Carleton University
Department of Systems and Computer Engineering
Course Outline

SYSC 5004 - (ELG 6104) Optimization for Engineering Applications
Fall 2018

Instructor
Jerome Talim
Office : 3091MC (Associate Dean's Office)
Email : Use cuLearn to send email to instructor

Office Hours
Monday 14:00-15:30 or by appointment

Course Objectives
The course introduces the major topics in operations research (OR) and their application in solving problems in engineering. The emphasis is

- on understanding the methods
- on defining the mathematical model
- and on the application of the OR algorithms
- and on calculating numerically the solutions

Learning Outcomes

- Formulate a mathematical model to represent a problem
- Understand and apply fundamental OR algorithms (Linear programming, Integer programming, dynamic programming, assignment/network optimization models ...)
- Derive the solutions from the model
- Use of software to obtain numerically the solutions

Course Web Site
CuLearn.carleton.ca
Textbook and References

- Notes from Prof. Chinneck https://sce.carleton.ca/faculty/chinneck/po.html

Evaluation and Marking Scheme

<table>
<thead>
<tr>
<th>Assignments</th>
<th>15%</th>
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<tr>
<td>Due dates: Sept 20, Oct 18, and Nov 15 (5% each)</td>
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<tr>
<th>Midterms</th>
<th>30%</th>
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<tr>
<td>During lecture time, on Oct 30 and Nov 20 (15% each)</td>
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<th>Final</th>
<th>55%</th>
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<td>Formally scheduled by the University during the period Dec 9-21</td>
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Fall break: Oct 22 - 26

Exams

All exams are closed-books.

The final examination is for evaluation purposes only and will not be returned to students. You will be able to make arrangements with the instructor or with the department office to see your marked final examination after the final grades have been made available.

General Regulations

- **Copyright on Course Materials**: The materials created for this course (including course outline, slides, posted notes, labs, project, assignments, quizzes, exams and solutions) are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).

- **Deferred Term Work**: Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for making alternate arrangements with the instructor and in all cases this must occur no later than three (3.0) working days after the term work was due. Consult the section 9.3 of the Graduate Calendar for more information.

- **Academic Integrity**: Students should be aware of their obligations with regards to academic integrity. Please review the information about academic integrity at: https://carleton.ca/registrar/academic-integrity/ This site also contains a link to the complete Academic Integrity Policy that was approved by the University’s Senate.

- **Academic Accommodations**: Requests for Academic Accommodation You may need special
arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

- **Pregnancy obligation**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Religious obligation**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Academic Accommodations for Students with Disabilities**
  If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca PMC

- **Survivors of Sexual Violence**
  As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

- **Accommodation for Student Activities**
  Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

**Tentative Week-By-Week Schedule**

1. Overview of the Operations Research Modelling Approach
2. Introduction to Linear Programming (LP)
3. LP : Simplex method, duality, sensitivity analysis (2 weeks)
4. Transportation and assignment problems
5. Networks Shortest route, minimum spanning tree, max flow/min cut, time-cost trade-off
6. Integer programming (mixed/binary integer programming), Branch-and-Bound
7. Nonlinear programming : Lagrange multiplier, KKT conditions, convexity/concavity (2 weeks)
8. Dynamic programming
9. Metaheuristics, Simulated Annealing, Genetic Algorithms