



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Operations research and optimization theory

### Course

Field of study

Logistics

Area of study (specialization)

Corporate Logistics

Level of study

Second-cycle studies

Form of study

part-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

14

Laboratory classes

Tutorials

14

Projects/seminars

Other (e.g. online)

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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### Prerequisites

algebra rules, basics of probability theory and statistics, operating skills in Excel and its formulas

### Course objective

Learning to plan and make quantitative and other decisions using methods of constrained optimization.

### Course-related learning outcomes

#### Knowledge

1. Student knows typical problems of logistics that can be solved using operation research [P7S\_WG\_05].
2. Knows graphical method and simplex for linear programming [P7S\_WG\_04].
3. Knows chosen optimization methods for and transportation, multicriteria problems, graphs and networks solving [P7S\_WK\_01].
4. Knows statistics used to assess decisions and risk, knows rules used under uncertainty [P7S\_WK\_01]
5. Knows examples of concave or network programming [P7S\_WG\_04].

#### Skills

1. Student can solve optimization tasks using Excel Solver add-in [P7S\_UO\_01].
2. Understands idea of graphical method and simplex algorithm [P7S\_UW\_04].
3. Can identify multi criteria decision tasks and problems that are solved with graph theory [P7S\_UO\_01].
4. Can optimize decision under risk and limit the level of risk [P7S\_UU\_01].

#### Social competences

Is able to explain benefits of optimization in practice [P7S\_KR\_02].

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Partial assessment:

- a) at lecture the modelling and classifying study of optimization case is assessed,
- b) at tutorial there is intrasemester assessment of tasks and theory.

Final grade:

- a) of lecture results from final test including tasks and problem questions of whole course.
- b) of tutorial – a group of 2 students use Solver to find out the optimum solution of a case different than the chosen one for partial assessment a) .



## Programme content

1. Introduction: decision variable, objective, constraint, feasible solution, the optimum, linear programme (LP). Task formulation: product-mix (assortment), blending problem, transportation and transshipment, multiperiod scheduling, using of Excel add-in Solver
2. linear programming methods: simplex, graphical method, sensitivity analysis,
3. balanced and unbalanced transportation problems, feasible solution finding, optimization using alphas and betas potentials,
4. multigoal task, multigoal efficiency, metacriterion, hierarchy, goal programming (GP), optimization degree, point multicriteria method versus AHP for suppliers assessment
5. uncertainty and risk: rules, news boy, decision tree, optimum stock quantity models (EOQ and others)
6. chosen tasks from: CPM, PERT, Gantt, time-cost analysis, minimum spanning tree, the shortest way, maximum flow, non-linear revenue, salesman problem, assignment problems.

## Teaching methods

lecture focused at problem, tutorial in solving tasks, case study

## Bibliography

Basic

1. Anholcer M., Gaspars H., Owczarkowski A., Ekonometria z Excelem, Wyd. UEP, Poznań 2010.
2. Brzęczek T., Gaspars-Wieloch H., Godziszewski B., Podstawy badań operacyjnych i ekonometrii, Wyd. PP, Poznań 2010.
3. Przykłady i zadania z badań operacyjnych i ekonometrii, Sikora W. (red.), Wyd. UEP, MD, Poznań 2005.

Additional

1. Józefowska J., Badania operacyjne i teoria optymalizacji, Wydawnictwo PP, Poznań 2011.
2. Sikora W. (red.), Badania operacyjne, PWE, Warszawa 2008.
3. Trzaskalik T. (red.), Wprowadzenie do badań operacyjnych z komputerem - CD, PWE, Warszawa 2008.



### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, preparation for tutorials, preparation for tests) <sup>1</sup>	35	1,5

<sup>1</sup> delete or add other activities as appropriate