



## UNSW Course Outline

# CVEN3401 Sustainable Transport and Highway Engineering - 2024

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## General Course Information

**Course Code :** CVEN3401

**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 :** Postgraduate, Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This is the first introductory course in 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 course comprises two strands.

- Strand one covers the analysis, design, and evaluation of traffic and transport systems, including the fundamentals of traffic flow theory and the "4-step transport modelling" approach to determine travel demands, a key component of infrastructure feasibility assessments and design to ensure satisfactory operations.
- The second strand provides a brief overview of the geometric design of Rural Highways and Roads. Topics include an introduction to road design, route location process, and design practice of urban and rural roads.

## Course Aims

The course aims to develop skills related to the analysis of traffic and transport systems and highway geometric design.

Strand one aims to introduce components of the field of transport engineering and basic elements of transport and traffic engineering practice, provide an opportunity to learn the engineering properties of traffic streams along with relevant measurement and network analysis techniques and explain urban transport planning concepts adopted by planning agencies and Roads and Traffic Authorities. The second strand will introduce the basic principles of road geometric design and explain the methods of geometric design including horizontal and vertical alignment design and design of cross-sections as well as earthwork volume calculations.

In particular, the students will be able to apply the data analysis and modelling concepts of transport planning and traffic engineering to develop and manage transport systems. Further, the design procedure being taught is based on the Austroads Road Design Guide. The student will therefore develop a good understanding of the design methods, guidelines, and quality requirements to enable him/her to evaluate the design.

# Course Learning Outcomes

Course Learning Outcomes
CL01 : Explain relationships between fundamental traffic flow parameters
CL02 : Describe basic concepts of four-step travel demand modelling and apply computational methods related to each step
CL03 : Perform computational evaluations of network traffic management methods
CL04 : Develop and evaluate horizontal and vertical alignments according to various design criteria
CL05 : Design cross-sections appropriate for various types of roads
CL06 : Present and document the road design in a standard format

Course Learning Outcomes	Assessment Item
CL01 : Explain relationships between fundamental traffic flow parameters	<ul style="list-style-type: none"><li>• Moodle Quizzes</li><li>• Final Exam</li></ul>
CL02 : Describe basic concepts of four-step travel demand modelling and apply computational methods related to each step	<ul style="list-style-type: none"><li>• Moodle Quizzes</li><li>• Final Exam</li></ul>
CL03 : Perform computational evaluations of network traffic management methods	<ul style="list-style-type: none"><li>• Moodle Quizzes</li><li>• Final Exam</li></ul>
CL04 : Develop and evaluate horizontal and vertical alignments according to various design criteria	<ul style="list-style-type: none"><li>• Highway Geometric Design</li><li>• Final Exam</li></ul>
CL05 : Design cross-sections appropriate for various types of roads	<ul style="list-style-type: none"><li>• Highway Geometric Design</li><li>• Final Exam</li></ul>
CL06 : Present and document the road design in a standard format	<ul style="list-style-type: none"><li>• Highway Geometric Design</li><li>• Final Exam</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

## 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
Moodle Quizzes Assessment Format: Individual	30%	Due Date: Not Applicable
Highway Geometric Design Assessment Format: Individual	20%	Start Date: 08/07/2024 09:00 AM Due Date: 02/08/2024 04:00 PM
Final Exam Assessment Format: Individual	50%	Start Date: TBA Due Date: TBA

## Assessment Details

### Moodle Quizzes

#### Assessment Overview

Three online quizzes will be administered via Moodle. 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.

#### Course Learning Outcomes

- CL01 : Explain relationships between fundamental traffic flow parameters
- CL02 : Describe basic concepts of four-step travel demand modelling and apply computational methods related to each step
- CL03 : Perform computational evaluations of network traffic management methods

### 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

## Highway Geometric Design

### Assessment Overview

This assignment will be based on the topics covered in Strand 2 lectures and workshops. The assignment tests a student's understanding of 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.

### Course Learning Outcomes

- CL04 : Develop and evaluate horizontal and vertical alignments according to various design criteria
- CL05 : Design cross-sections appropriate for various types of roads
- CL06 : Present and document the road design in a standard format

### Submission notes

Late submissions will attract penalties.

### Assessment information

See Moodle for details

## Final Exam

### Assessment Overview

A 2-hour 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.

### **Course Learning Outcomes**

- CL01 : Explain relationships between fundamental traffic flow parameters
- CL02 : Describe basic concepts of four-step travel demand modelling and apply computational methods related to each step
- CL03 : Perform computational evaluations of network traffic management methods
- CL04 : Develop and evaluate horizontal and vertical alignments according to various design criteria
- CL05 : Design cross-sections appropriate for various types of roads
- CL06 : Present and document the road design in a standard format

### **Assessment information**

See Moodle for details.

## **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.

### **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	Lecture	Introduction to Highway Engineering and Road Design
	Lecture	Kinematics, Speed Parameters, Sight Distance
	Workshop	Design Workshop 1: Introduction, Chainage, Highway Alignment Practice Problems: Kinematics, Speed Parameters, Sight Distance
Week 8 : 15 July - 21 July	Lecture	Horizontal alignment I
	Lecture	Horizontal alignment II
	Workshop	Design workshop II: Horizontal Alignment Practice Problems: Design of Horizontal Curves
Week 9 : 22 July - 28 July	Lecture	Vertical Alignment I
	Lecture	Vertical Alignment II
	Workshop	Design workshop III: Vertical Alignment Practice Problems: Design of Vertical Curves
Week 10 : 29 July - 4 August	Lecture	Cross-sections
	Lecture	Earthworks
	Workshop	Design workshop IV: Cross-sections & Earthworks Practice Problems: Earthwork Estimation

## 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 session.

# Course Resources

## Prescribed Resources

All required/recommended reading will be provided on Moodle or available in the library

- 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. Kilaeski
- 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/10.1002/9781119993308>.

## 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	Thursday 9am to 3pm	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 policies. 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](https://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](https://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 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.