CVEN9421 TRANSPORT LOGISTICS ENGINEERING

Semester 2, 2016

Never Stand Still | Faculty of Engineering | School of Civil and Environmental Engineering

COURSE DETAILS

Units of Credit	6	
Contact hours	3 hours per week	
Class	Wednesday, 18:00 – 21:00	Quadrangle G053 (K-E15-G053)

Course Coordinator and Lecturer	Dr. David Rey email: d.rey@unsw.edu.au office: Room 105, Civil and Environmental Engineering Building

INFORMATION ABOUT THE COURSE

This course is targeted to students in the Faculty of Engineering desiring a deeper understanding of transport logistics engineering. This course will provide an introduction to the mathematical optimization concepts and approaches used in solving large-scale logistical problems encountered in transportation, such as shortest path, network flow and vehicle routing. The expected outcomes of this course are reinforced capability mathematical modeling and in linear and discrete optimization theory as well as the ability implement efficient solution algorithms to solve large-scale transport logistics problems.

HANDBOOK DESCRIPTION

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.

The URL of the course online handbook is:
http://www.handbook.unsw.edu.au/undergraduate/courses/2016/CVEN9421.html

OBJECTIVES

Learning objectives of the course are:

- To reinforce a student's capability in modelling and apply the concepts learned to the analysis of transport logistics problems.
- To introduce students to fundamental linear and discrete optimization theory and its application to large-scale problems.
- To study and implement efficient and versatile optimization algorithms frequently used by engineers to solve logistical problems.
- Provide a solid foundation in mathematical modelling and advanced optimization approaches needed for their studies in the field of Engineering.
- A respect for ethical practice and social responsibility

- Skills for effective communication

TEACHING STRATEGIES

The teaching strategies that will be used and their rationale. Give some suggested approaches to learning in the course.

Private Study	• Review lecture material and textbook • Do set problems and assignments • Reflect on class problems and assignments
Lectures	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments (multiple choice questions, quizzes, tests, examinations, assignments, site visit reports, hand-in tutorials, laboratory reports etc.)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

By successfully completing this course you will be able to

- Acquire a deep understanding of transport logistics problems and its computational challenges
- Develop mathematical programming skills and use them to design quantitative models to represent complex logistical systems
- Understand the fundamental concepts and principles in mathematical optimization and its role in decision-making frameworks
- Explore famous and efficient optimization algorithms that are widely used by engineers to solve industrial scale transport and logistics problems
- Use mathematical modeling software to abstract transport logistics problems and implement relevant solution algorithms
- Apply methods learned to engineer solutions for real world transport logistics problems

For each hour of contact, it is expected that you will put in at least 1.5 hours of private study.

ASSESSMENT

Assessment is based on an in-class quiz, an assignment and a final written examination:

- the in-class quiz is worth 25% of the course mark,
- the assignment is worth 25% of the course mark,
- the final written examination is worth 50% of the course mark.

The in-class quiz and the assignment are assessed 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 final written examination will be in the conventional closed book format covering all topic areas. The formal exam

scripts will not be returned. The lecturer reserves the right to adjust the final scores.

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. Please note that passing of all course components is required to pass the subject.

ASSIGNMENTS

1. Assignment 1: issued on: September 21, 2016; due on: October 12, 2016

COURSE PROGRAM

SEMESTER 2, 2016

Week	Date	Topic	Assessments Due
1	27-July	Introduction to Transport Logistics Engineering	
2	3-August	Mathematical Optimization: Theory and Practice	
3	10- August	Linear Programming and its Applications to Transport Logistics Engineering	
4	17- August	Network Flow Models	
5	24- August	Integer Programming and its Applications to Transport Logistics Engineering	
6	31- August	The Knapsack Problem	
7	7- September	In-class Quiz and AMPL software practice	In-Class Quiz
8	14- September	The Vehicle Routing Problem: Theory and Models	
9	21- September	The Vehicle Routing Problem: Algorithms and their Implementation	
Break	28- September	*No class – Mid-semester Break*	
10	5 - October	Large-scale Problem Solving using Column and Row Generation	
11	12- October	Guest Lecture: Dynamic Vehicle Routing and its Applications	Assignment 1
12	19 - October	Conflict Resolution in Air Traffic Control	
13	26 - October	Course Review	

RELEVANT 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.

Larson, Richard C., and Amedeo R. Odoni. *Urban Operations Research*. Prentice Hall, 1981. Available at: http://web.mit.edu/urban_or_book/www/book/

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://my.unsw.edu.au/student/resources/KeyDates.html

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 ADVICE

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

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