School of Civil and Environmental Engineering

Term 2, 2020

CVEN2401: Sustainable Transport and Highway Engineering

COURSE DETAILS

Units of Credit	**6**	
Contact hours	5 hours per week	
Class	Thursday, 9:00 – 12:00	Weeks 1 - 5 & 7 – 10: Online through Blackboard Collaborate Ultra
Workshop	Thursday, 14:00 – 16:00 or 16:00 – 18:00	Weeks 1 – 5 & 7 – 10: Online through Blackboard Collaborate Ultra
Course Coordinator and Lecturer	Divya Jayakumar Nair email: divya.nair@unsw.edu.au office: CE103	

INFORMATION ABOUT THE COURSE

This is the first introductory course into the discipline of transport engineering as part of the broad field of civil and environmental engineering. An outline of the field of transport engineering and its relationships with other engineering and non-engineering disciplines is provided within the course. The basic concepts and terminology of the discipline is introduced. The course comprises of two strands.

The first strand of the course covers the first 5 weeks of the session. This section of the course is concerned with the analysis, design and evaluation of traffic and network systems, including basics of traffic flow theory and the steps of the regional transport planning process. The lectures and workshops will provide an opportunity to learn engineering properties of traffic streams along with relevant measurement and network analysis techniques.

The aim of the second strand is to give students a brief overview of the geometric design of Rural Highways and Roads, which will be covered in weeks 6-10. Road design is usually undertaken by specialists under the supervision of a civil engineer. The engineer must therefore have a good understanding of the design methods, guidelines and the quality requirements to enable him/her to evaluate the design. The progress of the project work will be noted by the demonstrators. The design procedure being taught is based on the Austroads Road Design Guide.

HANDBOOK DESCRIPTION

See link to virtual handbook:

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN2401

OBJECTIVES

The first strand is expected to develop skills related to the analysis of traffic and transport systems. Topics include: overview of the transport task, trends in motorization, sustainable transport, motorized and non-motorized transport, traffic flow fundamentals, definitions and concepts related to land use and transport systems; prediction methods of future transport demand; modelling and evaluation of transport systems; transport operations and traffic management.

- Understand components of the field of transport engineering.
- Learn the basic terminology of transport and traffic engineering practice.
- Learn urban transport planning concepts adopted by planning agencies and Roads and Traffic Authorities.
- Learn management methods related to road network systems.

The second strand is expected to develop skills related to highway design. Topics include: introduction to road design, route location process, and design practice of urban and rural roads. The course will:

- Introduce the basic principles of road geometric design.
- Explain the methods of geometric design including horizontal and vertical alignment design and design of cross-sections as well as earthwork volume calculations.

TEACHING STRATEGIES

The following teaching strategies will be used in the course:

Private Study	• Review lecture material and textbooks • Do set problems and assignments • Use Moodle for discussions • Download class notes from Moodle if not collected during classes • Reflect on class problems and assignments
Lectures	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by demonstrators • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

A successful study of the first strand will enable students to:

Learning Outcome		EA Stage 1 Competencies*
Strand 1		
1.	*Explain relationships between fundamental traffic flow parameters;*	*PE1.1, PE1.2, PE1.3, PE1.4*
2.	*Describe basics of transport modelling concepts*	*PE1.1, PE1.3, PE2.2*
3.	*Learn calculation methods related to each step of the four step planning process*	*PE1.1, PE1.2, PE1.3, PE2.1*
4.	*Perform computational evaluations of network traffic management methods*	*PE1.1, PE1.2, PE1.5, PE2.1, PE2.2*
Strand 2		
5.	*Develop horizontal and vertical alignments for simple road sections on different types of terrain*	*PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.2*
6.	*Evaluate the alignment design according to various design criteria*	*PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.2, PE3.1, PE3.2*
7.	*Design cross-sections appropriate for various types of roads*	*PE1.1, PE1.2, PE1.3, PE1.5, PE2.1, PE2.2, PE2.3*
8.	*Present and document the road design in a standard format*	*PE3.1, PE3.2, PE3.4, PE3.6*

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

Term 2 2020

Date	Topic	Lecture Content	Demonstration Content
04/06/2020 (Week 1)	Transport Systems and Planning	Outline of the course and Introduction to Transport Systems and Planning	Practice Problems: Transport Planning
11/06/2020 (Week 2)	Traffic Flow Theory	Fundamentals of Traffic Flow Theory	Practice Problems: Estimation of speed flow characteristics
18/06/2020 (Week 3)	4-step Transport Planning	Introduction and Trip Generation	Practice Problems: Trip Generation
25/06/2020 (Week 4)	4-step Transport Planning	Trip Distribution and Mode Choice	Practice Problems: Trip Distribution and Mode Choice
02/07/2020 (Week 5)	4-step Transport Planning	Traffic Assignment and Review of Strand 1	Practice Problems: Traffic Assignment and Review of Strand 1
09/07/2020 (Week 6)		***Non-teaching week for all courses***	
16/07/2020 (Week 7)	Introduction to road design	Route location, speed parameters	Design workshop – I Introduction and chainage
23/07/2020 (Week 8)	Design road sections	Horizontal alignment	Design workshop – II Horizontal curves
30/07/2020 (Week 9)	Design road sections	Vertical alignment	Design workshop – III Vertical curves
06/08/2020 (Week 10)	Design cross-sections	Cross sections and earthworks	Design workshop – IV Cross-sections & Earthworks

ASSESSMENT

The final grade for this course will be based on the sum of the scores from the assignments and the final examination. For the values of the single components see the table below:

Strand	Assessment	Weighting	Assessment Criteria
1	Weekly Moodle Quizzes (Weeks 1-5)	5%	Weekly online quizzes will be administered via Moodle. The Moodle quizzes will be based on the material covered in lectures and workshops. The Moodle quizzes will be open book and are intended to help prepare the students for the mid-session quiz and final exam. The weekly assessments also provide a means for continuous assessment and feedback for students throughout the course. The questions will be marked based on technical accuracy. There will be **5 quizzes** in total, one administered every week (**between Week 1 and Week 5**) which will be accessible immediately succeeding the workshop **(Thursday 6PM -7PM).**
1	Mid-term Exam	20%	A mid-session exam will be administered on **13th of July between 9AM and 12PM (Week 7)**. The exam will cover Strand 1 material (Week 1 to Week 5 Lectures/Workshops) and is intended to assess student's knowledge of the expected learning outcomes, prepare students for the final exam, and discourage last minute cramming. The quiz will be assessed on technical accuracy.
2	Design Assignment (Individual Assessment)	25%	This assignment will be based on the topics covered in Weeks 7 to 10 lectures and workshops. The assignment tests a student's understanding for designing different elements of a roadway in accordance with the Austroads design manual. The expected outcome of this assignment is to prepare students for the final exam and discourage last minute cramming. The questions will be marked based on methodological accuracy. The assignment will be made available at the beginning of Week 7. The last date of submitting assignment is **7th August Friday 11:59PM (Week 10).** The assignment is for individual assessment and must be submitted via the Turnitin link available on the course page in Moodle. The assignment must have a cover sheet according to UNSW template.
1 & 2	Final Exam	50%	A 2-hour open-book final exam will be administered at the end of the term. The exam will be cumulative (covering both Strand 1 and Strand 2 material) and intended to assess the student's knowledge of the material covered throughout the entire course. The exam questions (and weighting) will be evenly split between the two strands of the courses. The exam will be assessed on technical accuracy.

Failure to attend the quizzes/mid-term exam/final exam will result in a mark of zero. Students who miss the assessment as a result of illness or unforeseen circumstances must apply for special considerations through the School of Civil and Environmental Engineering and contact the course-coordinator. Students who perform poorly in the assignment and workshops are recommended to discuss progress with the lecturer during the term. The lecturer reserves the right to adjust the final scores by scaling if agreed to by the Head of School.

PENALTIES

A late penalty of 10% per day will apply for failure to submit the assignment by the stated due date. Any assignment submitted 5 or more days after the deadline will receive a mark of zero

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Due date and submission requirements	Deadline for absolute fail	Marks returned
Quizzes						
Quiz 1	1 hour	1%	1, 2	Thursday 4th June at 19:00 on Moodle	Thursday 4th June at 19:00	Thursday 4th June
Quiz 2	1 hour	1%	1, 2	Thursday 11th June at 19:00 on Moodle	Thursday 11th June at 19:00	Thursday 11th June
Quiz 3	1 hour	1%	2,3	Thursday 18th June at 19:00 on Moodle	Thursday 18th June at 19:00	Thursday 18th June
Quiz 4	1 hour	1%	2,3,4	Thursday 25th June at 19:00 on Moodle	Thursday 25th June at 19:00	Thursday 25th June
Quiz 5	1 hour	1%	2,3,4	Thursday 2nd July at 19:00 on Moodle	Thursday 2nd July at 19:00	Thursday 2nd July
Major Assessments						
Mid-term Exam	2 hours	20%	1, 2, 3, 4	Monday 13th July 12.00 on Moodle	Monday 13th July 12.00	Friday 24th July
Design Assignment	4 weeks	25%	5,6,7,8	Friday 7th August at 23:59 via Turnitin	Wednesday 12th August	Monday 17th August
Final Exam	2 hours	50%	1,2,3,4,5,6,7,8	TBD (Refer to myUNSW)	N/A	N/A

The pass mark in this course is 50% overall, however, students must score at least 40% in the final examination in order to qualify for a Pass in this course. If below a 40% is scored on the Final Exam, the final exam mark will replace your course mark. Please note that passing of all course components is required to pass the subject.

Supplementary Examinations for Term 2 2020 will be held on Monday 7th – Friday 11th September (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

RELEVANT RESOURCES

All required reading will be provided in the form of lecture notes. Recommended reading (available in the library):

- Copies of class notes are available at the Moodle site for this course: http://teaching.unsw.edu.au/elearning
- Principles of Highway Engineering and Traffic Analysis, Revised Edition/ Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski
- Moving People: Sustainable Transportation Development/Peter Cox
- Planning Sustainable Transport/Barry Hutton
- Sustainable Transportation Planning: Tools for Creating Vibrant, Healthy, and Resilient Communities/ Jeffrey Tumlin
- Sustainable Transportation: Problems and Solutions/ William R. Black
- An Introduction to Sustainable Transportation: Policy, Planning and Implementation/Preston L. Schiller, Eric Bruun, Jeffrey R. Kenworthy
- Modelling Transport, Fourth Edition/Juan de Dios Ortúzar, Luis G. Willumsen
    - Comments: Modelling Transport, Fourth Edition is Published Online: http://onlinelibrary.wiley.com/book/10.1002/9781119993308.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://student.unsw.edu.au/dates

PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership