CVEN9415

Transport Systems Part 2

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Divya Nair	divya.nair@unsw.edu.au	Thursday10am to 3pm	Room 103, Level 1, H20	(+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

Units of Credit 6

Summary of the Course

This course covers the role of stochasticity in transport systems using queuing theory to address congestion and delay minimisation. It focusses on applications to traffic flow using real-world data to constrain the models presented in the course material.

Students have the opportunity to work with real data in project-oriented design-based learning environment. In addition to the material presented on queuing theory and its applications, the course also develops skills for working with data and managing collaborative projects.

Course Aims

CVEN9415 introduces stochasticity and queuing in transport systems and the methods used to account for this within the transport infrastructure assessment. The unit will complement skills learnt in the other transport units to provide a well-rounded knowledge of transport planning and management. The main topics include an introduction to queuing theory, discussion of common queuing models, application of queuing models in traffic flow, and tools required to manage and analyse big volume of real-world data. The focus is on the application of queuing theory to vehicle flow at traffic intersections in real-world settings.

The learning goals that this course aims to achieve and details how the achievement of these goals will be assessed are described as follows:

- Understand operations research concepts applicable in the field of transport engineering.
- Describe queuing theory concepts in transport context
- Compare modelling techniques (deterministic and stochastic) adopted in transport engineering practice.
- Apply queueing models and data analysis to real-world transport problems using real data.
- Generalise on modelling results to produce policy recommendations

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Explain the basic concepts and fundamental assumptions in modelling queues in transport systems.	PE1.1, PE1.2, PE1.3
2. Describe stochastic characteristics of traffic flow in road network.	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2
3. Utilise queueing models to evaluate existing conditions and transport policy alternatives.	PE1.2, PE1.3, PE2.1, PE2.2
4. Design research question, methodology and data approach to solve real-world transport system problems.	PE1.1, PE1.6, PE2.1, PE2.3, PE2.4, PE1.4

Learning Outcome	EA Stage 1 Competencies
5. Demonstrate the ability to critically analyse real-world data applying statistical methods.	PE1.1, PE1.2, PE2.2
6. Demonstrate solving complex existing and potential transport system problems in team environment	PE1.1, PE1.2, PE2.1, PE2.2, PE2.4, PE3.2, PE3.3, PE3.6

Teaching Strategies

The following teaching strategies will be used in the course:

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
Group Work	• Exchange ideas with team members • Collaboratively solve problems • Reflect on project results
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

Assessment

Students will undertake a variety of individual and group assessment components that are associated with course objectives and learning outcomes. Groups with four members will be self-selected using groups on Moodle by end of Week 2. For group assessment items only one submission is allowed to be submitted per group. All assessment submissions will be through Moodle and/or Turnitin.

There is no final exam for this course*. The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. Read the information under the individual assignment briefs to understand the breakdown between individual and group marks for each assessment task. The lecturers reserve the right to adjust the final scores by scaling if agreed by the Head of School.*

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Moodle Quiz	20%	17/06/2022 11:59 PM	1, 2
2. Preliminary Project Design Brief (Individual Assessment)	10%	01/07/2022 11:59 PM	3, 4
3. Data Analysis and Simulation Techniques (Individual Assessment)	20%	15/07/2022 11:59 PM	3, 5
4. Project - Presentation, Professional skills and Technical Report	50%	05/08/2022 11:59 PM	2, 3, 5, 6

Assessment 1: Moodle Quiz

Start date: 16/06/2022 02:00 PM
Due date: 17/06/2022 11:59 PM
Deadline for absolute fail: 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 and contact the course-coordinator.

An online quiz will be administered via Moodle. The Moodle quiz will be based on the material covered in the first 3 weeks lectures and workshops. The Moodle quiz will assess students understanding on the basic tenets of queueing theory which will be applicable to the rest of the assessments in the course. The questions will be marked based on technical accuracy.

The Moodle quiz will be made accessible at 2 pm Thursday the 16th of June 2022 and will close by 11.59 pm Friday the 17th of June 2022. The Moodle quiz will be an open-book assessment. Students must submit their responses while the quiz is still active. You will be given only one attempt to do the quiz. Failure to complete/submit a quiz within the accessible time period will result in a mark of zero.

Assessment criteria

See Moodle for details

Additional details

See Moodle for details

Assessment 2: Preliminary Project Design Brief (Individual Assessment)

Due date: 01/07/2022 11:59 PM
Marks returned: 15 July 2022

In this assessment, you will prepare a Preliminary Project Design Brief related to a transport planning and management topic of your choice. This assessment will require you to:

1. *Identify your research question;*
2. *Describe your approach to answering this question;*
3. *Define your data needs for addressing this question;*
4. *Identify the skills required to solve this problem;*
5. *Expected outcome of the project.*

The Preliminary Project Design Brief is formed using a "Moodle Questionnaire", where your task is to respond to a series of short answer and multiple choice questions. (Note a report is not necessary for this assignment). Late submissions will attract penalities

Assessment criteria

See Moodle for details

Additional details

See Moodle for details

Assessment 3: Data Analysis and Simulation Techniques (Individual Assessment)

Due date: 15/07/2022 11:59 PM
Deadline for absolute fail: Penalties: A late penalty of 5% 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.
Marks returned: 29th July 2022

This assignment will be based on the topics covered in the Week 4 and 5 lectures and workshops. The assignment tests a student's ability to understand and interpret the available real-world traffic data, and simulation techniques used in queueing theory. The knowledge tested through this assignment will later be used in the group project assessment later in the course. The questions will be marked based on technical and methodological accuracy.

The assessment will be made available at the beginning of Week 5. The last date for submitting the assessment is Friday, 15th July 2022 11:59 PM (Week 7). The individual assessment must be submitted via the Turnitin link available on the Moodle course page.

Late submissions will attract penalties.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment criteria

See Moodle for details

Assessment 4: Project - Presentation, Professional skills and Technical Report

Due date: 05/08/2022 11:59 PM

The group project involves developing queueing models to analyse vehicle flow at a traffic intersection using the available real-world dataset. Students have to form teams comprising a maximum of 4, on Moodle, prior to commencing project work. The aim of the project is to give students an experience of the practice followed by transport consultants in proposing solutions to real-world problems in transport. Students will also get experience working in a team environment and collaborating with team members during this project activity.

The assessment has three components:

(1) Presentation and Peer Assessment (10%) - An oral presentation to the lecturer, demonstrator and peers. The presentations will occur during Week 10.

(2) Technical Report (30%) - This is a group assessment - the final technical report. The report submission link will be made available at the beginning of Week 9 and the last date for submitting the technical report is Friday, 5th August 2022 11:59 PM (Week 10).

(3) Professional Skills (10%) - This is an individual assessment where the students are required to submit a project management statement and a self reflection statement. The deadline for the submission is Friday, 5th August 2022 11:59 PM (Week 10).

Technical Report: Only one submission per group should be made via the Turnitin link available on the course page in Moodle. The assignment must have a cover sheet according to UNSW template and must list the name of all team members. Late submissions will attract penalties.

Assessment criteria

See Moodle for details

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 30 May - 3 June	Lecture	Introduction to Queuing Theory
	Workshop	Practice problems on Basics of Queueing Theory
Week 2: 6 June - 10 June	Lecture	Deterministic Queuing Models
	Workshop	Practice problems on Deterministic Queueing Models
Week 3: 13 June - 17 June	Lecture	Stochastic Queuing Models
	Workshop	Problems on Stochastic Queuing Models
	Assessment	Moodle Quiz
Week 4: 20 June - 24 June	Lecture	Data Analysis and Preliminary Project Design
	Workshop	Data Analysis - Using SQLite + practice problems on SQL and Assessment 2 Consultation
Week 5: 27 June - 1 July	Lecture	Simulation Methods in Queuing Models
	Workshop	Practice problems on Monte Carlo Simulation and Assessment 2 and 3 Consultation
	Assessment	Preliminary Project Design Brief (Individual Assessment)
Week 6: 4 July - 8 July		
Week 7: 11 July - 15 July	Lecture	Simulation Methods in Queuing Models Part II
	Workshop	Practtice Problems and Assessment 3 Discussion
	Assessment	Data Analysis and Simulation Techniques (Individual Assessment)
Week 8: 18 July - 22 July	Lecture	Queuing Models and Project Discussion
	Workshop	Practice Problems and Project Discussion
Week 9: 25 July - 29 July	Lecture	Policy Implications of Queueing Models

	Workshop	Group Project Consultation
Week 10: 1 August - 5 August	Lecture	Group Presentation and Peer Assessment
	Workshop	Group Presentation and Peer Assessment
	Assessment	Project - Presentation, Professional skills and Technical Report

Resources

Prescribed Resources

- Roess, Roger P., Elene S. Prassas, William R. McShane. Traffic Engineering. Third Edition, Upper Saddle River: Pearson Prentice Hall, 2004 (ISBN 0-13-142471-8)
- Vukan Vuchic. Urban Transit Operations, Planning and Economics – John Wiley & Sons, 2005;
- Daganzo, C. Fundamentals of Transportation and Traffic Operations, Pergamon-Elsevier,Oxford, U.K. (1997)
- de Neufville, Richard. “Applied Systems Analysis - Engineering Planning and Technology Management”, McGraw Hill, 1990.
- Hall, W. Randolph. “Queueing Methods - For Services and Manufacturing”, Prentice Hall, 1991.
- Ravindran, A., Phillips, Don T. and Solberg, James J. "Operations Research - Principles and Practice", John Wiley and Sons, 1987.
- Additional resources will be made available through Moodle

Recommended Resources

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

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 and assessments. Workshops are online/face-to-face sessions and are scheduled on Weeks 1 to 10.

Submission of Assessment Tasks

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

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

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

Final Examinations:

Final exams in T2 2022 will be held online between 12th - 25th August 2022 inclusive, and supplementary exams between 5th - 9th September 2022 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Book an Academic Advising session: https://app.acuityscheduling.com/schedule.php?owner=19024765

Disclaimer

This course outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

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	✓