CVEN4404

Fundamentals of Traffic Engineering

Term One // 2021

School of Civil and Environmental Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Divya J. Nair	divya.nair@unsw.edu.au	Thursday 9am to 3pm	Office: H20, Level 1, CE 103	(+61 2) 9065 4861

School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Credit Points 6

Summary of the Course

CVEN4404: Fundamentals of Traffic Engineering aims to provide undergraduate and postgraduate students with the knowledge and skills necessary to contribute as a practising Traffic Engineer. Traffic engineering professionals are tasked with the responsibility of ensuring the safe and efficient movement of people and goods through the provision and maintenance of transportation systems. The effectiveness of the transport system defines the economic development and quality of life for the entire community. This course offers students to understand the technical expectations required by both public and private sector employees in the discipline.

The course will cover the broad topics of traffic flow theory and modelling, traffic control device design and implementation and traffic management practices. The fundamentals of traffic flow theory and the tools necessary to assess capacity and level of service for road segments and intersections are discussed in detail during the first half of the course. The second half of the course covers the application of the theory and use of the tools to conduct traffic studies and manage and control traffic-related issues. Students will have the opportunity to analyse real traffic data, develop traffic management plans and design traffic control devices using industry prevalent modelling software such as "SIDRA Intersection", developing necessary practical skills as a Traffic Engineer.

Course Aims

This course is designed to develop students' understanding, skills and knowledge in the field of traffic and transport engineering. While the focus of the course is clearly on the design, analysis and management of road transport facilities on both the supply and demand side, importance is also placed on the reporting and presentation of technical material that can be used by high-level decision-makers.

List of programme attributes:

- In-depth knowledge of the fundamentals of traffic engineering
- Capacity for analytical and critical thinking and for creative problem-solving in traffic engineering
- Ability to engage independent and reflective learning
- Skills for collaborative and multi-disciplinary work
- Learn management methods related to traffic engineering.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Understand relationships between fundamental traffic flow parameters	PE1.1, PE1.2, PE1.4
2. Identify and understand current technologies being used in traffic management and control	PE1.1, PE1.5, PE1.4, PE2.2, PE2.4
3. Have a sound understanding of the practical application of basic concepts, methods and techniques in urban traffic management studies.	PE2.1, PE2.2, PE2.4
4. Understand the value of traffic design softwares as a tool to evaluate various strategies	PE1.1, PE1.2, PE1.5
5. Understand and analyse field survey methodologies and analyse traffic data	PE1.1, PE1.2, PE2.1, PE2.2, PE2.4
6. Recognise and remediate existing and potential traffic management problems	PE1.1, PE1.2, PE2.1, PE2.2, PE2.4, PE3.3
7. Develop appropriate management and control strategies to achieve these goals	PE2.1, PE2.2, PE2.4, PE3.1, PE3.2

Teaching Strategies

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
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
Laboratory Work	• Hands-on work, to set studies in context

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Moodle Quiz: Understanding Traffic Flow Theory	5%	04/03/2021 07:00 PM	1, 2, 3
Mid-Term Exam	25%	01/04/2021 11:00 AM	1, 2, 3, 5
Assignment: Practical Project	20%	23/04/2021 11:59 PM	4, 5, 6, 7
Final Exam	50%	Not Applicable	1, 2, 3, 4, 5, 6, 7

Assessment Details

Assessment 1: Moodle Quiz: Understanding Traffic Flow Theory

Start date: 04/03/2021 05:00 PM

Length: 2 hours

Details:

This assignment focuses on students "Understanding Theory" that has been presented during the **first 3 weeks of the term**. The quiz will involve solving a series of problems, extending from the problems discussed during the lectures. The quiz will assess the expected learning outcomes and will be assessed based on technical accuracy.

Due Date and Absolute Deadline: 04/03/2021 07:00 PM

Failure to attend the Moodle quiz 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 (https://student.unsw.edu.au/special-consideration**)** and contact the course-coordinator.

Grades will be returned on 11/03/2021.

Submission notes: This assignment will be submitted on Moodle (Quiz)

Turnitin setting: This is not a Turnitin assignment

Assessment 2: Mid-Term Exam

Start date: 01/04/2021 09:00 AM

Length: 2 hours

Details:

A mid-term exam will be administered **during the Week 7 Lecture**. The exam will cover all the **material until and including Week 5 of the course** and is intended to assess students' knowledge of the expected learning outcomes, prepare students for the final exam, and discourage last-minute cramming. The exam will be assessed on technical accuracy.

Due Date and Absolute Deadline: 01/04/2021 11:00 AM

Failure to attend the Moodle quiz 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 (https://student.unsw.edu.au/special-consideration**)** and contact the course-coordinator.

Grades will be returned on 18/04/2021 and students will be provided with individual online feedback concerning performance. Exam solutions will be provided for review prior to the final exam.

Additional details:

Submission notes: This assignment will be submitted on Moodle (Quiz)

Turnitin setting: This is not a Turnitin assignment

Assessment 3: Assignment: Practical Project

Start date: 11/03/2021 11:59 PM

Length: 6 Weeks

Details:

This assignment allows students to display their understanding of how to conduct a traffic study and propose traffic management schemes for realistic scenarios. The assignment will involve investigating a case study and using the knowledge gained within the lectures to develop solutions for the specific case. The assignment will assess the expected learning outcomes and will be assessed based on technical accuracy, clarity in reporting and presentation.

Due Date: 23/04/2021 11:59PM

Absolute Deadline: 28/04/2021 11.59PM

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

Grades will be returned on 09/05/2021 and students will be provided with individual online feedback concerning performance.

Additional details:

Submission notes: This assignment will be submitted on Moodle and online individual feedback will be

provided to each student

Turnitin setting: This is not a Turnitin assignment

Assessment 4: Final Exam

Start date: Not Applicable

Length: 2 hours

Details:

A 2-hour open-book final exam will be administered at the end of the semester. The exam will be cumulative and intended to assess the students' knowledge of the material covered throughout the entire course. The exam will be assessed on technical accuracy.

The performance in the final exam will contribute to 50% of the final grade. In order to pass the course, a student MUST achieve a mark greater than 40% in the final exam to demonstrate a holistic understanding of the course material.

Submission notes: This assignment will be submitted on Moodle and online individual feedback will be provided to each student

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

Students are strongly encouraged to attend all lectures and workshops and review the recordings. 100% of lab attendance is mandatory for Assessment 3: Practice Project Submission. Failure to attend all the lab sessions will result in a mark of zero for Assessment 3: Practice Project. Students who miss the lab sessions as a result of illness or unforeseen circumstances must contact the course-coordinator.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 15 February - 19 February	Lecture	Traffic Flow Theory: Fundamentals of traffic flow theory
	Workshop	Fundamentals of traffic flow theory: practice problems
Week 2: 22 February - 26 February	Lecture	Traffic Flow Theory: Introduction to traffic studies, traffic flow elements and data collection
	Workshop	Introduction to traffic studies, traffic flow elements and data collection - practice problems
Week 3: 1 March - 5 March	Lecture	Traffic Flow Theory: Microscopic approaches to describe traffic flow theory, shock waves
	Workshop	Shockwaves: practice problems
Week 4: 8 March - 12 March	Lecture	Signalised Intersections: Concepts and design; Guest Lecture: Introduction to SIDRA
	Tut-Lab	Introduction to SIDRA: guidelines, data Inputs, setting up a base model, calibrating and validating
Week 5: 15 March - 19 March	Lecture	Signalised Intersection: Optimisation, coordination and adaptive signal control
	Tut-Lab	SIDRA- Design and optimize intersection: traffic signal model
Week 6: 22 March - 26 March		
Week 7: 29 March - 2 April	Lecture	Mid-Term Review and Exam
	Tut-Lab	SIDRA - Evaluation of signalised intersection
Week 8: 5 April - 9 April	Lecture	Road segments: uninterrupted flow facilities; Guest Lecture: Capacity and Level of Service (HCM)
	Tut-Lab	SIDRA - Traffic flow parameter sensitivity analysis: calibration and optimisation
Week 9: 12 April - 16 April	Lecture	Capacity and Level of Service: Road segments: uninterrupted flow facilities
	Workshop	Road segments: uninterrupted flow facilities- practice problems
Week 10: 19 April - 23 April	Lecture	Interrupted Traffic Flow: facilities, capacity and level of service
	Workshop	Interrupted Traffic Flow - practice problems

Resources

Prescribed Resources

- Roess, Roger P., Elene S. Prassas, William R. McShane. **Traffic Engineering**. Fourth Edition, Upper Saddle River: Pearson Prentice Hall, 2011 (ISBN 0-13-913573-0)
- Daganzo, C. Fundamentals of Transportation and Traffic Operations, Pergamon-Elsevier ,Oxford, U.K. (1997)
- Mannering, F. and Washburn, S. (2013). “Principles of Highway Engineering and Traffic Analysis”. Chapter 5: Fundamentals of Traffic Flow and Queueing Theory.
- **Highway Capacity Manual** (2010) (HCM2010), Transportation Research Board
- Austroads (2008-2015). **Guide to Traffic Management Set** (13 Part Series)
    - Part 2. Traffic Theory
    - Part 3. Traffic Studies Analysis
    - Part 6. Intersections, Interchanges and Crossings
    - Part 8. Local Area Traffic Management
    - Part 7. Traffic Signals

Recommended Resources

Please see Moodle under "Resources" tab for all recommended and additional reading resources

Course Evaluation and Development

Laboratory Workshop Information

Workshops: Workshops will be guided by the lecturer and demonstrators (postgraduate research students/research fellow) and will be focussed on solving practice problems and asking questions related to the lecture. Workshops are online sessions and are scheduled on Weeks 1,2,3,9 and 10.

Labs: Labs will be guided by the lecturer, Traffic Engineer (TfNSW) and demonstrators (postgraduate research students/research fellow). Students will have the opportunity to analyse real traffic data, develop traffic management plans and design traffic control devices using industry prevalent modelling software such as "SIDRA Intersection", developing necessary practical skills as a Traffic Engineer. Labs are online/face-to-face sessions and are scheduled on Week 4 to Week 8

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

Academic Honesty and 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 Information

Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.

Final Examinations:

Final exams in Term 1 will be held online between 30th April - 13th May inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

Supplementary Examinations:

Supplementary Examinations for Term 1 2021 will be held on 24th - 28th May inclusive should you be required to sit one. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

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

Image Credit

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CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in 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	