Carleton UNIVERSITY | Department of Systems and Computer Engineering

# SYSC 4005
# Discrete Simulation/Modeling

## Calendar description

Simulation as a problem solving tool. Random variable generation, general discrete simulation procedure: event table and statistical gathering. Analyses of simulation data: point and interval estimation. Confidence intervals. Overview of modeling, simulation, and problem solving using SIMSCRIPT, MODSIM, and other languages.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory one hour a week.

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

## Prerequisites

(ECOR 2050 or SYSC 2510 or STAT 2605 or STAT 3502) and fourth-year status in Engineering, or permission of the Department.

Also offered at the graduate level, with different requirements, as SYSC 5001, for which additional credit is precluded.

## Prior knowledge

Students should:

- Have knowledge of basic probability theory.
- Have knowledge of a high-level programming language such as C++, Java, or Python.

## Course objectives

The goal of the course is to provide the basic background for modeling and computer simulation of systems. Emphasis is placed on the design of simulation experiments and the correct interpretation of the associated statistical results. The course includes a brief overview of simulation languages and probability theory. If time permits, special topics such as design of experiments and variance reduction techniques will be discussed.

## List of topics

- Introduction to Simulation
- General Principles
- Simulation Software
- Statistical Models

- Input Modeling
- Random-Number Generation
- Random-Variate Generation
- Verification and Validation
- Performance Estimation
- Queueing Models
- Variance Reduction Techniques

## Learning outcomes

By the end of this course, students should:

- Know how to solve a problem using simulation and modeling approach.
- Know how to use common probability models.
- Know how to use basic queueing models.
- Be able to analyze and model input data.
- Know how to generate random variates.
- Be able to design and implement simulation models.
- Know how to verify and validate a simulation model.
- Know how to plan and conduct simulations.
- Know how to estimate system performance.
- Be able to process output data and assess different design alternatives.
- Know how to write a project report.
- Be able to complete a project in a team.
- Be able to use different software tools (MATLAB, GPSS, spreadsheet, etc.) to conduct simulation.

## 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/.

## Accreditation Units (AUs)

For more information about Accreditation Units, please visit: https://engineerscanada.ca/.

The course has a total of 44 AUs, divided into:

- Engineering Science: 50%
- Engineering Design: 50%

## 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)