

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Problems solving methods in transportation		Code 1010612211010610637
Field of study Transport	Profile of study (general academic, practical) (brak)	Year /Semester 1 / 1
Elective path/specialty Logistics of Transport	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 4
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 4 100% 4 100%
Responsible for subject / lecturer: Adam Redmer Eng. PhD email: adam.redmer@put.poznan.pl tel. +48 61 665 21 29 Faculty of Machines and Transport 3 Piotrowo street, 60-965 Poznan, Poland		Responsible for subject / lecturer: Paweł Zmuda-Trzebiatowski Eng. MSc email: pawel.zmuda-trzebiatowski@put.poznan.pl tel. +48 61 665 27 16 Faculty of Machines and Transport 3 Piotrowo street, 60-965 Poznan, Poland
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	student has a basic knowledge of mathematics and operational research moreover transportation and management as well
2	Skills	student is able to accumulate information, interpret it, reasoning based on it, express and justify opinions, identify, associate and interpret phenomena occurring in a practice
3	Social competencies	student is aware of the importance and understands non-technical aspects and effects of transportation processes, including those coming from decision-making
Assumptions and objectives of the course: -to prepare students for transportation management using quantitative methods (including optimization and decision aid methods) that allow for rational and effective management in transportation and logistics systems.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Students know the notion of the optimization (single and multiple criteria) and the decision making. - [K2A_W01] 2. Students know steps of optimization and decision making processes. - [K2A_W01] 3. Students know and understand make or buy, carrier selection, fleet sizing/composition and replacement decision problems. - [K2A_W02] 4. Students know principles of the optimization and the mathematical modeling. - [K2A_W02] 5. Students know principles of the Multicriteria Decision Making / Aid ? MCDM/MCDA. - [K2A_W04] 6. Students know methods and tools of the optimization (solver) and the decision making (AHP. ELECTRE, LBS, UTA). - [K2A_W04]		
Skills:		
1. Students are able to carry out optimization and decision making processes. - [K2A_U04] 2. Students are able to construct optimization / mathematical model of a problem and a decision maker preference model as well. - [K2A_U05] 3. Students are able to select appropriate solution methods to models / problems. - [K2A_U06] 4. Students are able to apply optimization and decision making / aid tools (software). - [K2A_U05] 5. Students are able to asses obtained results and to recommend ways of their application. - [K2A_U14]		
Social competencies:		

<p>1. Students are aware of the significance of making right / the best possible / optimal decisions in business practice. - [K2A_K02]</p> <p>2. Students are aware of potential technical, economic and social effects that an improper / incorrect decision making / problems solving may cause. - [K2A_K04]</p> <p>3. Students are able to develop independently their knowledge of operational research, optimization and MCDM/MCDA. - [K2A_K05]</p>
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Assessment methods of study outcomes		
-A final exam based on the knowledge obtained within the lectures (a multiple choice test).		
Course description		
<p>-The notion of the optimization and the decision making: introduction to the optimization and decision making (definitions, meanings) ? multiple criteria in decision making ? the essence of the compromise solutions.</p> <p>Single criterion optimization: principles of the mathematical modeling, utilization of optimization tools, basic algorithms.</p> <p>Make-or-buy problem: the definition and the essence of the make-or-buy problem in transportation / logistics (in-house or outside logistics, in-house or outside transport).</p> <p>Fleet sizing/composition problem: the definition of the fleet sizing/composition problem; the essence and characteristic of the problem; factors influencing fleet size /composition.</p> <p>Multiple criteria optimization: principles of the multiobjective optimization, Pareto-optimal solutions of problems, methods of generating / seeking for Pareto optimal solutions.</p> <p>Multicriteria Decision Making / Aid ? MCDM/MCDA: the definition and the essence of the MCDM/MCDA, classification of MCDM/MCDA methods; principles of decision maker?s preferences modeling; selection of an appropriate MCDM/MCDA tools; an application of MCDM/MCDA methods to a ?buy? option ? carriers selection and assessment; a ?make? option ? fleet replacement.</p> <p>Logistic solutions for SME sector: case study; designing of a logistic solution for a given SME.</p>		
Basic bibliography:		
<p>1. Sikora W. (red.): Badania operacyjne. Polskie Wydawnictwo Ekonomiczne, Warszawa 2008 (in Polish)</p> <p>2. Hillier F., Lieberman G.: Introduction to Operations Research. McGraw Hill Publishing, New York 2002</p> <p>3. Wagner H.: Badania operacyjne: zastosowania w zarządzaniu. Polskie Wydawnictwo Ekonomiczne, Warszawa 1980 (in Polish)</p> <p>4. Figueira J., Greco S., Ehrgott M. (eds.): Multiple Criteria Decision Analysis. State of the Art. Surveys. Springer, New York 2005</p> <p>5. Żak J.: Wielokryterialne wspomaganie decyzji w transporcie drogowym. Rozprawy, Nr 394, Wydawnictwo Politechniki Poznańskiej, Poznań, 2005 (in Polish)</p>		
Additional bibliography:		
<p>1. Jędrzejczak Z., Kukła K., Skrzypek J., Walkosz A.: Badania operacyjne w przykładach i zadaniach. Wydawnictwo Naukowe PWN, Warszawa 2005 (in Polish)</p> <p>2. Jacyna M.: Modelowanie wielokryterialne w zastosowaniu do oceny systemów transportowych. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001 (in Polish)</p>		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Participation in laboratories	15	
3. Individual work (homework and preparation to a final exam)	15	
Student's workload		
Source of workload	hours	ECTS
Total workload	60	4
Contact hours	45	3
Practical activities	15	1