MTH355e Basic Mathematical Optimization

Level: 3

Credit Units: 5 Credit Units

Language: ENGLISH

Presentation Pattern: EVERY JAN

E-Learning: BLENDED - Learning is done MAINLY online using interactive study materials in Canvas. Students receive guidance and support from online instructors via discussion forums and emails. This is supplemented with SOME face-to-face sessions. If the course has an exam component, this will be administered on-campus.

Synopsis:

MTH355e Basic Mathematical Optimization will provide undergraduates with an understanding of the common algorithms used in linear optimization. The topics covered are of central importance for many applications in data science and data analytics. The course gives a comprehensive introduction to the simplex method and integer programming whilst only assuming a knowledge of basic linear algebra. Additionally, the course will teach students how such algorithms are implemented using the software Gurobi.

Topics:

- LU Decomposition
- Matrix Iterative Methods
- Formulation of a Linear Programming Model
- The Simplex Method
- Dual Form of a Linear Programming Problem
- Sensitivity Analysis
- Parametric Linear Programming
- Branch and Bound Method
- Either/or and 0-1 Variable Models
- The Barrier Method
- Goal Programming Problems involving Multiple Goals
- Maximising Minima and Minimising Maxima

Textbooks:

Frederic S. Hiller & Gerald J. Lieberman.: Introduction to Operations Research (eTextbook) 10th Edition McGraw-Hill
ISBN-13: 9781307348163

Frederic S. Hiller & Gerald J. Lieberman.: Introduction to Operations Research (eTextbook) 10th Edition McGraw-Hill
ISBN-13: 9781307348163-AA

Learning Outcome:

- Formulate linear optimization problems into mathematical and graphical linear models
- Solve linear optimisation modelling problems using the simplex method
- Analyze linear optimization problems with the two-phase simplex solution technique
- Apply the LU decomposition technique and the conditions of convergence for linear sets of equations
- Employ the branch and bound method to solve integer programming and 0-1 variable models
- Compute the optimum solution of a large linear programming model

Assessment Strategies:

Continuous Assessment Component	**Weightage (%)**
PRE-CLASS QUIZ	2
TUTOR-MARKED ASSIGNMENT	16
PRE-CLASS QUIZ	2
COMPUTER MARKED ASSIGNMENT	8
PRE-CLASS QUIZ	2
Sub-Total	**30**

Examinable Component	**Weightage (%)**
Written Exam	70
Sub-Total	**70**

Weightage Total	**100**