



Course Outline

Code: ENG422

Title: Design of Roads and Drainage

School:	Science & Engineering
Teaching Session:	Semester 1
Year:	2019
Course Coordinator:	A/Prof Terry Lucke Tel: 07 5456 5185 Email: tlucke@usc.edu.au.
Course Moderator:	Dr Helen Fairweather

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

In this course you focus on more traditional civil engineering skills such as: how to interpret and use survey data; how to design roads and draft road plans; how to plan and calculate bulk earthworks; and how to design and construct pavements and road drainage systems. The course is very "hands-on" and you will learn many useful and interesting civil engineering skills that you will need in your career as a civil engineer.

1.2 Course topics

- Introduction to Survey Field Practice
- Survey Drafting Techniques
- Road Survey and Set Out
- Designing Road Centrelines, Vertical and Horizontal Curves
- Bulk Earthwork Calculations (Cut & Fill)
- Designing Road Drainage Systems
- Drafting Roads and Drainage Systems
- Professional Drafting of Plans using AutoCAD
- Road Drainage Design using DRAINS software

2. What level is this course?

400 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 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 outcomes in task/s:	Graduate Qualities or Professional Standards mapping Completing these tasks successfully will contribute to you becoming:
Explain, describe and apply theory of surveying and road design	Task 1 – Tutorial Activities Task 2 – Mid semester exam	Knowledgeable
Apply practical knowledge and skills in the design of roads and drainage systems for sub-developments	Task 1 – Tutorial Activities Task 2 – Mid semester exam	Creative and critical thinkers
Produce engineering designs and plans and conduct engineering investigations as a result of collaboration with others in a team project environment	Task 1 – Tutorial Activities Tasks 3 – Design Projects 1 Task 4 - Design Project 2	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

Nil

5.3 Co-requisites

Nil

5.4 Anti-requisites

ENV3104 Hydraulics 2 (USQ Course)

5.5 Specific assumed prior knowledge and skills (where applicable)

A good understanding of basic trigonometry is required in this course

6. How am I going to be assessed?

6.1 Grading scale

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

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6.2 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	Weekly Tutorial Questions & Tasks W1-8	Individual	0%	Answers to 2-5 Questions/Tasks per week – formative assessment only	Beginning of next week's Lecture (Weeks 2-9)	Hardcopy to Lecturer in Class
2	Mid-semester exam	Individual	20%	2 hrs	Week 6	In class
3	Design Project 1 – Rural Road Design	Individual	40%	Undertake all necessary design calculations and supply all design drawings	Week 8	Drawings and calcs to Lecturer
4	Design Project 2 DRAINS and AutoCAD Design	Individual	40%	DRAINS and AutoCAD project files and Construction Drawings	Week 13	Drawings and calcs to Lecturer
			100%			

Assessment Task 1: Answers to Weekly Tutorial Questions and Tasks (0% – formative assessment only)

Goal:	The goal of this self-directed formative assessment task is to prepare you with the skills and knowledge to successfully undertake assessment tasks 2-4.
Product:	Answers to tutorial questions including required drawings and plans
Format:	A number of tutorial questions and drawing tasks will be set each week (Weeks 1-8 only) from the material covered in the lectures and course notes. You should use the theory and practice introduced each week to solve each week's tutorial questions and complete the drawing tasks. This is a formative assessment task only (not compulsory), i.e., this means that it is intended to help you understand the material and give you feedback on how you are advancing. You are not required to submit the solutions to your tutorials for assessment. However, If you would like some feedback on your work, you are very welcome to do so.
Criteria:	<ul style="list-style-type: none"> • Computational Accuracy • Use of correct methodology and formulae (showing all working) • Demonstrated technical drawing skills competency (correctness & neatness!)
Generic skill assessed	Skill assessment level
Problem solving	Graduate
Engineers Australia Stage 1 Competencies	
1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	
1.5. Knowledge of engineering design practice and contextual factors impacting the engineering discipline.	
2.2. Fluent application of engineering techniques, tools and resources.	

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Assessment Task 2: Mid-semester exam (2hrs – 20% of final grade)

Goal:	The mid-semester exam is designed to assess your understanding of the Course topics up until and including Week 6. You will need to do some simple calculations and drawings. Bring Drawing gear!	
Product:	Solutions to geometric calculations and plan of road	
Format:	The duration of the mid-semester exam will be 2 hours. It will be held during the Week 6 Lecture time slot. You will be required to solve a number of typical geometric road survey questions similar to those given in the weekly tutorial questions to date. You will also be required to produce a drawing of a road.	
Criteria:	<ul style="list-style-type: none"> • Computational Accuracy • Use of correct methodology and formulae (showing all working) • Demonstrated technical drawing skills competency (correctness & neatness!) 	
Generic skill assessed		Skill assessment level
Problem solving		Graduate
Engineers Australia Stage 1 Competencies		
1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline. 2.1. Application of established engineering methods to complex engineering problem solving. 2.2. Fluent application of engineering techniques, tools and resources.		

Assessment Task 3: Design Project 1 – Rural Road Design (40% of final grade)

Goal:	This self-directed learning design project will allow you to put the theoretical and practical knowledge you have learned into practice by designing a real two-lane rural roadway	
Product:	Design calculations and construction plans	
Format:	Design Project 1 will involve the preliminary design of a new two-lane rural road through undulating terrain (design speed 60km/h). The roadway will consist of a number of straight sections that are joined by horizontal curves. You will need to undertake all necessary design calculations for the road and supply all necessary drawings. All design drawings for this project <u>must</u> be individually hand drawn. AutoCAD drawings <u>will not</u> be accepted for this project.	
Criteria:	Assessment Criteria: <ul style="list-style-type: none"> • Accuracy of Roadway Design including bearings, distances and chainages • Use of correct methodology and formulae (showing all working) • Appropriateness of design grades and curves • Accuracy of earthwork calculations and cross-sections • Demonstrated technical drawing skills competency (correctness & neatness!) 	
Generic skill assessed		Skill assessment level
Applying technologies		Graduate
Engineers Australia Stage 1 Competencies		
1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline. 1.5. Knowledge of engineering design practice and contextual factors impacting the engineering discipline. 2.2. Fluent application of engineering techniques, tools and resources. 2.3. Application of systematic engineering synthesis and design processes. 2.4. Application of systematic approaches to the conduct and management of engineering projects. 3.4. Professional use and management of information. 3.5. Orderly management of self, and professional conduct.		

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Assessment Task 4: Design Project 2 – DRAINS and AutoCAD Design (40% of final grade)

Goal:	In this self-directed learning design project you will learn how to create professional engineering drawings using AutoCAD. You will also learn how to design an open-channel stormwater drainage system to drain a new housing sub-development.	
Product:	Various Road and Drainage Design Drawings & DRAINS software Drainage Design	
Format:	This self-directed learning design project will familiarise you with how drafting plans are created in the design office. You will use AutoCAD to redraw some of the information from Design project 1 that you drew by hand. You will produce a number of drawings for this project including a PLAN (with Longitudinal Section) drawing; a CROSS Sections drawing; a Drainage Layout Plan (showing all drainage lines and pits); and Long Sections for each of your drainage lines. Part of Design Project 2 will also involve the design of a stormwater drainage system to successfully drain your new road during a 10% AEP storm using the DRAINS program.	
Criteria:	Assessment Criteria: <ul style="list-style-type: none"> • Appropriateness & Accuracy of Drainage Design • Accuracy of Hydrological Model (all 10% AEP stormwater collected in pipes) • Use of correct methodology and formulae • Quality of AutoCAD construction drawings (design drawings professional?) 	
Generic skill assessed	Skill assessment level	
Applying technologies	Graduate	
Engineers Australia Stage 1 Competencies		
1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline. 1.5. Knowledge of engineering design practice and contextual factors impacting the engineering discipline. 2.2. Fluent application of engineering techniques, tools and resources. 2.3. Application of systematic engineering synthesis and design processes. 2.4. Application of systematic approaches to the conduct and management of engineering projects. 3.4. Professional use and management of information. 3.5. Orderly management of self, and professional conduct.		

7. What are the course activities?**7.1 Directed study hours**

13 x 2hr Lectures

13 x 2hr Tutorials/Activities/Design Sessions

7.2 Teaching semester/session(s) offered

Sippy Downs: Semester 1

7.3 Course content

Teaching Week / Module	What key concepts/content will I learn?	What activities will I engage in to learn the concepts/content?
		Directed Study Activities
Week 1	Survey Drafting Techniques	Self-directed drafting tutorial and field surveying activities
Week 2	Road Survey And Set Out	Self-directed drafting tutorial and field surveying activities s Design Project 1 Introduction
Week 3	Long Sections And Vertical Alignment	Self-directed drafting tutorial and field surveying activities
Week 4	Design Centreline Longitudinal Sections	Self-directed drafting tutorial and field surveying activities

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Week 5	Detailed Vertical Alignment	
Week 6	Detailed Horizontal Alignment	Self-directed AutoCAD & DRAINS tutorial Lecture, Mid-semester Exam – 2 hrs
Week 7	More Detailed Horizontal Alignment- Final Earthworks	Design Project 2 – Introduction Self-directed AutoCAD & DRAINS tutorial
Mid-semester break		
Week 8	AutoCAD- Other Civil Engineering Practices	Self-directed AutoCAD & DRAINS tutorial Design Project 1 – Due
Week 9	AutoCAD- Other Civil Engineering Practices	Self-directed AutoCAD & DRAINS tutorial
Week 10	AutoCAD- Other Civil Engineering Practices	Self-directed AutoCAD & DRAINS tutorial
Week 11	DRAINS & AutoCAD	Self-directed AutoCAD & DRAINS tutorial
Week 12	DRAINS & AutoCAD	Self-directed AutoCAD & DRAINS tutorial
Week 13	DRAINS & AutoCAD	Design Project 2 – Due

Please note that the course activities may be subject to variation.

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)

No textbook prescribed. Course notes will be supplied for this course.

8.2 Required and recommended readings

Nil

8.3 Specific requirements

You will need to purchase and bring the following equipment with you to class from Weeks 1-8:

1. Engineering Scale Rule (1:100, 1:200, 1:250, 1:500)
2. Simple 300 mm ruler
3. Protractor (full 360 degree, 15cm diameter)
4. Compass (cheap one from supermarket)
5. 2 pencils, soft and hard (e.g. HB and 3H) and one 0.4 - 0.5mm tip black felt pen
6. Pencil sharpener
7. Eraser
8. Scientific Calculator with Degrees, Minutes and Seconds (Polar-Rectangular conversion) function

9. Risk management

Health and safety risks have been assessed as low.

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 SouthBank** - 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

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au