STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Operational Research and Econometrics	**1011102311011134996**

Field of study	Profile of study (general academic, practical)	Year /Semester
Engineering Management - Full-time studies -	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Production and Operations Management	**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: **15** Project/seminars: **-**	**3**

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 %)
social sciences	**100 3%**
Economics	**100 3%**

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. Student knows typical optimization problems in management, their objectives and constraints. - [K2A_W01]
2. Knows problems of production structure, mixture and schedulling. - [K2A_W09]
3. Knows allocation problems for tasks, resources, travel route and for transport plan problem. - [K2A_W09]
4. Knows optimization methods with continous and descrete variable and linear or non-linear function. - [K2A_W09]
5. Knows multi criteria optimization methods. - [K2A_W09]
6. Knows ordinary least squares method. - [K2A_W10]

Skills:

1. Student builds input-output model of economic system effectiveness. - [K2A_U01]
2. Uses optimization methods: graphical, simplex, graphs and transportation algorithm. - [K2A_U04,]
3. Student estimates or optimizes models with Excel, GRETL and Solver (inc. Solver Foundation). - [K2A_U07]
4. Uses multi criteria methods (aims hierarchy, metacriterion, fulfillment degre, AHP). - [K2A_U04]
5. Estimates linear and linaerizable econometric models with OLS. - [K2A_U04]
6. Explains results of optimization and econometric models and uses them in management. - [K2A_U02]

Social competencies:

1. Student is aware of optimization benefits in management and planning. - [K2A_K03]
2. Spreads optimization in management problem solving. - [K2A_K05]
3. Can objectively assess and analyze data and solutions of management problems. - [S2A_K06]

Assessment methods of study outcomes

Exercises pass with mark from written test in theory and tasks.

Laboratory pass with mark from test in solving tasks with use of computer or team project ?Optimization problem solution in a chosen company?.

Course description

1. Estimation of linear and linearizable econometric models with OLS.
2. Clasification and modeling of decision tasks. Problems of production structure, mixture, resource division, transportation and tasks allocation.
3. Linear programming. Simplex and graphical method.
4. Multi-criteria continous programming. Metacriterion, objectives hierarchy.
5. Multi-criteria integer programming. Fulfillment degre, AHP.
6. Net programming. CPM ? critical path method. PERT-program evaluation and review technique.
7. Transportat optimization problem and Little algorithm.
8. Basics of nonlinear programming.

Basic bibliography:

1. Balakrishnan N., Render B., Stair RM., Managerial Decision Modeling with Spreadsheets, Pearson Education 2006.
2. Brzęczek T., Gaspars-Wieloch H., Godziszewski B., Podstawy badań operacyjnych i ekonometrii, Wydawnictwo PP, Poznań 2010.
3. Maddala G.S., Lahiri K., Introduction to Econometrics 4-th edition, Wiley 2009.
4. Ravindran A.R. (ed.), Operations Research and Management Science Handbook, 904 p., Operations Research Series, CRC Press 2007.
5. Przykłady i zadania z badań operacyjnych i ekonometrii, Sikora W. (red.), Wyd. UEP, seria MD 163, Poznań 2005.
6. Taha H.S., Operations Research: An Introduction (8-th Edition), 813 p., 2006 (with AMPL and Excel Solver examples).

Additional bibliography:

1. Krajevski LJ., Ritzman LP., Malhorta MK., Operations Management, Prentice Hall Int., 2006.
2. Węglarz J., Modelowanie i optymalizacja. Badania operacyjne i systemowe, Exit, Warszawa 2003.
3. Winston W.L., Operations Research: Applications and Algorithms (with CDrom and InfoTrac) 1440 p., Duxbery Press 2003.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	15
2. Exercises	15
3. Laboratories	15
4. Consultation	30

Student's workload

Source of workload	hours	ECTS
Total workload	75	3
Contact hours	75	3
Practical activities	30	1