STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Operation research and optimization theory	**1011102321011137646**

Field of study	Profile of study (general academic, practical)	Year /Semester
Logistics - Full-time studies - Second-cycle	**general academic**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Chain of Delivery 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: **15** Classes: **15** Laboratory: **-** Project/seminars: **15**	**3**

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

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**
Technical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student knows economic terms and management problems, esppecially operation management problems.
2	**Skills**	Student has Excel and computer skills. Makes basic operations of matrix algebra.
3	**Social competencies**	Student works in team and prepares project.

Assumptions and objectives of the course:

To develop skills of input-output modeling in management systems and optimization skills. To deliver knowledge about methods of management optimization and methods of estimation of an economic model.

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

Knowledge:

1. Knows problems of production structure, mixture and schedulling. - [K2A_W01]
2. Knows resources allocation problems: travel route and transshipment problems. - [K2A_W01]
3. Student knows typical optimization problems in logistics, their objectives and constraints. - [K2A_W09]
4. Knows multi criteria optimization methods. - [K2A_W13]
5. Knows optimization methods with continous and descrete variable and linear or non-linear function. - [K2A_W22]

Skills:

1. Student uses Excel's Solver and basic functions of Solver Foundation. - [K2A_U05]
2. Student works in project group to analyse a chosen problem - [K2A_U08]
3. Uses optimization methods: graphical, simplex, graphs and transportation algorithm. - [K2A_U10,]
4. Uses multi objective methods (objectives hierarchy, metacriterion, fulfillment degre, AHP). - [K2A_U10]
5. Student builds input-output model of economic system effectiveness. - [K2A_U14]
6. Explains results of optimization models and uses them in management. - [K2A_U15]

Social competencies:

1. Student is aware of optimization benefits in logistics and planning. - [Such a course effect was not assumed]

Assessment methods of study outcomes

Formulating mark:

a) from exercises and lecture concerning current work of a student and the result of a first written test

b) concerning project: assessment of proceeding in the realisation of a project by a group

End mark (pass mark):

a) exercises pass and lecture pass from two written tests in theory and tasks solving

b) project pass: results of a team project ?Decision Modeling and optimization in a chosen company?.

Course description

1. Clasification and modeling of decision tasks. Problems of production structure, mixture, resource division, transportation and tasks allocation.
2. Linear programming. Simplex and graphical method.
3. Multi-criteria continous programming. Metacriterion, objectives hierarchy.
4. Multi-criteria integer programming. Fulfillment degre, AHP.
5. Net programming. CPM ? critical path method. PERT-program evaluation and review technique.
6. Transshipment optimization problems.
7. Basics of dynamic programming. Little algorithm.
8. Basics of nonlinear programming.
9. Decisions under risk.

DYDACTIC METHODS:

Lecture: lecture with a problem analysis

Exercise: exercises in tasks

Project: case study analysis

Basic bibliography:

1. Anholcer M., Gaspars H., Owczarkowski A., Ekonometria z Excelem Wyd. UEP, Poznań 2010.
2. Badania operacyjne, Sikora W. (red.), PWE, Warszawa 2008.
3. Brzęczek T., Gaspars-Wieloch H., Godziszewski B., Podstawy badań operacyjnych i ekonometrii, Wydawnictwo PP, Poznań 2010.
4. Przykłady i zadania z badań operacyjnych i ekonometrii, Sikora W. (red.), Wyd. UEP, seria MD 163, Poznań 2005.

Additional bibliography:

1. Józefowska J., Badania operacyjne i teoria optymalizacji, Wydawnictwo PP, Poznań 2011.
2. Trzaskalik T., Wprowadzenie do badań operacyjnych z komputerem - CD, PWE, Warszawa 2008.
3. Węglarz J., Modelowanie i optymalizacja. Badania operacyjne i systemowe, Exit, Warszawa 2003.

Result of average student's workload

Activity	Time (working hours)
1. lecture	15
2. exercise classes	15
3. project	15
4. consultation	10
5. own work in a project group	10
6. preparing to classes and tests	25

Student's workload

Source of workload	hours	ECTS
Total workload	90	3
Contact hours	47	2
Practical activities	30	1