



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Operation research and optimization theory

---

### Course

Field of study

Logistics

Area of study (specialization)

Logistics systems

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

English

Requirements

compulsory

---

### Number of hours

Lecture

15

Tutorials

15

Laboratory classes

Projects/seminars

15

Other (e.g. online)

### Number of credit points

3

---

### Lecturers

Responsible for the course/lecturer:

Ph.D., Tomasz Brzeczek,

Phone: 61 665 33 92

Mail to: [tomasz.brzeczek@put.poznan.pl](mailto:tomasz.brzeczek@put.poznan.pl)

Faculty of Engineering Management,

ul. J.Rychlewskiego 2, 60-965 Poznań

Responsible for the course/lecturer:

Ph.D., Eng. Andżelika Libertowska

Phone: 61 665 33 90

Mail to: [andzelika.libertowska@put.poznan.pl](mailto:andzelika.libertowska@put.poznan.pl)

Faculty of Engineering Management,

ul. J. Rychlewskiego 2, 60-965 Poznań



### 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 multicriteria problems, graphs and networks solving [P7S\_WK\_01].
4. Knows statistics used to assess decisions and risk. Knows decision rules used under uncertainty [P7S\_WG\_04].

#### Skills

1. Student can solve optimization tasks using Excel Solver add-in [P7S\_UO\_01].
2. Understands solving idea of graphical method and simplex, network and transportation algorithms [P7S\_UW\_04].
3. Can identify multi criteria decision tasks and problems being 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 persuade management practitioners to benefits of optimization and modelling usage [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 solving and theory answering.
- c) at laboratory current outcomes of project groups are assessed

Final grade:

- a) at lecture results from whole semester course test including open and closed questions about theory and problems to be analysed.
- b) at tutorial solving tasks from topics of second half of semester



c) at laboratory – a group of 2 students use Solver to find out the optimum solution of a case.

### Programme content

1. linear programmes (LP) formulation: product assortment, blending problem, transportation and transshipment, multiperiod scheduling, using of Excel add-in Solver
2. linear programming. simplex, graphical methods, sensitivity analysis,
3. transportation and transshipment problem, balanced, unbalanced supply-demand,
4. discrete multigoal tasks and methods, multigoal optimality, ranks, optimization degree, AHP,
5. decisions under uncertainty and risk: strategies, news boy, decision tree, spare parts stock,
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.
7. Chosen problems of dynamic and nonlinear optimization, travelling salesman, portfolio analysis

### 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	45	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests) <sup>1</sup>	30	1,0

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