COURSE OUTLINE

MEC300 Mechanical Design 2

School: School of Science, Technology and Engineering

2026 | 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

We live in a world of change which is driven by innovation and the desire for more efficient and sustainable machines and devices. This course provides you with the knowledge and skills to understand the design need, recognise the theory required and to synthesise an integrated solution. Machines comprise of a number of components working together to create a useful and efficient device. The course introduces you to the fundamental theory, applications and interaction of a number of machine components, which will work in an integrated manner to achieve the design requirements of the machine.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – On-line Learning Materials.	2hrs	Week 1	13 times
Tutorial/Workshop 1 – On-campus tutorials	2hrs	Week 1	13 times
Tutorial/Workshop 2 – On-campus workshop	2hrs	Week 1	13 times

1.3. Course Topics

- Revision of Stress/Strain Analysis
- Stress Concentrations and Factors of Safety
- Buckling of Columns
- Fatigue
- Threaded Fasteners
- Riveted and Welded Joints
- Design of Springs
- Lubrication and Plain Bearing
- Roller-element Bearings
- Design of Spur Gears
- Clutches and Brakes
- Belt Drives
- Shaft and Shaft Fittings

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	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 knowledge of the appropriate analytical principles to describe, design and predict thebehaviour of standard machine components.	Knowledgeable	1.3, 2.3, 3.6
2 Apply correct theoretical models to the design of appropriate machine components	Empowered	2.2, 2.3
3 Demonstrate creative and design skills and methodology in the design of two artefacts.	Engaged	3.3, 3.6
4 Present clarity of thought and expression in written and oral communication of design	Engaged	2.3, 3.2, 3.5

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.
2.2	Engineering Application Ability: Fluent application of engineering techniques, tools and resources.
2.3	Engineering Application Ability: Application of systematic engineering synthesis and design processes.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
3.3	Professional and Personal Attributes: Creative, innovative and pro-active demeanour.
3.5	Professional and Personal Attributes: Orderly management of self, and professional conduct.
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

(ENG221 or MEC221 and (ENG227 or MEC227)

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

ENG228

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

Feedback provided during engagement in weekly formative tutorial exercises will demonstrate the level of proficiency and understanding of the course material.

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	Written Piece	Individual	35%	Each assignment would require, on average, 3 hours of independent effort.	Throughout teaching period (refer to Format)	Online Submission
All	2	Portfolio	Group	25%	Design output and associated report --- max 2000 words using appropriate diagrams/drawings	Week 13	To be Negotiated
All	3	Examination - Centrally Scheduled	Individual	40%	2 hrs	Exam Period	Online Submission

All - Assessment Task 1: Assignments

GOAL:	You will develop skills and understanding of analytical design principles, material selection criteria and performance behaviour of standard components, which will allow you to design appropriate fit-for-purpose machine parts.
PRODUCT:	Written Piece
FORMAT:	Questions will be set for each of the three assignments from the material covered in the on-line learning resources and tutorials up to, and including, the week prior to the submission. (Instructions will be provided on CANVAS). Submit: Assignment 1 by 8:00 am on Monday of Week 4, Assignment 2 by 8:00 am on Monday of Week 8, and Assignment 3 by 8:00 am on Monday of Week 12.
CRITERIA:	**No.** — **Learning Outcome assessed** 1 — Demonstration of knowledge using correct terminology, diagrams and methodology. — 1, 2 2 — Application of correct formulae; including all workings showing a logical sequence to the problem solution — 2
GENERIC SKILLS:	Communication, Problem solving, Applying technologies

All - Assessment Task 2: Workshop Portfolio

GOAL:	This activity will allow you to demonstrate creativity, innovation and design methodology in designing, building and testing machine components and systems
PRODUCT:	Portfolio
FORMAT:	The projects are completed by groups of 3 students. The portfolio and the built mechanical device are to be submitted by the group. The portfolio should NOT be longer than 10 pages
CRITERIA:	

No.		Learning Outcome assessed
1	Analysis of materials selection, design and functionality of machine components.	2
2	Structured approach to design, fabrication and display of artefacts.	3
3	Presentation of the report meeting the specified page limit; demonstrating depth of discussion and reflection on the project	4

GENERIC SKILLS:	Collaboration, Applying technologies

All - Assessment Task 3: Final Examination

GOAL:	You will demonstrate your knowledge and understanding of the design principles, material selection criteria and performance behaviour of standard components.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	The final open-book, on-line exam will assess the contents of the entire course. The duration of the final exam will be 2 hours (during centrally scheduled exam period, open book). You will be required to provide responses to a number of typical problems similar to those given in the tutorial and assignment questions throughout the semester. Your exam solutions will be used to evaluate your understanding of the total course material.
CRITERIA:	

No.		Learning Outcome assessed
1	Demonstration of knowledge using correct terminology, diagrams and methodology	1 2
2	Application of correct formulae; including all workings showing a logical sequence to the problem solution	2

GENERIC SKILLS:	Communication, Problem solving, Applying technologies

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.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
Week 1 : Introduction, Revision of Mechanics of Materials	Engage with on-line learning resources, undertake tutorial exercise (problem solving) Revise MEC221 Mechanics of Materials Course topics, Introduction to Workshop Projects (group creation)
Week 2 : Stress Analysis of Curved Beams; Buckling	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and Workshop Project 1 - engine disassembly
Week 3 : Stress Concentrations	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and Workshop Project 1 - engine disassembly
Week 4 : Fatigue Analysis	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and Workshop Project 1 - engine disassembly and display planning
Week 5 : Power Screws and Threaded Fasteners	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and Workshop Project 1 - engine sectioning and display planning
Week 6 : Rivetted and Welded Joints	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine sectioning and display planning, and Project 2 - Creative design
Week 7 : Design of Springs	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine sectioning and display planning, and Project 2 - Creative design planning
Week 8 : Lubrication and Plain Bearings	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine sectioning and display planning, and Project 2 - Creative design fabrication
Week 9 : Rolling Element Bearings	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine display assembly, and Project 2 - Creative design fabrication.
Week 10 : Design of Spur Gears	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine display assembly, and Project 2 - Creative design fabrication.
Week 11 : Brakes and Clutches	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), Workshop Project 1 - engine display assembly, and Project 2 - Creative design assembly.
Week 12 : Belt Drives	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and Design Exhibition.
Week 13 : Design of Shafts	Engage with on-line learning resources, undertake tutorial exercise and revision examples (problem solving), and preparation of workshop portfolio.

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	Robert C. Juvinall,Kurt M. Marshek	2020	Fundamentals of Machine Component Design, 7th Australia and New Zealand Edition with Wiley E-Text Card Set	7th	Wiley

8.2. Specific requirements

Fully enclosed shoes must be worn in the engineering laboratory. If you do not have the correct shoes you will not be allowed to do the workshop task. You must also undertake the laboratory induction before you can undertake any task in the workshop/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

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