



**UNIVERSITÉ
DE NAMUR**

FACULTÉ
DES SCIENCES ÉCONOMIQUES,
SOCIALES ET DE GESTION

ELOIM427 Quantitative Models in Operations Management

Period: 1st Semester + 2nd semester

ECTS credits: 5 ECTS

Language: English

Instructor: Adel Hatami-Marbini

Email: adel.hatami@unamur.be

LEARNING GOALS

Upon completion of this course, students should be able to:

- Identify and clearly express the problem given a description of the situation,
- Translate a formal description of a system to a mathematical and computational model,
- Specify and express the qualitative factors that affect the implementation of a proposed solution;
- Obtain the analytical capability for each field,
- Demonstrate the ability to read, utilize and interpret managerial and quantitative models,
- Communicate effectively in an oral presentation,
- Build individual skills to solve problems.

COURSE DESCRIPTION

Operations Research (O.R.), is a discipline that tackles the application of advanced analytical methods to help make reasonable decisions. The main focus of OR is on quantitative techniques such as mathematical modeling, statistical analysis, and mathematical optimization where it makes an attempt to arrive at optimal or near-optimal solutions to complex decision-making problems. OR has a very close connection with other disciplines such as business engineering and operations management where it is frequently concerned with deciding a maximum (such as profit, efficiency, etc.) or minimum (such as loss, risk, or cost).

This advanced course mainly lays emphasis on three principle optimization techniques involving (i) linear programming, (ii) integer programming, and (iii) non-linear programming. The purpose of linear programming is to understand the optimization problems and their formulation as one of the most studied and developed area in which the model seeks to optimize a linear objective function that is subject to a number of linear constraints. Integer programming as an extension of continuous linear programming models aims at considering binary or zero–one variables. Contrary to linear programming, integer programming is more complicated because a feasibility region is not generally convex. Integer linear programming models can be applied in many applications such as transportation problems; allocation and optimisation networks; sequencing problems; travelling salesman problems; knapsack problems; investment problems; fixed costs problems; set covering and partition problems; among others. Lastly, non-linear programming problems are formulated when objective function, or any of the constraints, is not linear in the presence



**UNIVERSITÉ
DE NAMUR**

FACULTÉ
DES SCIENCES ÉCONOMIQUES,
SOCIALES ET DE GESTION

of continuous decision variables. The objective of non-linear programming is to help realize the formulation of non-linear programming models as well as introducing their applications in the management domain.

REFERENCE TEXTBOOKS

- Taha, H. A. (1982). *Operations Research: An Introduction (For VTU)*. Pearson Education India.
- Winston, W. L., & Goldberg, J. B. (2004). *Operations research: applications and algorithms* (Vol. 3). Belmont, CA: Duxbury press.
- Bertsekas, D. P. (1999). *Nonlinear programming* (pp. 1-60). Belmont: Athena scientific.
- Cooper, W. W., Seiford, L. M., & Tone, K. (2006). *Introduction to data envelopment analysis and its uses: with DEA-solver software and references*. Springer Science & Business Media.

LECTURE TOPICS (AT A GLANCE)

- Linear programming:
 - Performance Evaluation (DEA)
 - Selected Applications
 - Goal Programming
- Integer programming:
 - Logistics and Facility Location
 - SPLP/ Capacitated facilities/ Cost functions
 - The p-median and set-covering problem
 - The maximal-coverage location problem
 - Hub, Maxisum
 - Selected Applications
- Non-linear programming:
 - Kuhn-Tucker conditions
 - Selected Applications

HANDOUTS FOR THE CLASS

The slides and other texts related to each session will be posted.

EVALUATION COMPONENTS

The assessment is in three portions as adding up to 100% of the marks as follows:

First assessment – Individual Written Report and Presentation worth 45% of the total marks. It is outlined in Appendix 1.

Second assessment – Individual Research Proposal worth 30% of the total marks. It is outlined in Appendix 2.



**UNIVERSITÉ
DE NAMUR**

FACULTÉ
DES SCIENCES ÉCONOMIQUES,
SOCIALES ET DE GESTION

Third assessment – Written Exam worth 25% of the total marks

These assessments are aimed at providing opportunities to examine both the surface and the deep learning of students.

The assessment allows you to investigate operations research in real-world organisations, thereby reinforcing the applied nature of the subject. By researching the task in-depth you are given the opportunity to show the knowledge and understanding that you have gained in subject-specific areas. The presentation of the assessment allows you to demonstrate how you have transferred the generic key skills to this particular context.