

## Quantitative methods in Management

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### Description

The area of quantitative methods for decision making uses the scientific method as the basis to research and help make decisions on complex problems of the organizations. The purpose of this course is to equip the participants with the relevant tools and techniques for applications in solving managerial problems. The focus of this course will be on applications of quantitative methods in business situations.

The methodology of the course is based on what is known as Operations Research, a science that offers to the decision maker different quantitative methodologies in order to make decisions. The objective of the course is to learn the fundamental concepts, the quantitative models, up to date solution techniques in problem solving and complex decision making. During the course we will see how to apply these techniques in different areas of an organization, such as marketing, production and operations, logistics, finance, etc. Emphasis will be made on practical and real world applications. Excel spreadsheet together with the module "Solver" will be intensively used.

### Contents

1. **Introduction to modelling**
2. **Linear Programming:**
  - 2.1. Structure of the problem.
  - 2.2. Mathematical conditions.
  - 2.3. Objectives and constraints.
  - 2.4. Examples of formulations: human resources problems, capacity problems, transportation problems.
3. **Solution methods in LP**
  - 3.1. Graphical method
  - 3.2. The simplex algorithm
  - 3.3. Solver and other software.
  - 3.4. Heuristic methods
4. **Integer programming**
  - 4.1. Problem formulation.
  - 4.2. The branch and bound procedure.
  - 4.3. The knapsack problem.
  - 4.4. Assignment problems.
  - 4.5. Location modelling problems
5. **Multi objective programming**
  - 5.1. Objective space.
  - 5.2. Efficiency in solutions
  - 5.3. The weighting method and constraint methods. Case studies.
  - 5.4. Goal programming.

## 6. Network Models

- 6.1. Network notation
- 6.2. Minimum spanning tree
- 6.3. Maximal flow
- 6.4. Shortest Path

## 7. Project Management

- 7.1. Critical Path Model
- 7.2. PERT
- 7.3. PERT/CMP
- 7.4. Probabilistic PERT
- 7.5. Case study

## 8. Waiting Lines and Queuing Theory and Modelling

- 8.1. Waiting line characteristics
- 8.2. Arrivals
- 8.3. Service
- 8.4. The M/M/1 model
- 8.5. The M/M/m model
- 8.6. Case studies

## Evaluation criteria

- Final exam: 40% of the grade. You need to obtain in this exam at least 4 out of 10 to pass the course.
- Continuous evaluation: 60% of the grade:
  - 40% homework and case studies
  - 20% presentations