

MEC202 Mechanical Design

School: School of Science, Technology and Engineering

2024 | 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 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, driven by increasing demands for better, more efficient products. Mechanical engineering is at the forefront of this change; providing the knowledge, technology and skills to meet the requirements of a consumer-driven society. This course provides the foundations which converts ideas into new products. The course builds on the content of Mechanics of Materials, and introduces design methodology and CAD/CAM skills to produce feature-based, parametric solid models.

1.2. How will this course be delivered?

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

1.3. Course Topics

Topics may include:

- Normal Stress/Strain and Shear Stress/Strain
- Introduction to Stress concentrations
- Failure Analysis and Factor of Safety
- Introduction to Industrial Design
- Parametric Solid Modelling
- Introduction into 3D Printing

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

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... | Competencies from multiple Professional Bodies (see below) * |
| 1 Demonstrate knowledge of the principles of mechanical engineering design. | Knowledgeable | 1.1, 1.6 |
| 2 Apply appropriate methodologies, including the correct use of theory, formula and units, to solve design-based problems. | Empowered | 1.5, 2.2 |
| 3 Analyse fail modes and suggest appropriate design revisions and present these in an appropriate engineering report format. | Creative and critical thinker | 1.3, 2.3 |
| 4 Demonstrate knowledge of 3D solid modelling techniques and skills. | Empowered | 2.2, 2.3 |
| 5 Design a creative device, which demonstrates simple mechanisms. | Engaged | 3.2, 3.3, 3.6 |
| 6 Communicate design in written and oral format. | Engaged | 2.3, 3.2 |

* Competencies by Professional Body

| CODE | COMPETENCY |
|--|--|
| ENGINEERS AUSTRALIA STAGE 1 ENGINEERING TECHNOLOGIST COMPETENCY STANDARDS | |
| 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. |
| 1.6 | Knowledge and Skill Base: Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the technology domain. |
| 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. |
| 1.5 | Knowledge and Skill Base: Knowledge of engineering design practice and contextual factors impacting 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. |
| 3.6 | 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

ENG104

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

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

Early feedback will be provided through completion of weekly activities in workshops. Furthermore, feedback on each assessment will be provided which will be used to help with the following assessment.

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 | 1a | Written Piece | Individual | 5% | Answer to ALL assignment questions | Week 4 | Online Submission |
| All | 1b | Practical / Laboratory Skills | Individual | 5% | Answer to ALL assignment questions and tasks | Week 5 | Online Submission |
| All | 1c | Written Piece | Individual | 10% | Answer to ALL assignment questions and tasks | Week 7 | Online Submission |
| All | 1d | Practical / Laboratory Skills | Individual | 25% | Answer to ALL assignment tasks. | Week 12 | Online Submission |
| All | 2 | Portfolio | Group | 25% | Design artifacts and associated report (max 10 pages + appropriate diagrams/ drawings) | Week 13 | Online ePortfolio Submission |
| All | 3 | Examination - Centrally Scheduled | Individual | 30% | 2 hrs | Exam Period | Online Submission |

All - Assessment Task 1a: Assignment 1 - Design Assignment

| | | |
|------------------|--|--|
| GOAL: | Solutions to design assignment questions. | |
| PRODUCT: | Written Piece | |
| FORMAT: | Design Assignment: Questions will be set for each of the assignments, from the material covered in on-line lessons up to and including the week prior to the submission. You are required to use the theory introduced in the lessons to respond to the assignment questions. The assignments will be provided to you on Canvas. You are required to complete the assignment and submit on Canvas. Weighting for this assignment: Assignment 1 (Design)= 5%; Design Assignment submissions can either be hand-written or word-processed, showing all working and calculations (where relevant). | |
| CRITERIA: | No. | Learning Outcome assessed |
| | 1 | Correct responses to the questions 1 |
| | 2 | Demonstrated understanding through use of correct formulae 2 |
| | 3 | Inclusion of all workings showing a logical sequence to the problem solution. 6 |

All - Assessment Task 1b: Assignment 2 : Solid Modelling

| | | |
|------------------|--|--|
| GOAL: | Generation of parametric solid models of drafting questions. | |
| PRODUCT: | Practical / Laboratory Skills | |
| FORMAT: | Solid Modelling Assignments: Solid Modelling tasks would be set from the material and techniques covered in the Modelling tutorials. The assignments will be provided to you on Canvas. You are required to complete the assignment and submit on Canvas. You must submit all relevant solid modelling files (in a zipped folder) for the Solid Modelling assignment. | |
| CRITERIA: | No. | Learning Outcome assessed |
| | 1 | Correct responses to the questions; Use of correct Solid Modelling techniques 4 |
| | 2 | Presentation of accurate parametric models and engineering drawings 6 |

All - Assessment Task 1c: Assignment 3 : Design Assignment

| | | |
|-----------------|---|--|
| GOAL: | Solutions to design assignment questions. | |
| PRODUCT: | Written Piece | |
| FORMAT: | Design Assignments: Questions will be set from the material covered in the on-line lessons up to and including the week prior to the submission. You are required to use the theory introduced in the lessons to respond to the assignment questions. | |

| CRITERIA: | No. | Learning Outcome assessed |
|-----------|--|---------------------------|
| | 1 Correct responses to the questions | 1 |
| | 2 Demonstrated understanding through use of correct formulae | 2 |
| | 3 Inclusion of all workings showing a logical sequence to the problem solution | 3 6 |

All - Assessment Task 1d: Assignment 4 : Major Solid Modelling Assignment

| GOAL: | Generation of accurate parametric solid part models, development of assemblies of part models and generation of engineering drawings. | | | | | | |
|--|--|-----|---------------------------|---|---|--|---|
| PRODUCT: | Practical / Laboratory Skills | | | | | | |
| FORMAT: | Solid Modelling Assignments: Solid Modelling tasks would be set from the material and techniques covered in the Modelling tutorials. The assignment will be provided to you on Canvas. You are required to complete the assignment and submit on Canvas. You must submit all relevant solid modelling files (in a zipped folder) for the Solid Modelling assignment. | | | | | | |
| CRITERIA: | <table border="1"> <thead> <tr> <th>No.</th> <th>Learning Outcome assessed</th> </tr> </thead> <tbody> <tr> <td>1 Use of correct Solid Modelling techniques</td> <td>4</td> </tr> <tr> <td>2 Presentation of accurate Engineering drawings;</td> <td>6</td> </tr> </tbody> </table> | No. | Learning Outcome assessed | 1 Use of correct Solid Modelling techniques | 4 | 2 Presentation of accurate Engineering drawings; | 6 |
| No. | Learning Outcome assessed | | | | | | |
| 1 Use of correct Solid Modelling techniques | 4 | | | | | | |
| 2 Presentation of accurate Engineering drawings; | 6 | | | | | | |

All - Assessment Task 2: Workshop Portfolio - Design Projects

| | |
|-----------------|--|
| GOAL: | The four projects are designed as hands-on activities that demonstrate creativity, innovation and the application of the design methodology in designing and building of displays and devices which meet the proposed design brief. |
| PRODUCT: | Portfolio |
| FORMAT: | The projects are completed by groups of 3 or 4 students. The portfolio and the built displays and devices are to be submitted by the group. Presentations (in the form of an Exhibition) will be conducted in Week 13. The portfolio should NOT be longer than 10 pages. |

| CRITERIA: | No. | Learning Outcome assessed |
|-----------|-----|---------------------------|
| | 1 | 3 5 |
| | 2 | 2 |
| | 3 | 6 |
| | 4 | 5 6 |

All - Assessment Task 3: Final Examination

| GOAL: | The final exam will allow you to demonstrate your understanding of the theory presented in this course, by accurately answering short problem-based questions. | | | | | | |
|------------------|--|-----|---------------------------|---|-----|---|---|
| PRODUCT: | Examination - Centrally Scheduled | | | | | | |
| FORMAT: | The final exam will assess the content of lessons (Design Module only) presented in the course. The duration of the final exam will be 2 hours (during centrally scheduled exam period, on-line, open book). You will be required to provide responses to a number of typical problems similar to those given in the assignment questions. | | | | | | |
| CRITERIA: | <table border="1"> <thead> <tr> <th>No.</th> <th>Learning Outcome assessed</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1 6</td> </tr> <tr> <td>2</td> <td>2</td> </tr> </tbody> </table> | No. | Learning Outcome assessed | 1 | 1 6 | 2 | 2 |
| No. | Learning Outcome assessed | | | | | | |
| 1 | 1 6 | | | | | | |
| 2 | 2 | | | | | | |

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

There are no required/recommended resources for this course.

8.2. Specific requirements

Not applicable

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

10.3. Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate (the rates are cumulative):

- 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 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 and supply the required documentation to negotiate an outcome.

Refer to the Assessment: Courses and Coursework Programs – Procedures

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.

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.

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