Carleton UNIVERSITY | Department of Systems and Computer Engineering

SYSC 3200
Industrial Engineering

Calendar description

Techniques of operations research for decision-making in complex engineering systems. Linear programming, network models, PERT, integer programming, dynamic programming, queuing systems and inventory models. Problem solving is emphasized.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory/problem analysis one and a half hours per week.

http://calendar.carleton.ca/undergrad/courses/SYSC/

Prerequisites

MATH 1004 and MATH 1104 and ((ECOR 1051and ECOR 1052 and ECOR 1053 and ECOR 1054) or ECOR 1606 or SYSC 1005), and second-year status in Engineering.

Precludes additional credit for BUSI 2300, ECON 4004, or MATH 3801.

Prior knowledge

Students should:

- Be proficient in secondary school level algebra and calculus.
- Possess basic knowledge of a procedural programming language, or Excel, or MATLAB.
- Possess basic knowledge of simple engineering systems, such as manufacturing facilities, or transportation networks.

Course objectives

This course introduces the major topics of operations research and their application in solving problems common in engineering, business, and government. A main topic is optimization, i.e. methods for finding the best solutions to complex practical problems (e.g. how much of each product a company should produce to maximize profits in the face of constraints on the availability of raw materials, labour, etc…). The course also includes a brief introduction to queuing methods, which are used in modelling probabilistic systems such as vehicle traffic or telecommunications systems. See the complete list of topics below.

List of topics

- Linear programming via the simplex method.
- Linear programming for nonstandard models.
- LP sensitivity analysis, LP in practice.
- Networks: Shortest route, minimum spanning tree, max flow/min cut.
- Network flow programming.
- PERT including time-cost trade-offs and resource levelling.
- Branch and bound.
- Discrete and integer programming, genetic algorithms, heuristics.
- Dynamic programming.
- Markov chains and queueing theory.
- Queueing continued. Inventory models.
- Inventory models.

Learning outcomes

The emphasis is on the ability to apply suitable methods in practice, to formulate problems correctly, to solve them, and to understand the results. Problems are stated as tiny cases. There is no computer programming per se, but students will use existing computer programs to carry out calculations to solve problems. “Programming” as in “linear programming” is an old use of the word to mean “planning”.

Graduate Attributes (GAs)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. There are no GA’s related to this course. For more information, please visit: https://engineerscanada.ca/.

Instructor and TA contact

Specific to course offering (tbd)

Textbook (or other resources)

Specific to course offering (tbd)

Evaluation and grading scheme

Specific to course offering (tbd)

Breakdown of course requirements

Specific to course offering (tbd)

Tentative week-by-week breakdown

Specific to course offering (tbd)

General regulations

Specific to course offering (tbd)