

Optimization in Machine Learning (ACM 40990) – Introduction

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1 Overview

In this brief document, I explain the format of ACM 40990 in the Spring Trimester of the Academic Year 2025-2026, starting in Week 1, Monday January 19th 2026.

Version history:

- First version, 5th January 2026

2 Mode of Delivery

The instruction in this module is planned to be primarily face-to-face.

Faculty responsible for the delivery of the module

The module will be taught by Dr Lennon Ó Náraigh and Professor X. The first **seven weeks** are shared with another cohort, ACM 41030. In these weeks, the module will be taught by Dr Lennon Ó Náraigh. This part of the module will deal with the theoretical foundations of numerical optimization. The format in these weeks will be as follows:

- Three face-to-face lectures per week:
 - Tuesdays at 09:00 (possibly to be replaced with a recorded lecture, subject to student demand)
 - Thursdays at 15:00 (two hours).

This will take us up to the midterm break. In the second part of the module, which will last **five weeks**, students will look at the practical applications of optimization algorithms, in Machine Learning. This part of the module will be taken by Professor X, and will be more 'hands-on' in its approach.

VLE

Very little information will be posted on Brightspace for the first seven weeks. Instead, during those weeks, the module website will be the main point of contact for students, and all materials relevant to those weeks will be posted there:

<https://maths.ucd.ie/~onaraigh/optimization.html>

Already, there is a complete set of **typed notes** available there. Again, these typed notes refer to the first **seven weeks** of the module; the lectures in those weeks will follow the typed notes closely.

The second part of the module might use Brightspace a bit more frequently but this will be at the discretion of Professor X.

3 Assessment

The assessment structure is as follows:

- One hour-long written exam which will assess the materials from the first seven weeks of the module. The exam will take place during the trimester, just after the midterm break. This will be worth **40%** of the final grade.
- Major assignment, submitted in report format, worth **20%** of the final grade, due in Week 12.
- One hour-long final exam, which will assess the materials from the final five weeks of the module. The exam will take place during the May exam session. This will be worth **40%** of the final grade.

4 How to succeed in the first part of the module

The Lecturer will give out four sets of exercises. These are not for credit. Model answers will be provided. We will work through some of the model answers in class. These exercises are a bit like training, if you can do all of the exercises you will really understand the first part of the module. With that in mind, some of the questions in the first written exam will be drawn from the exercises. To be more precise, the first written exam will be based on the following topics:

- A selection of questions drawn from Exercises 1–4.
- A selection of theorems from the lecture notes (the list will be provided in due course).

Integrity in assessment

The usual rules around academic integrity to all elements of assessment in the module. There is a university plagiarism policy which is posted on the Brightspace page, along with the School of Mathematics and Statistics academic integrity protocol.

Please don't fail the module!

If you do, there will be a resit exam in the Summer Trimester.

5 Grading

The Standard Conversion Scale is used in this module

6 Textbooks

For the first part of the module, the typed lecture notes are self-contained. For extra reading, students may refer to the following recommended textbook:

Nocedal, J. and Wright, S.J. eds., 1999. *Numerical Optimization*. New York, NY: Springer New York.