UNSW Course Outline

CVEN4404 Fundamentals of Traffic Engineering - 2024

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General Course Information

Course Code : CVEN4404
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Civil and Environmental Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

<u>Useful Links</u>

<u>Handbook</u> <u>Class Timetable</u>

Course Details & Outcomes

Course Description

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 impacts the economic

development and quality of life for the entire community.

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", which will provide students with the necessary practical skills to be 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 program attributes:

An in-depth knowledge of 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

Course Learning Outcomes
CLO1 : Explain relationships between fundamental traffic flow parameters
CLO2 : Apply basic concepts, methods, and techniques in urban traffic management studies.
CLO3 : Identify and apply current technologies in traffic management and control
CLO4 : Critically analyse field survey methodologies and traffic data
CLO5 : Solve complex existing and potential traffic management problems

Course Learning Outcomes	Assessment Item
CLO1 : Explain relationships between fundamental traffic flow parameters	• Moodle Quizzes • Final Exam
CLO2 : Apply basic concepts, methods, and techniques in urban traffic management studies.	• Moodle Quizzes • Final Exam
CLO3 : Identify and apply current technologies in traffic management and control	• Assignment • Moodle Quizzes • Final Exam
CLO4 : Critically analyse field survey methodologies and traffic data	• Assignment • Final Exam
CLO5 : Solve complex existing and potential traffic management problems	• Assignment • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Moodle Quizzes Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Not Applicable
Assignment Assessment Format: Individual	20%	Due Date: 10/04/2024 04:00 PM
Final Exam Assessment Format: Individual	50%	

Assessment Details

Moodle Quizzes

Assessment Overview

3 x 30 minute quizzes which will run during the lectures in Weeks 3, 4 and 5. Marks will be

returned 1 week from the submission date.

Course Learning Outcomes

- CLO1 : Explain relationships between fundamental traffic flow parameters
- CLO2 : Apply basic concepts, methods, and techniques in urban traffic management studies.
- CLO3 : Identify and apply current technologies in traffic management and control

Detailed Assessment Description

Three online quizzes will be administered via Moodle in weeks 3, 7 and 10. The Moodle quizzes will be based on the material covered in lectures and workshops. The Moodle quizzes are intended to help prepare the students for the final exam. These 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.

QUIZ 1: Topics covered - Traffic Flow Theory (Week 3)

QUIZ 2: Topics covered - Shockwaves and Signal Deesign (Week 7)

QUIZ 3: Topics covered - Capacity and Level of Service (Week 10)

Assessment Length

30 minutes

Submission notes

This assignment will be submitted on Moodle (Quiz)

Assessment information

See Moodle for details

Assignment submission Turnitin type

This is not a Turnitin assignment

Assignment

Assessment Overview

This assignment should be a maximum of 10 pages in length (including numerical and application problems). Marks will be returned 2 weeks from the submission date.

Course Learning Outcomes

- CLO3 : Identify and apply current technologies in traffic management and control
- CLO4 : Critically analyse field survey methodologies and traffic data
- CLO5 : Solve complex existing and potential traffic management problems

Detailed Assessment Description

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.

Assessment Length

3 Weeks

Submission notes

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

Assessment information

See Moodle for details

Assignment submission Turnitin type

This is not a Turnitin assignment

Final Exam

Assessment Overview

2-hour final exam held in the formal examination period. All content from the term may be assessable.

Course Learning Outcomes

- CLO1 : Explain relationships between fundamental traffic flow parameters
- CLO2 : Apply basic concepts, methods, and techniques in urban traffic management studies.
- CLO3 : Identify and apply current technologies in traffic management and control
- CLO4 : Critically analyse field survey methodologies and traffic data
- CLO5 : Solve complex existing and potential traffic management problems

Assessment Length

2 hours

Assessment information

The final grade for this course will be based on the sum of the scores from the assignment, mid-term exam and the final examination.

The pass mark 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 in the final exam, the final exam mark will replace your course mark.

Students who perform poorly in the group project and mid-session exam are recommended to discuss the progress with the lecturer during the term. The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Assignment submission Turnitin type

This is not a Turnitin assignment

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Traffic Flow Theory: Fundamentals of traffic flow theory
	Workshop	Traffic Flow Theory: practice problems
Week 2 : 19 February - 25 February	Lecture	Traffic Flow Theory: Microscopic approaches to describe traffic flow theory, shock waves
	Workshop	Shockwaves: practice problems
Week 3 : 26 February - 3 March	Lecture	Traffic Flow Theory: Traffic studies, traffic flow elements and data collection
	Workshop	Shockwaves and Traffic Studies - practice problems
	Assessment	Moodle Quiz 1: Traffic Flow Theory
Week 4 : 4 March - 10 March	Lecture	Signalised Intersections: Concepts and design Guest Lecture: SIDRA Intersection
	Tut-Lab	Signal design - practice problems Introduction to SIDRA: guidelines, data Inputs, setting up a base model, calibrating and validating
Week 5 : 11 March - 17 March	Lecture	Signalised Intersection: Optimisation, coordination and adaptive signal control
	Tut-Lab	Signal Optimisation - practice problems SIDRA- Design and optimize intersection: traffic signal model
Week 6 : 18 March - 24 March	Other	Flexibility Week
Week 7 : 25 March - 31 March	Lecture	Guest Lecture: Aimsun traditional modelling and simulation through to the current practices - multi-modality, AI & ML and use in real-time operations and traffic control
	Tut-Lab	AIMSUN - guidelines, data Inputs, setting up a base model, calibrating and validating
	Assessment	Moodle Quiz 2: Shockwaves and Signal Design
Week 8 : 1 April - 7 April	Lecture	Road segments: uninterrupted traffic flow facilities; Capacity and Level of Service (HCM)
	Workshop	Capacity and level of service - practice problems
Week 9 : 8 April - 14 April	Lecture	Road segments:Interrupted traffic flow facilities
	Tut-Lab	SIDRA - Evaluation of signalised intersection Traffic flow parameter sensitivity analysis: calibration and optimisation
	Assessment	Assessment 2: Assignment
Week 10 : 15 April - 21 April	Lecture	Variability in Traffic Flow and Queuing Approach
	Workshop	Interrupted Traffic Flow and Variability in Traffic Flow - practice problems
	Assessment	Moodle Quiz 3: Capacity and Level of Service

Attendance Requirements

Students are strongly encouraged to attend all lectures and workshops and review

the recordings. 100% lab attendance is mandatory for Assessment 2 submission; failure to

attend all the lab sessions will result in a mark of zero for Assessment 2. Students who miss the lab sessions as a result of illness or unforeseen circumstances must contact the course coordinator.

Course 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, 2022) (HCM2010, HCM2022), Transportation Research Board
- Austroads (2008-2023). **Guide to Traffic Management Set** (13 Part Series)
  - Part 2. Traffic Theory
  - Part 3. Traffic Studies Analysis
  - Part 6. Intersections, Interchanges and Crossings
  - Part 9. Transport Control Systems, Strategies and Operations
  - Part 7. Traffic Controllers

Recommended Resources

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Divya J. Nair		Office: H20, Level 1, CE 103		Wednesday 9am to 4pm	No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or

within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the

University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/ Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way

through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific 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)

School-specific Information

Final Examinations

Final Exams in T1 2024 will be held on campus between the 26th April and 9th May, and Supplementary Exams between the 20th - 24th May 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see the Nucleus: Student Hub. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.