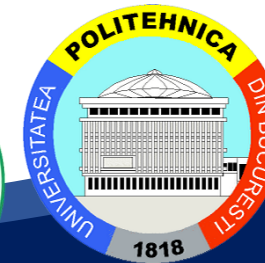




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Advanced Optimization: Techniques and Industrial Applications



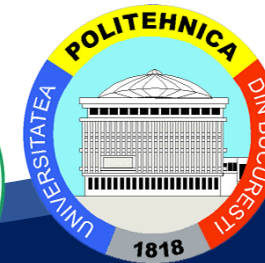
Curriculum Development
of Master's Degree Program in
Industrial Engineering for Thailand Sustainable Smart Industry



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Session 1.1: Basic Modeling Concepts



Curriculum Development
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Industrial Engineering for Thailand Sustainable Smart Industry

Management Science

Use of mathematical models in providing guidelines to managers for

- Making effective decisions within the state of the current information
- Seeking further information if current knowledge is insufficient to reach a proper decision

Operations Research

The application of the methods of science to complex problems arising in the direction and management of large systems

Management science & Operations research are very close to each other

Model Building Process

1. Formulate the problem
2. Observe the system
3. Formulate a mathematical model of the problem
4. Verify the model and use the model for prediction
5. Select a suitable alternative
6. Present the result and conclusion of the study
7. Implement and evaluate recommendations



Modeling Principles

1. Do not build a complicated model when a simple one can be used
2. Beware of modeling the problem to fit the technique
3. The deduction phase of modeling must be conducted rigorously
4. Models should be validated prior to implementation
5. A model should never be taken too literally
6. Beware of overselling the model
7. A model cannot be any better than the information that goes into it
8. Models cannot replace decision makers





Basic Mathematical Programming Problems

Linear Programming (LP)

Quadratic Programming (QCP)

Nonlinear Programming (NLP)

Integer Programming (IP)

Mixed Integer Linear Programming (MIP)

Mixed Integer Nonlinear Programming (MINLP)

Dynamic Programming (DP)

Stochastic Programming

Network Analysis

Game Theory

...



Software Packages

Lindo – Lingo – What'sBest

CPLEX

TORA

NPSOL – MINOS

KNITRO

GAMS

Spreadsheet Solver

etc.