



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Operational Research and Econometrics [S2IZarz1>BOiE]

### Course

Field of study

Engineering Management

Year/Semester

1/1

Area of study (specialization)

Enterprise Resource and Process Management

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr inż. Andżelika Libertowska

andzelika.libertowska@put.poznan.pl

dr Tomasz Brzęczek

tomasz.brzeczek@put.poznan.pl

### Lecturers

### 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. Learning methods of economic relations estimation and applications.

### Course-related learning outcomes

Knowledge:

1. Student knows typical problems of operation management, analyzes and solves tasks [P7S\_WG\_02].
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\_WG\_08].
4. Knows statistics used to assess decisions and risk, knows rules used under uncertainty [P7S\_WG\_02].

5. Knows ordinary least squares method, its assumptions, properties and applications [P7S\_WG\_03].

#### Skills:

1. Student can solve optimization tasks using Excel Solver add-in [P7S\_UW\_01; \_03].
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\_UW\_06].
4. Can optimize decision under risk and limit the level of risk [P7S\_UW\_06].
5. Can estimate econometrics model, can assess significancy, goodness of fit and analyse results. In particular estimates costs model due to quantity of one or many products and sales trend [P7S\_UW\_02].

#### Social competences:

Is able to persuade mangement praticioners to benefits of optimization and modelling usage [P7S\_KK\_01-02; P7S\_KO\_01].

### 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 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

The program covers the following issues: linear programming, programming under risk, programming under uncertainty, multi-criteria problems, and econometric model parameter estimation.

### Course topics

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. estimation of an econometric model with ordinary least squares, assessment of significancy and goodness of fit, and forecasting and forecast expected error calculus.

### 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	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00