Final Report

Course Title:	**Optimisation for Industry**
Venue:	**Newton Gateway (hybrid course)**
Dates:	**3rd, 10th, 17th – May 2022**
Course leader:	**Guglielmo Lulli**
Lecturers:	**Guglielmo Lulli (Lancaster U.), Vinh Doan (Warwick U.), Nursen Aydin (Warwick U.) and Ahmed Kheiri (Lancaster U.)**
Participants:	**21**

Overview of the Course

The course was led by Guglielmo Lulli and designed in collaboration with Vinh Doan.
The course was organized in three full days of lectures with a mix of "theoretical" lectures and practical sessions. The first day of the course was delivered face-to-face, the other two were delivered online. The course was designed for participants from a wide range of backgrounds, from those that are new to optimisation to those that already have some knowledge in optimisation but want to learn more about its applicability to decision-making.

The topics covered were as follows:

- Introduction to decision making problems and mathematical programming
- Optimization under uncertainty
- Overview of modern heuristic optimization techniques

Electronic versions of the lecture notes and slides were made available to the students.

Statistical summary of student feedback

The student feedback was collected online using a Microsoft Forms questionnaire. The feedback was anonymized and only 8 students out of 21 responded to the feedback questionnaires.

Students were asked to comment on the set of 9 questions (given below).

1. The course met my expectations (A)
2. The sessions were logically organised and formed a coherent whole (A)
3. The course as a whole was interesting (A)
4. Teaching methods (visual aids etc.) were good (A)
5. The quality of the course materials was good (A)
6. I will recommend Optimisation for Industry to others (A)
7. The amount of prior knowledge assumed (B)
8. The level of the course (B)
9. The length of the course (B)

Questions 1-6, labelled with "A", used the following scale:
1 = Strongly Disagree; through to 5 = Strongly Agree.

Questions 7-9, labelled with "B", used the scale 1 to 5 with
1 = too little/easy/short, 3 = about right, 5 = too much/hard/long

A non-applicable response was allowed, but was ignored when calculating the averages.

The following bar chart summarized the average score of each question. Bars representing questions 1-6 (scale “A”) are in orange colour, while questions 6-9 (scale “B”) are in blue colour. For this last set of questions, the ideal score is 3 represented in the diagram with the dashed red line.

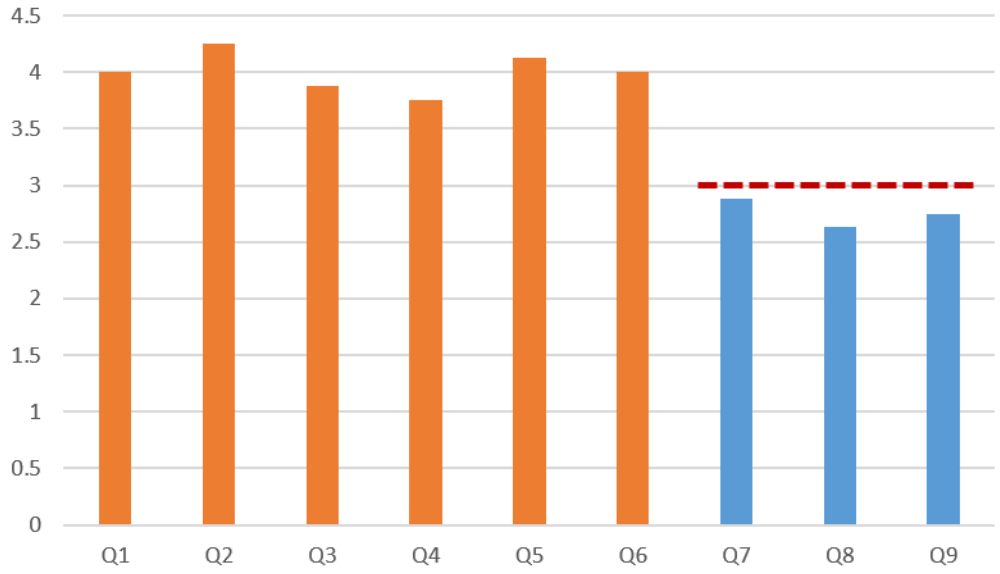

Figure 1: Average score for questions 1-9

Summary

Overall, the responses show a high degree of satisfaction with the course, its content and delivery. Most students would positively recommend Optimisation for Industry to others.
The average response to questions 6-9 was just below 3, indicating that knowledge required for the course, and the level and length of the course was about right.
Question 3 and 4 show slightly lower scores. This is the direct consequence of the mix of participants with many different interests and background. As for as question 4, recommendations are also given in the General Comments section below.

Preferred method of delivery

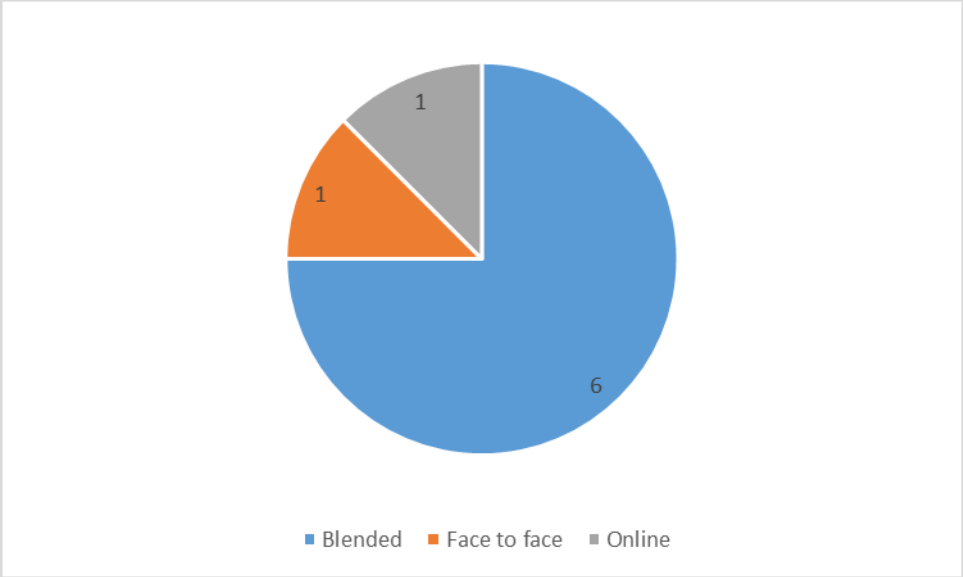

Figure 2: Preferred method of delivery

The Lecturers

The questionnaire also included an evaluation of each of the four main speakers, based on the following six questions (on the scale 1 = Strongly Disagree; through to 5 = Strongly Agree):

- **A.** The lecturer knew the subject well
- **B.** The lecturer was well prepared
- **C.** The lecturer provided information at the right speed
- **D.** The lecturer gave clear directions and encouraged participation
- **E.** The lecturer encouraged questions and gave adequate answers
- **F.** The lecturer's overall performance was satisfactory

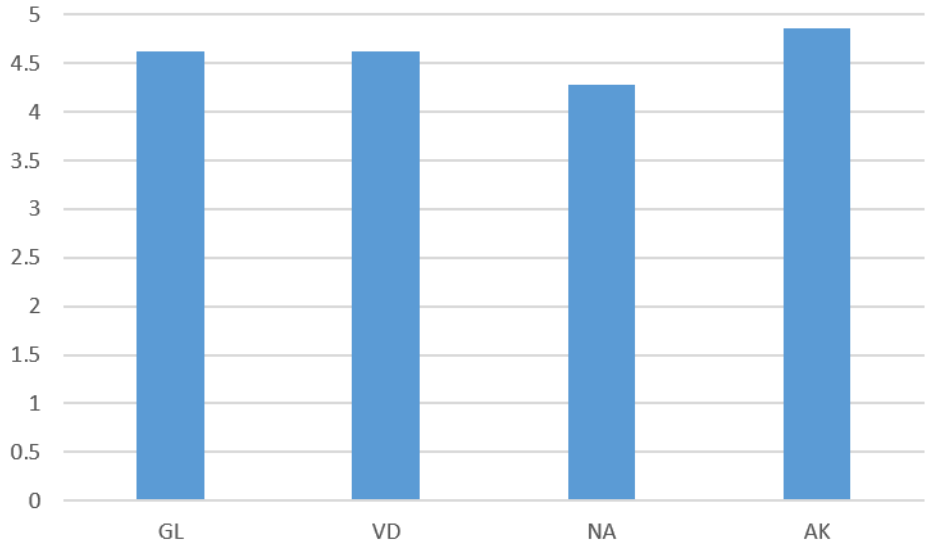

Figure 3: Lectures' overall performance

It is clear from these scores that lecturers have generally provided instruction of a high quality.

General Comments

Students were invited to give their views in a ‘general comments’ section under the following headings:

1. What did you like most about the course?
2. What did you like least about the course?
3. What suggestions to improve the course do you have?
4. Which other topics would you like to see NATCOR & Newton Gateway deliver?

With regard to question 1, students said that they liked the practical sessions, and the good balance between lecture and computer practise. They also valued the connection to industry related problems.

As for question 2, some participants did not consider the use of breakout rooms very efficient.

As for question 3, we received only four responses. The most relevant one is to include some applications in engineering specific problems.

The responses to question 4 were only four. Two respondents suggested “Machine Learning”, one suggested Stochastic Programming (and optimization under uncertainty) and the fourth suggesting focusing on space applications.

Conclusions/Recommendations

1. Once again, the practical sessions were generally much appreciated.

2. When participants work in subgroups (especially if online using breakout rooms), a group leader should be designated. The leader will be also in charge of reporting the outcomes of the work/discussion to all the other participants.

3. Only 8 out 21 participants provided a feedback. To increase the number of replays, we suggest asking to fill the survey at the end of last lecture.