CVEN9421

Transport Logistics Engineering

Term One // 2021

School of Civil and Environmental Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
David Rey	d.rey@unsw.edu.au	9-5pm	105 H20	(+61 2) 9385 5056

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

This postgraduate course covers engineering methods applied to transport logistical systems. In this course, the material provided will cover the basics of graph theory, algorithmic complexity and mathematical programming, which are critical tools to solve complex decision-making problems arising in the field of transportation. These advanced methods will be then used to create engineering solutions to manage existing logistical systems as well as answer questions on transport infrastructure needs. Throughout the course, these techniques will be illustrated on challenging transport and logistics problems such as network flows, facility location, vehicle routing, transit systems as well as rail and air logistics. After completing this course, students will have been exposed to efficient methods and their application to solve transport and logistics decision-making problems. The course will use real data for a course project as well as invite leading practitioners to present their expertise on selected topics. This course will help address the gap of transport logistics engineering in the Masters for Transportation Engineering Curriculum.

Course Aims

This course covers engineering methods applied to transport logistical systems. In this course, the material provided will cover the basics of graph theory, algorithmic complexity and mathematical programming, which are critical tools to solve complex decision-making problems arising in the field of transportation.

These advanced methods will be then used to create engineering solutions to manage existing logistical systems as well as answer questions on transport infrastructure needs.

After completing this course, students will have been exposed to efficient methods and their application to solve transport and logistics decision-making problems.

The course will use real data for a course project as well as invite leading practitioners to present their expertise on selected topics.

This course will help address the gap of transport logistics engineering in the Transportation Engineering Stream Curriculum.

Further, the same techniques can be used to solve a broad class of management problems encountered in industrial engineering, hence equipping students with versatile analytical skills.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Model real work transport logistics problems	PE1.1, PE1.2
2. Have a good understanding of the practical application of basic concepts, methods and techniques in transport logistics problems	PE1.6

Learning Outcome	EA Stage 1 Competencies
3. Understand and use optimization engines to solve complex and large scale transport logistics problems	PE1.2, PE2.2
4. Develop ability to critically analyze transport logistics systems	PE2.4, PE2.3
5. Develop familiarity and understanding of current state-of-art technologies and methods being used in transport logistics engineering	PE2.4, PE1.6

Teaching Strategies

Please refer to the information in Moodle

Assessment

Assessment is based on fortnightly Moodle quizzes a Mid-Trimester Online Moodle Quiz, an Assignment and a Final Examination:

- Fortnightly Moodle Quizzes are worth 10% of the course mark (5 quizzes, worth 2% each)
- The Mid-Trimester Online Moodle Quiz is worth 20% of the course mark,
- The Assignment is worth 20% of the course mark,
- The Final Examination is worth 50% of the course mark.

All assemments are evaluated on the technical merit and consistency of the methodology followed. Attention to the detail and demonstrated initiative in experimentation with concepts learned will be rewarded. Late assignment submissions will not be accepted.

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.

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Fortnightly Moodle Quizzes	10%	Not Applicable	1, 2, 3, 4, 5
Mid-trimester Online Moodle Quiz	20%	10/03/2021 03:30 PM	1, 2, 3, 4, 5
Assignment	20%	14/04/2021 02:00 PM	1, 2, 3, 4, 5
Final Examination	50%	Not Applicable	1, 2, 3, 4, 5

Assessment Details

Assessment 1: Fortnightly Moodle Quizzes

Start date: Not Applicable

Length: 24 hours each

Details:

Short Moodle quizzes to be held fortnightly in Weeks 1, 3, 5, 7 and 9.

Each quiz is worth 2% of the course mark.

A quiz may contain more than one question.

Each quiz will be open for 24 hours from Wednesday 5pm to Thursday 5pm on Weeks 1, 3, 5, 7 and 9.

Submission notes: Moodle

Assessment 2: Mid-trimester Online Moodle Quiz

Start date: 10/03/2021 02:30 PM

Length: 1 hour

Details:

The online Moodle quiz will be administered in Week 5 and cover all material up to and including Week 4. The quiz will consist of a series of short problems. The quiz will be assessed based on technical accuracy, clarity and presentation. Attention to the detail and demonstrated initiative in experimentation with concepts learned will be rewarded.

Submission notes: Moodle

Assessment 3: Assignment

Start date: 17/03/2021 02:00 PM

Details:

The Assignment will be released in Week 6 and will be due in Week 9. The assignment will consists of a series of problems and focus on students implementing optimization algorithms for transport logistics problems presented during the course. The assignment will assess the expected learning outcomes and will be assessed based on technical accuracy, clarity in reporting and presentation.

Submission notes: Moodle

Assessment 4: Final Examination

Start date: Not Applicable

Length: 2 hours

Details:

The final written examination will be in the conventional closed book format covering all topics introduced throughout the course. The final examination will consists of a series of problems and focus on theoretical and methodological concepts presented within the lectures as well as within previous assessments. The final examination will assess the expected learning outcomes and will be assessed based on technical accuracy, clarity in reporting and presentation.

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: 15 February - 19 February	Lecture	**Lecture 1A:** Introduction to Transport Logistics Engineering
	Lecture	**Lecture 1B:** Introduction to Linear and Integer Programming
Week 2: 22 February - 26 February	Lecture	**Lecture 2A:** Network Optimisation Part 1: Routing and Flows
	Lecture	**Lecture 2B:** Network Optimisation Part 2: Mathematical Programming
Week 3: 1 March - 5 March	Lecture	**Lecture 3A:** Linear Programming Part 1: Theory
	Lecture	**Lecture 3B:** Linear Programming Part 2: Simplex Algorithm
Week 4: 8 March - 12 March	Lecture	**Lecture 4:** The Transportation Problem
	Assessment	**Mid-Trimester Online Moodle Quiz**
Week 5: 15 March - 19 March	Lecture	**Lecture 5A:** Integer Programming Part 1: Theory
	Lecture	**Lecture 5B:** Integer Programming Part 2: Branch and Bound Algorithm
Week 7: 29 March - 2 April	Lecture	**Lecture 7A:** Traffic Signal Modeling and Control
	Lecture	**Lecture 7B:** The Knapsack Problem
Week 8: 5 April - 9 April	Lecture	**Lecture 8A:** Vehicle Routing Problem Part 1: Modeling
	Lecture	**Lecture 8B:** Vehicle Routing Problem Part 2: Subtour Generation Algorithm
Week 9: 12 April - 16 April	Lecture	**Lecture 9A:** Guest Lecture TBA
	Workshop	**Workshop 9B:** Practice Problems
Week 10: 19 April - 23 April	Lecture	**Lecture 10A:** Stochastic Optimisation: The

		Newsvendor Model
	Workshop	**Workshop 10B:** Course Review and Q&A

Resources

Recommended Resources

Textbooks (**recommended as reference**)

- Bertsimas, Dimitris, and John N. Tsitsiklis. *Introduction to linear optimization*. Vol. 6. Belmont, MA: Athena Scientific, 1997.
- Schrijver, Alexander. *Theory of linear and integer programming*. John Wiley & Sons, 1998.
- Fourer, Robert, Gay, David M. and Brian W. Kernighan. *AMPL: A Modeling Language for Mathematical Programming,* Second edition, ISBN 0-534-38809-4.
- AMPL Book Resources (Chapters and examples files): https://ampl.com/resources/the-ampl-book/
- Larson, Richard C., and Amedeo R. Odoni. *Urban Operations Research*. Prentice Hall, 1981. Available at: http://web.mit.edu/urban_or_book/www/book/

Course Evaluation and Development

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

Synergies in Sound 2016

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	