



Course Outline

Code: ENG336

Title: Engineering System Design

School of:	Science & Engineering
Teaching Session:	Semester 2
Year:	2019
Course Coordinator:	Selvan Pather Email: spather@usc.edu.au
Course Moderator:	Rezwanul Haque Email: rhaque@usc.edu.au

Please go to the USC website 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

The success of most engineering systems depends on the effective and efficient synergy of a number of sub-assemblies which in turn comprise a number of individual integrated machine components. This course provides you with the theoretical knowledge and skills which underline the design philosophy required for effective engineering systems; which requires careful design synthesis and analysis to ensure that all components are integrated to provide for the best possible overall performance of the system. The design process will also provide you with an introduction to the impact that engineering systems have on natural resources, the environment and society.

1.2 Course topics

Module: Embedded Control

1. Basic electrical theory
2. Electronic sensors and Control
3. Embedded Control Systems

Module: System Design

1. System Design Philosophy
2. System Reliability
3. Design for Sustainability
4. Design for Ergonomics
5. Design Standards

Module: Automation

1. Pneumatic Systems
2. Hydraulic Systems
3. Programmable Logic Controllers (PLC's)

2. What level is this course?

300 level Graduate - Independent application of graduate knowledge and skills. Meets AQF and professional requirements. May require pre-requisites and developing level knowledge/skills. Normally taken in the 3rd or 4th 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?

Specific Learning Outcomes On successful completion of this course you should be able to:	Assessment Tasks You will be assessed on the learning outcome in task/s:	Graduate Qualities or Professional Standards mapping Completing these tasks successfully will contribute to you becoming:
Demonstrate an understanding of the appropriate analytical principles to describe, design and predict the behaviour of standard engineering systems.	Task 1 Task 3	Knowledgeable. Empowered.
Apply correct theoretical models to design appropriate engineering systems.	Task 1 & Task 3	Sustainability-focussed. Creative and critical thinkers.
Undertake design projects, encompassing the synergy of fundamental machine component theory in an engineering system.	Task 2	Creative and critical thinkers. Engaged.

5. Am I eligible to enrol in this course?

Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1 Enrolment restrictions

Nil

5.2 Pre-requisites

ENG228 Mechanical Engineering Design 2 or MEC2301 Design of Machine Elements (USQ course)

5.3 Co-requisites

Nil

5.4 Anti-requisites

MEC3303 System Design (USQ)

5.5 Specific assumed prior knowledge and skills (where applicable)

Nil

6. How am I going to be assessed?

6.1 Grading scale

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

6.2 Details of early feedback on progress

The delivery and facilitation of the tutorials and workshop projects will provide regular feedback throughout the semester.

6.3 Assessment tasks

Task No.	Assessment Tasks	Individual or Group	Weighting %	What is the duration / length?	When should I submit?	Where should I submit it?
1	Project-based Design / Case Study Portfolio	Individual	Total 30% (3 x 10%)	Solutions to project-based design problems, and/or reflection on case studies.	Week4; Week8 ; Week 12	Bb
2	Workshop Portfolio: Major Design Project	Group	Total 40%	Design output and associated reports (max 30 pages) + appropriate diagrams/drawings; 15 min Oral presentation of Design	Week 13	Portfolio – Blackboard; Oral presentation – in class
3	Module examination	Individual	30% (3 x 10%)	3 x 1 hours	Week 5; Week 9; Week 13	In class
			100%			

Assessment Task 1: Project-based design and Case Studies (Total 30% of final grade)

Goal:	You will develop critical thinking and evaluation of engineering systems, and formulate and apply appropriate analytical principles to describe, design and predict the behaviour of standard engineering systems
Product:	System design and case studies.
Format:	Questions will be set for each of the design requirements and/or case studies which cover the material of each module. You are required to use the theory introduced in the lectures and workshop tasks to respond to these questions. The projects and/or case studies will be provided to you on Blackboard. You are required to complete the reports and submit on Blackboard . Each of the three projects has equal weighting of 10% each.
Criteria:	Assessment Criteria: <ul style="list-style-type: none"> • Critical analysis and evaluation of project and/or case study • Correct responses to the questions; • Use of correct terminology, diagrams and methodology; • Demonstrated understanding through use of correct formulae; and • Inclusion of all workings showing a logical sequence to the problem solution.
Engineers Australia competencies assessed in this task	
1.3	In-depth understanding of specialist bodies of knowledge within the engineering discipline
2.3	Application of systematic engineering synthesis and design process
3.2	Effective oral and written communication in professional and lay domains

Assessment Task 2: Workshop Portfolio (40% of final grade)

Goal:	These practical tasks will enable you to demonstrate your creativity, innovation and understanding of system design by designing effective engineering systems that meet the proposed design brief.
Product:	Detailed project reports, covering all aspects of design philosophy, system reliability, sustainability, ergonomics and any specialist field required for an effective engineering system.
Format:	The design projects are completed by groups of 2 students. The portfolio is to be submitted by the group. The page limit for the portfolio is 30 pages (5 pages each for Projects A (Embedded Control) and B (PLC control), and 20 pages for Project C (Major Design)) Include, in an appendix, all appropriate drawings/sketches, product specifications and technical data of specified components. Project C also includes an oral presentation of your team's conceptual design.
Criteria:	<p>Assessment Criteria:</p> <ul style="list-style-type: none"> • Analysis of materials selection and materials testing exercises. • Structured approach to the system design • Appropriate use of materials • Performance of the device, measured against performance criteria stated in the design brief • Completeness of all components of the report within the specified page limit. • Assessment of oral presentation
Engineers Australia competencies assessed in this task	
2.2	Fluent application of engineering techniques, tools and resources
3.3	Creative, innovative and pro-active demeanour
3.6	Effective team membership and team leadership

Assessment Task 3: Module Examinations (3 x 1 hr – Total of 30% of final grade)

Goal:	You will solve problems to demonstrate the application your knowledge to the design, behaviour and performance of engineering systems covered in each module.
Product:	Examination
Format:	Each of the 3 open-book exams will assess the content of each module. The duration of each of the exams will be 1 hour and will be conducted in class at the end of each module. You will be required to provide responses to a number of typical problems similar to those given in the tutorial questions for each of the modules. Your exam solutions will be used to evaluate your understanding of each module.
Criteria:	<p>Assessment Criteria:</p> <ul style="list-style-type: none"> • Correct answers to the problems • Use of correct terminology, diagrams and methodology • Use of appropriate design standards
Engineers Australia competencies assessed in this task	
2.2	Fluent application of engineering techniques, tools and resources
2.3	Application of systematic engineering synthesis and design processes
3.2	Effective oral and written communication in professional and lay domains

7. What are the course activities?

7.1 Directed study hours

The directed study hours listed here are a portion of the workload for this course. 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. Directed study hours may vary by location. Student workload is calculated at 12.5 learning hours per one unit.

Location: Specific Campus(es) or online:	Directed study hours for location:
USC Sunshine Coast	13 x 2 hr Lectures 13 x 2 hr Tutorials 13 x 1 hr Workshop sessions

7.2 Course content

Week # / Module #	What key concepts/content will I learn?
Week 1	Introduction; Revision of Fundamentals of Machine Elements – ENG228 Mechanical Design 2; Introduction to Module 1: Electrical Theory
Week 2	Introduction to Embedded Control Systems; Basic electric circuits
Week 3	Basic Electric circuits
Week 4	Sensors and Measurement
Week 5	Sensors and Measurement
Week 6	Introduction to Module 2: System Design; Design Philosophy
Week 7	System Reliability
Week 8	Design for Manufacture; Design for Ergonomics
Week 9	Design for the Environment: Design Standards
Week 10	Introduction to Module 3: Automation; Fluid Power; Pneumatic System
Week 11	Pneumatic Systems; Hydraulic Systems
Week 12	Programmable Logic Controllers (PLC's)
Week 13	Revision

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

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

8.1 Prescribed text(s)

Please note that you need to have regular access to the resource(s) listed below as they are required:

Author	Year	Title	Publisher
TBA			

8.2 Specific requirements

Fully enclosed shoes (preferably safety shoes/boots) must be worn in the engineering laboratory. If you do not have the correct shoes you will not be allowed to do the workshop practical. You must also undertake the laboratory induction before you can undertake any practical. It is advisable to use a dust-coat (or overall) when in the laboratory.

9. Risk management

Health and safety risks for this course have been assessed as low. There will be an induction into the safe use of all hand tools which will be used in these workshops.

It is your responsibility as a student 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. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the online Health Safety and Wellbeing training module 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 Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

10.2 Assessment: Additional requirements

Eligibility for Supplementary Assessment

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

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

10.3 Assessment: Submission penalties

Late submission of assessment tasks will 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 and supply the required documentation to negotiate an outcome.

10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to [Student Hub](#).

Contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au

10.5 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
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:

<http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

10.6 General Enquiries

In person:

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

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au