



UNSW

UNSW Course Outline

CVEN3402 Transport Engineering and Environmental Sustainability - 2024

Published on the 28 May 2024

General Course Information

Course Code : CVEN3402

Year : 2024

Term : Term 2

Teaching Period : T2

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 : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

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 the basics of traffic flow theory and the steps of the regional transport planning process. The lectures and workshops will provide an opportunity to learn the engineering properties of traffic streams along with relevant measurement and network analysis techniques.

The second strand of the course cover analysis methods required for sustainable transport engineering. This includes technical skills required for the evaluation and management of environmental impacts from transport projects, including estimation of vehicle emissions, energy consumption, and travel demand management. The course covers the application of planning concepts in the development of economically sustainable transport systems including lifecycle and cost-benefit analyses. Additionally, estimation of noise levels and engineering solutions to control noise is covered in the context of transport noise generators such as road traffic.

Course Aims

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 quantifying sustainability with regard to transport systems. During the course we will:

- Recognise the importance of transport within the framework of Ecologically Sustainable Development.
- Explain the nature of transport and traffic noise.

- Describe the sources and impacts of transport emissions.
- Assess the sustainability of the transport system from a broad multi-criteria perspective

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Explain relationships between fundamental traffic flow parameters;
CLO2 : Explain basic concepts of four-step travel demand modelling and demonstrate calculation methods related to each step
CLO3 : Perform computational evaluations of network traffic management methods
CLO4 : Describe the relationships between Land Use, Transport and the Environment
CLO5 : Estimate traffic noise levels, emissions and energy consumption under different planning scenarios
CLO6 : Apply the generalised cost framework to evaluate transport strategies
CLO7 : Perform life-cycle based computational evaluations of projects and policies

Course Learning Outcomes	Assessment Item
CLO1 : Explain relationships between fundamental traffic flow parameters;	<ul style="list-style-type: none"> • Weekly Moodle Quiz • Final Exam • Mid-Term Exam
CLO2 : Explain basic concepts of four-step travel demand modelling and demonstrate calculation methods related to each step	<ul style="list-style-type: none"> • Weekly Moodle Quiz • Final Exam • Mid-Term Exam
CLO3 : Perform computational evaluations of network traffic management methods	<ul style="list-style-type: none"> • Final Exam • Mid-Term Exam
CLO4 : Describe the relationships between Land Use, Transport and the Environment	<ul style="list-style-type: none"> • Weekly Moodle Quizzes • Final Exam
CLO5 : Estimate traffic noise levels, emissions and energy consumption under different planning scenarios	<ul style="list-style-type: none"> • Weekly Moodle Quizzes • Final Exam
CLO6 : Apply the generalised cost framework to evaluate transport strategies	<ul style="list-style-type: none"> • Weekly Moodle Quizzes • Final Exam
CLO7 : Perform life-cycle based computational evaluations of projects and policies	<ul style="list-style-type: none"> • Weekly Moodle Quizzes • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

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

Additional Course Information

The most important factors in learning are students' commitment and learning methods. You are encouraged to attend all the lectures and other teaching activities, ask questions and participate in class discussions. Weekly review of lecture and workshop material. Follow worked examples. Reflect on lecture/workshop problems and quizzes. In addition, relevant resources on the Moodle course page are of great help in understanding the basic concepts discussed in the lectures and the trends in the discipline of transport engineering.

Complete all the required tasks in the Moodle course page. Weekly reading and recording of your learning. Planning your time to achieve all assessment requirements (see assessment). We encourage you to work with your peers. A good way to learn the material is in small study groups. Such groups work best if members have attempted the problems individually before meeting as a group. A valued and honest collaboration occurs when, for example, you get stuck early on in attacking an exercise and go to your classmate with a relevant question. Your classmate then has the opportunity to learn from your question as well as help you. You then bring something to the collaboration.

Students who perform poorly in the assessments are strongly encouraged to discuss their progress with the lecturer during the term. Please do not suffer in silence - seek help at an early stage! We would like you to make the most of this learning process.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Weekly Moodle Quiz Assessment Format: Individual	5%	Start Date: Not Applicable Due Date: Not Applicable
Weekly Moodle Quizzes Assessment Format: Individual	25%	Start Date: Not Applicable Due Date: Week 7: 08 July - 14 July, Week 8: 15 July - 21 July, Week 9: 22 July - 28 July, Week 10: 29 July - 04 August
Final Exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable
Mid-Term Exam Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Not Applicable

Assessment Details

Weekly Moodle Quiz

Assessment Overview

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.

Course Learning Outcomes

- CLO1 : Explain relationships between fundamental traffic flow parameters;
- CLO2 : Explain basic concepts of four-step travel demand modelling and demonstrate calculation methods related to each step

Detailed Assessment Description

QUIZ 1: Topics covered - Transport Systems and Planning, Trip Generation and Trip Attraction Models

QUIZ 2: Topics covered - Mode Choice and Traffic Assignment Models

QUIZ 3: Topics covered - Traffic Flow Theory and Fundamental Relationship Between Traffic Flow Elements

Assessment information

See Moodle for details

Weekly Moodle Quizzes

Assessment Overview

Strand 2 assessments will be made available as 4 Moodle quizzes. Each assessment will contribute 6.25% of the final grade. Any late submission will be considered as a fail and no scores will be given to the student. The questions will be based on the material covered in lectures and are designed to build on the skills developed in workshop. Each week, the students will use the assessments to revise the lecture material and solidify the relevant methodologies. The questions will be marked based on technical accuracy.

Course Learning Outcomes

- CLO4 : Describe the relationships between Land Use, Transport and the Environment
- CLO5 : Estimate traffic noise levels, emissions and energy consumption under different planning scenarios

- CLO6 : Apply the generalised cost framework to evaluate transport strategies
- CLO7 : Perform life-cycle based computational evaluations of projects and policies

Detailed Assessment Description

Quiz 1: Transport air pollution

Quiz 2: Economics of transport externalities

Quiz 3: Transport emission models

Quiz 4: Transport noise models

Assessment information

See Moodle for details

Final Exam

Assessment Overview

A 2-hour final exam will be administered at the end of the semester. 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.

Course Learning Outcomes

- CLO1 : Explain relationships between fundamental traffic flow parameters;
- CLO2 : Explain basic concepts of four-step travel demand modelling and demonstrate calculation methods related to each step
- CLO3 : Perform computational evaluations of network traffic management methods
- CLO4 : Describe the relationships between Land Use, Transport and the Environment
- CLO5 : Estimate traffic noise levels, emissions and energy consumption under different planning scenarios
- CLO6 : Apply the generalised cost framework to evaluate transport strategies
- CLO7 : Perform life-cycle based computational evaluations of projects and policies

Detailed Assessment Description

See Moodle for details.

Assessment information

See Moodle for details

Hurdle rules

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.

Mid-Term Exam

Assessment Overview

A mid-session exam will cover Strand 1 material 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 exam will be assessed on technical accuracy.

Course Learning Outcomes

- CLO1 : Explain relationships between fundamental traffic flow parameters;
- CLO2 : Explain basic concepts of four-step travel demand modelling and demonstrate calculation methods related to each step
- CLO3 : Perform computational evaluations of network traffic management methods

Detailed Assessment Description

See Moodle for more information. Topics include:

- Transport Systems and Planning, Trip Generation and Trip Attraction Models
- Mode Choice and Traffic Assignment Models
- Traffic Flow Theory and Fundamental Relationship Between Traffic Flow Elements

General Assessment Information

Students who miss the assessments as a result of illness or unforeseen circumstances must apply for special considerations through <https://student.unsw.edu.au/special-consideration> 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.

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.

Grading Basis

Standard

Requirements to pass course

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.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Outline of the course; Introduction to Transport Systems and Planning
	Lecture	Transport Systems and Planning: 4-Step Modeling
	Workshop	Practice Problems: Transport Systems and Planning
Week 2 : 3 June - 9 June	Lecture	Trip Generation Models
	Lecture	Trip Distribution Models
	Workshop	Practice Problems: Trip Generation and Distribution Models
Week 3 : 10 June - 16 June	Lecture	Mode Choice Models
	Lecture	Mode Choice and Traffic Assignment Models
	Workshop	Practice Problems: Mode Choice and Traffic Assignment
	Assessment	QUIZ 1: Transport Systems and Planning, Trip Generation and Trip Attraction Models
Week 4 : 17 June - 23 June	Lecture	Traffic Assignment Models and Applications of the 4-Step Model
	Lecture	Introduction to Traffic Flow Theory
	Workshop	Practice Problems: Traffic Flow Theory
	Assessment	QUIZ 2: Mode Choice and Traffic Assignment
Week 5 : 24 June - 30 June	Lecture	Fundamental Relationship Between Traffic Flow Elements
	Lecture	Applications of Traffic Flow Theory and Review of Strand 1
	Workshop	Practice Problems: Fundamental Relationship Between Traffic Flow Elements
	Assessment	QUIZ 3: Traffic Flow Theory and Fundamental Relationship Between Traffic Flow Elements
Week 7 : 8 July - 14 July	Assessment	Mid-term Exam: Moodle Exam on strand 1
	Lecture	Transport Air Pollution, Low Carbon Fuels and Vehicles
	Lecture	Transport Sustainability Framework
	Workshop	Practice Problem: Vehicle air Pollution and Fleet Transition Towards Low Carbon Transport
	Assessment	Quiz 4: Air Pollution and Low Carbon Fuels
Week 8 : 15 July - 21 July	Lecture	Economies of Transport Externalities
	Lecture	Guest Lecture: Hydrogen Fuel Cell Vehicles
	Workshop	Practice Problem: Economic Analysis of Emissions and NPV Calculations
	Assessment	Quiz 5: Economic Analysis of Transport Externalities
Week 9 : 22 July - 28 July	Lecture	Transport Emission Models
	Lecture	Fleet Transition and Net Zero Target
	Workshop	Practice Problem: Emission Modelling and Sustainable Transport Strategies
	Assessment	Quiz 6: Emission Measurements
Week 10 : 29 July - 4 August	Lecture	Emission Dispersion Models
	Lecture	Noise Emission Models
	Workshop	Practice Problem: Noise Emission Measurement
	Assessment	Quiz 7: Noise Measurement

Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled for the duration of the sessions.

Course Resources

Prescribed Resources

All required/recommended reading for Strand 1 will be provided on Moodle, including:

- Copies of class notes are available at the Moodle site for this course: <http://teaching.unsw.edu.au/elearning>
- Austroads Guide to Road Design: Part 1 Objectives of Road Design and Part 3: Geometric Design.
- Traffic and Highway Engineering, fourth edition, Garber N.J. and Hoel L.A
- Principles of Highway Engineering and Traffic Analysis, Revised Edition/ Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski
- An Introduction to Traffic Flow Theory, Lily Elefteriadou
- Modelling Transport, Fourth Edition/Juan de Dios Ort  ezar, Luis G. Willumsen
 - Comments: Modelling Transport, Fourth Edition is Published Online: <http://onlinelibrary.wiley.com/book/10.1002/978111993308>

All required/recommended reading for Strand 2 will be provided on Moodle, including:

- ATAP Guideline – PV5 Environmental Parameter Values
- COPERT Australia: a new software to estimate vehicle emissions in Australia (2013)
- MOVES 3 Overview (2021)
- Electric Vehicle Uptake: Modelling a Global Phenomenon (BITRE, 2019)
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, developed by the Environment Protection Authority (EPA), 2016
- CoRTN- Calculation of Road Traffic Noise, UK, 1988
- RTA Environmental Noise Management Manual

Recommended Resources

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

Course Evaluation and Development

Workshops: Workshops will be guided by the lecturer and demonstrators (UG, PG, research

students) and will be focussed on solving practice problems and asking questions related to the lecture. Workshops are face-to-face sessions and are scheduled on Weeks 1-5 and 7-10.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Divya Nair		Room 103, Level 1, H20	+61 2 9065 4861	Monday 10am to 3pm	No	No
	Elnaz Irann ezhad		Room 105, Level 1, H20		Monday, Tuesday, Wednesday, Friday 9am to 3pm	No	Yes
	Meedad Saber i Kalaei		Room 104, Level 1, H20			No	No

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 Plagiarism

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 T2 2024 will be held on campus between the 9th - 22nd August, and Supplementary Exams between the 2nd - 6th September 2024. You are required to be available on these dates. Please do not 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 this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.