INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
LYON

Engineering methods
Operational research

IDENTIFICATION

CODE : GI-3-S1-EC-ROO
ECTS : 2.0

HOURS

Lectures :	2.0 h
Seminars :	18.0 h
Laboratory :	12.0 h
Project :	0.0 h
Teacher-student contact :	32.0 h
Personal work :	12.0 h
Total :	44.0 h

ASSESSMENT METHOD

IE (interrogation écrite)
EE (évaluation écrite: poster, rapports¿.)

TEACHING AIDS

Available on caseine.org:
- lecture notes (in English and French)
- virtual programming labs to implement and test the programs as self-training (in English)
- quiz to check your understanding (in English)
- French / English glossary + crossword puzzles

TEACHING LANGUAGE

English

CONTACT

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AIMS

This course belongs to teaching unit Informatique et mathématiques décisionnelles (GI-3-S1-UE-IMAD) and contributes to the following skills :
A1 Analyze a system (real or virtual) or a problem (Level 2)
A2 Operate a model of a real or virtual system (Level 2)
C2 Modeling and designing an information, decision and production system, of goods and services (Level 2)
C3 Evaluating, prototyping and simulating a system (Level 1)
C4 Sizing the hardware and / or software of a system (Level 1)
C5 Managing a production system and react to malfunctions (Level 1)
C8 Managing supply in connection with the planning and inventory management policy (Level 1)
C9 Localizing and assigning the production, storage and transportation processes to different members of the supply chain (Level 1)

By allowing the engineering students to work and be evaluated on the following knowledge :
- Linear programming, simplex algorithm, duality (A1, A2, C2)
- Integer linear programming, branch&bound algorithm (A1, C2)
- Use of Excel Solver and OpenSolver for decision support (xA2, C2, C3)

To be able to :
- Specify a linear program in integer or real variables from the description of a problem expressed in natural language (C2, C3)
- Design a decision support tool for the management of a production or transport process
Design a decision support tool for the management of a production or transport process (A1, A2, C2, C4, C5, C8, C9)
- Identify the classic problem class to which a given real problem relates (A1, C2)

CONTENT

Introduction to operations research and its industrial applications
Modeling in linear programming, graphical solving
Simplex algorithm
Duality and sensitivity analysis
Branch & Bound
Modeling in integer linear programming; modeling tips; concepts of complexity and formulation quality
Backpack and bin-packing problem
Modeling in PL/PLNE with Excel: application to a lot-sizing problem with capacity constraints
Coverage and partition issues
Traveling Salesman (TSP) and Vehicle Routing (VRP) Issues

BIBLIOGRAPHY

- Dinkel J. J., G. A. Kochenberger and D. R. Plane, Management Science Text and Applications, Irwin Editor, 1978, ISBN 0-256-02037-X
- Taha H. A., Operations Research an introduction, Sixth edition, Prentice Hall, 1997, ISBN 0-13-272915-b

PRE-REQUISITE

- Linear algebra (matrix calculation),
- Production management (MRP, concept of independent / dependent need).
- Use of simple Excel functions