3
	5	adhere to established conventions for diagrams	3

### All - Assessment Task 2: Practical reports

<b>GOAL:</b>	These practical reports will enable you to better understand and master key statics theory and principles that involve rigging, lifting, and fixed structures. Ultimately you will be able to test and collect data to validate theoretical calculations about how structures react to loads.		
<b>PRODUCT:</b>	Report		
<b>FORMAT:</b>	<p>In groups of 3-5 (depending on the class size), you carry out tests to collect data about how real structures react to different loads, taking account of any sources of interference. In your team you collaborate to write three engineering reports (one on each Practical) as per conventions (see Canvas). Each report is of 450 to 600 words or equivalent (excluding diagrams, calculations and Appendices) and calculations with correct units throughout (scanned copies of pre-practical calculations are acceptable), explain sources of interference. You also include where relevant captioned diagrams, tables of data, graphs, and photographs. Weeks 4, 7 and 10</p> <p>The names of all team members are to be on the cover page of each report with their signatures and student numbers.</p>		
<b>CRITERIA:</b>	No.		Learning Outcome assessed
	1	Demonstrate and apply current knowledge of basic sciences, and fundamental engineering statics principles and concepts to structures in engineering design contexts	1
	2	Solve simple engineering statics problems by: testing and collecting data and dealing with sources of interference	2
	3	Communicate in the form of written practical reports adhere to prescribed report structure and word count	3
	4	English expression and conventions	3
	5	terminology, nomenclature and units	3
	6	adhere to established conventions for presenting diagrams and solutions	3
	7	Act professionally by functioning in teams when carrying out and writing up practicals You are awarded an individual grade for each report. Marks are recorded and made available to you through Gradebook.	4

### All - Assessment Task 3: Final examination

<b>GOAL:</b>	You will demonstrate and apply fundamental knowledge of statics principles and concepts to solve simple problems about structures subjected to loads	
<b>PRODUCT:</b>	Examination - Centrally Scheduled	
<b>FORMAT:</b>	<p>The problems in this exam involve more complex theory and structures, and test all the Course topics.</p> <p>Short answers such as:</p> <p>interpreting symbols in free body diagrams</p> <p>labelling diagrams following conventions</p> <p>solving 2D and 3D force systems, trusses and pin-jointed frame - involves calculations</p> <p>interpreting diagrams of simple structure under different loads, requiring drawing a free body diagram to represent the structure, and using a sequence of equations to calculate the unknown forces</p> <p>calculate and draw internal forces diagram.</p> <p>Programmable calculators NOT permitted but scientific ones are. The use of mobile phones and tablets is not permitted. The examination will be open book, with both notes and text book allowed.</p>	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1	Demonstrate and apply current knowledge of basic sciences, and fundamental engineering statics principles and concepts to structures in engineering design contexts <span style="float: right;">1</span>
	2	Solve simple engineering statics problems by: using free body diagrams to represent structures subjected to various loads <span style="float: right;">2</span>
	3	interpreting and analysing these diagrams to calculate the resulting internal forces using established conventions to present sequenced solutions <span style="float: right;">1 2</span>
	4	Communicate to specialist audiences in written and visual modes to present solutions: terminology, nomenclature and units <span style="float: right;">3</span>
	5	adhere to established conventions for diagrams. <span style="float: right;">3</span>

## 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	(14th SI edition, Global)	n/a

### 8.2. Specific requirements

You must wear closed-in shoes in the laboratory.

## 9. How are risks managed in this course?

Risk assessments have been performed for all studio and laboratory classes and a low level of health and safety risk exists. Some risk concerns may include equipment, instruments, and tools; as well as manual handling items within the laboratory. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the 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

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](tel:0754301168) or using the [SafeZone](#) app. For general enquires contact the SafeUniSC team by phone [07 5456 3864](tel:0754563864) or email [safe@usc.edu.au](mailto: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](tel:0754301226) or email [studentwellbeing@usc.edu.au](mailto: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](mailto: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](mailto: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](mailto: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](mailto:studentcentral@usc.edu.au)