STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Operation research and optimization theory	**1011102221011137646**

Field of study	Profile of study (general academic, practical)	Year /Semester
Logistics - Full-time studies - Second-cycle	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Corporate Logistics	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **30**	Classes: **15**	Laboratory: **-**	Project/seminars: **15**	**5**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**5 100%**
Technical sciences	**5 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student knows terms and rules of economics. Knows fields of operations research in business
2	**Skills**	Student can work with computer and Excel. Studen has skill of basic matrix algebra calculus
3	**Social competencies**	Student can work in team and prepare project

Assumptions and objectives of the course:

C1. Student can model and solve problems of resources input and outputs in business.
C2. Student knows basics of statistics and optimization methods used in management.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows operations problem in management and logistics: decisions, objectives and constraints. - [K2A_W09]
2. Knows problems of production mix, blend and labor and production planning. - [K2A_W01]
3. Knows problems of work assignment, transportation and vehicle routing. - [K2A_W01]
4. Differs between continous and descrete decision variable and linear (LP) and other problems classes - [K2A_W22]
5. Student kows multiple-goal programming - [K2A_W13]
6. Student knows OLS metohod of economic parameters estimation. - [K2A_W13]

Skills:

1. Student can model business operations. - [K2A_U14]
2. Can solve a problem using graphical, simplex, network or transport algorithm - [K2A_U10]
3. Uses computer optimization and estimation software: Solver, Solver Foundation - [K2A_U10]
4. Can solve multiple-goal problem (metacriterion, degree of realisation or AHP) - [K2A_U10]
5. Estimates model parametrs using OLS method and GRETL programme - [K2A_U14]
6. Can explain and use results of modeling and optimization in management - [K2A_U15]
7. Student by himself studies chosen problems in details - [K2A_U05]

Social competencies:

1. Student is aware of estimation and optimization role in business. - [K2A_K06]
2. Promotes estimation and optimization methods in business. - [K2A_K03]
3. Can work in team for operations optimization in business. - [K2A_K03]

Assessment methods of study outcomes

Forming mark form:

a) lecture on a basis of answer for questions concerning worked over problems,

b) exercises on a basis of activness and task solving,

c) project on a basis of team's project advances consultation.

Summary mark from:

a) lecture and exercises on a basis of written test of task solving and theory,

b) project on a basis of a team project about "Optimization problem solution in a chosen enterprise" and its presentation.

Course description

1. Optimization models classyfication. Formulation of problems of: production mix, blend, technology process plan, labor and production planning, transportation and assignment.
2. Simplex method.
3. Multi-goal continous models. Graphical, Pareto-effective, metacriterion and hierarchy methods.
4. Multiple-goal descrete model of supplier selection (metacriterion-point scale, degree of realisation or AHP).
5. Network. Critical parth method (CPM) in analysis of project time or cost. Gantt?s time schedule.
6. Transportation problems: balanced, unbalanced, indirect and resaler problem.
7. Dynamic programming. Routing and resource allocation problem.
8. Nonlinear programming. Nonlinear evenue function: conditional optimization and Kuhn-Tucker conditions. Portolio analysis.
9. Decision uncertainty.Basics of games theory.
10. Decision risk. Decision tree, optimum supply problem, optimum stock quantity.
11. Idea of heuristic methods: genetic algorithm.

Basic bibliography:

1. Badania operacyjne, Sikora W. (red.), PWE, Warszawa 2008.
2. Brzęczek T., Gaspars-Wieloch H., Godziszewski B., Podstawy badań operacyjnych i ekonometrii, Wydawnictwo PP, Poznań 2010.
3. Józefowska J., Badania operacyjne i teoria optymalizacji, Wydawnictwo PP, Poznań 2011.
4. Kufel T., Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu GRETL, WN PWN, Warszawa 2011.
5. Przykłady i zadania z badań operacyjnych i ekonometrii, Sikora W. (red.), Wyd. UEP, seria MD 163, Poznań 2005.

Additional bibliography:

1. Anholcer M., Gaspars H., Owczarkowski A., Ekonometria z Excelem Wyd. UEP, Poznań 2010.
2. Balakrishnan N., Render B., Stair R.M., Managerial Decision Modeling with Spreadsheets, Prentice Hall 2007
3. Ekonometria i badania operacyjne. Zagadnienia podstawowe, Guzik B. (red.), Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań 2003.
4. Trzaskalik T., Wprowadzenie do badań operacyjnych z komputerem - CD, PWE, Warszawa 2008.
5. Węglarz J., Modelowanie i optymalizacja. Badania operacyjne i systemowe, Exit, Warszawa 2003.
6. Witkowska D., Podstawy ekonometrii i teorii prognozowania, Oficyna Ekonomiczna, Kraków 2006.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Exercises	15
3. Project classes	15
4. Consultation	30
5. Student	35

Student's workload

Source of workload	hours	ECTS
Total workload	125	5

Contact hours	90	4
Practical activities	60	3