

**Department Of Management Science**  
**MSCI 223 Business Modelling and Simulation**  
**Course Details 2022**

## **Contacts**

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## **Introduction**

Modern business involves decision making in uncertain, dynamic, and complex environments. This course focusses on the use of simulation techniques to make better business decisions under such conditions. For that purpose, the course combines relevant theoretical knowledge with immediate application of simulation techniques on computer-based tools.

In particular, we use discrete event simulations. In all cases, real-life business operations are represented in computer models. These models serve as a safe playground to study and evaluate business decision making. You gain essential knowledge to improve business performance.

**Pre-requisites:** All students should have taken either MSCI 103 or MSCI 224.

## **Reading (not mandatory)**

There are many books on computer simulation, in particular:

- Robinson S., *Simulation: the practice of model development and use*, MacMillan, 2014
- Pidd M., *Computer Simulation in Management Science*, John Wiley & Sons.
- Law A.M. & Kelton W. D., *Simulation Modelling & Analysis*. McGraw-Hill.

## **Learning outcomes/objectives**

The objective of this course is to provide you with the necessary skills to perform sound simulation studies, as well as to shape your understanding of business decision making under uncertainty.

Particularly, the goals of this course are the following:

- understand the concept of decision making under uncertainty;
- gain insight into how the quality of a solution is affected by uncertain factors and future;
- become familiar with the background of discrete event simulations;
- learn how to use simulation software tools, such as Witness, for modeling and solving decision making problems under uncertainty.

## **Cognitive abilities/Non-subject-specific learning outcomes:**

A successful simulation project requires a wide variety of skills. Through both lectures and assessments the course aims to improve your skills in the following areas:

- Analytical skills

- Creativity
- Report writing
- Understanding and evaluating technical material including academic journal articles
- Group work – organise a task as a group and coordinate with other group members

## Teaching Methods

**Methods:** (online) lectures, (online) workshops

**Term Taught:** Lent

## Teaching Plan

Note: There could be some changes to these details during the course.

### Lectures:

Week	Topic
11	Introduction to simulation
12	Discrete event simulation and activity cycle diagrams
13	Simulating variability and random number generators
14	Three phase approach
15	Conceptual modelling
16	Data collection and input modelling
17	Verification and validation
18	Introduction to experimentation
19	Experimentation and output analysis

### Workshops:

Workshops will help you learn the simulation software Witness. These are an **essential** part of the course – there will be questions on using Witness in the test, and you will need to use Witness for the group project. It is very important to complete the workshop exercises.

Week	Workshop
12	Witness Workbook One: Simple model examples
13	Witness Workbook One: Building your first model
14	Witness Workbook One: Building your first model
15	Bank model (handout provided)
16	Witness Workbook Two: Multi-Cycle Machine and Labour Modelling
17	Witness Workbook Two: Shift and Arrival Profile Modelling
18	Input data (handout provided)
19	Witness Workbook Two: Experimentation and Optimisation
20	Experimentation (handout provided)

## Assessment

There will be two pieces of assessment – an online multiple choice exam and a group coursework project.

- The test will be an one-hour online multiple choice. The test is 40% of the course assessment.
- The group project details will be provided during the course. This is 60% of the course assessment. You can choose your own group of 5 students. The submission date will be in the summer term. Standard departmental penalties will apply for late work unless you have been given an extension by the course lecturer (only for exceptional reasons).

## Learning and feedback

**Important:** In general, feedback on university modules is more than just formal feedback for coursework assignments. For example, you also obtain feedback through exercises and workshops, e.g., whether you can complete the task and how easily you do so gives you feedback on how well you are learning the course material.

<i>Tasks</i>	<i>Learning and feedback</i>
Course material	You are expected to attend all lecture sessions. Some sessions will include some discussions, exercises and interactive tasks. The tasks will not be assessed but, as noted above, they will give you an indication of how well you understand the material. Reviewing slides (and the videos), and reading the suggested text books will also help.
Workshops	It is also essential to complete the workshop material. The Witness workbooks and other material will be provided for you to work through. Some instructions in the handouts will assume that you know the material from previous weeks. The ease with which you can complete the workshop gives you feedback on your understanding of the software. One useful exercise would be to try and repeat the task using the instructions as little as possible – the ability to do this will show that you are becoming proficient with the software. Working through parts of the Witness workbooks that we don't cover in the workshops will also be beneficial.
Group coursework	Your model and report will be marked and feedback comments will be provided.
Test	The feedback for this will be your mark.