Description of course	
Code of course	**1160-TRTSEM-MSA-0109**
Name of course	***Transport Systems Planning***
Version of course	2021/22
A. ***Place of the course in system of studies***	
Level of education	*Second-cycle degree*
Form and mode of studies	*Full-time studies*
Field of studies	*Transport*
Profile of studies	*General academic profile*
Specialization	*Transport systems engineering and management*
Place of teaching of course	*Warsaw University of Technology, Faculty of Transport, Division of Transportation Systems Engineering and Logistics*
Place of realization of course	*Not applicable*
Coordinator of course	*Izdebski Mariusz, Ph.D., DSc., Assoc. Prof., Division of Transportation Systems Engineering and Logistics, Faculty of Transport, Warsaw University of Technology*
B. ***General characteristic of the course***	
Group/*Block of courses*	*Specialization subject*
Level of course	*Basic level*
Type of course	*Compulsory subject*
Language of course	*English*
Location of the course in the study plan – nominal semester	1
Location of the course in the academic year	*Winter semester*
Preliminary requirements - formal	*None.*
Limit of students	*Lecture: 100, Project: 18*
C. ***Effects of education and manner of teaching***	
Purpose of course	*The aim of the course is to familiarize students with the stages planning of transport systems various types, e.g. transport system road, air, rail, intermodal and presenting them in terms of mathematics*

Effects of education with reference to the learning outcomes for the area and field of study

No. effect	***Description of the effect***	***Reference to the characteristics of learning outcomes***	***Reference to the learning outcomes in the program***
Assumed learning outcomes in terms of knowledge			
W01	*He knows the methods and tools for planning transport systems.*	I.P7S_WG.o	Tr2A_W04 Tr2A_W10
W02	*He has knowledge of the efficiency assessment of planned transport systems.*	I.P7S_WG.o I.P7S_WK	Tr2A_W10 Tr2A_W12
Assumed learning outcomes in terms of skills			
U01	*He can develop a mathematical model of any transport system.*	I.P7S_WG.o I.P7S_WK	Tr2A_U14
Assumed learning outcomes in the field of social competences			
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Form of didactic studies and number of hours	*Lecture*	*Exercise*	*Laboratory*	*Project*	*Other*
On a weekly plan	1	0	0	1	0
Throughout the semester	15	0	0	15	0

Contents of education - separately for each form of didactic studies	*Lecture*: *Introduction to transport systems, definition of the transport system, its elements. Presentation of the stages of planning transport systems in mathematical terms, i.e. defining the model input data, decision variables, constraints, and criterion functions. Presentation of the basic decision-making problems in planning transport systems:*

	1) the problem of locating objects in the transport network, e.g. reloading terminals, warehouses, *2) planning a system for intermodal, transport, and international transport,* *3) selection of resources for tasks, the issue of allocation.* *Presentation of exemplary transport systems in mathematical terms, e.g. courier companies, municipal companies. Risk analysis in planning transport systems. Stages of the four-stage model, division of transport tasks. The scoring method as applied to the multi-criteria evaluation.* *Project*: *Development of mathematical models of selected transport systems.*
Teaching methods	*Lecture:* *Lecture with the use of MS PowerPoint multimedia presentations, with computational examples.* *Project*: *Project with the use of MS PowerPoint multimedia presentations, with calculation examples.*
Methods of verification of effects of education	
No. effect	***Methods of verification***
Assumed learning outcomes in terms of knowledge	
W01	*Lecture: written test in the form of open questions. It is required to answer at least 51% of the questions asked about this educational effect.*
W02	*Lecture: written test in the form of open questions. It is required to answer at least 51% of the questions asked about this educational effect.*
Assumed learning outcomes in terms of skills	
U01	*Project: completed project tasks.*
Assumed learning outcomes in the field of social competences	
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Methods of evaluation	*Lecture:* *Written test in the form of open questions. In both cases, an answer to at least 51% of the questions asked is required.* *Project:* *On the basis of 3-4 projects to be carried out. It is required to pass 51% of each project.* *Integrated degree:* *Average of partial grades.*
Exam	*No*
Literature	*Basic literature*: 1) Juan de Dios Ortúzar, Luis G. Willumsen: Modelling Transport, 4th Edition, 2011 2) Izdebski M., Jacyna-Gołda I., Jakowlewa I.: Planning International Transport Using the Heuristic Algorithm. Advances in Intelligent Systems and Computing, 2018, 229–241.doi:10.1007/978-3-319-99477-2_21. 3) Izdebski M., Jacyna-Gołda I., Gołębiowski P. [i.in.]: The Optimization Tool Supporting Supply Chain Management in the Multi-Criteria Approach, w: Archives of Civil Engineering, vol. 66, nr 3, 2020, ss. 505-524. 4) Jacyna M., Jachimowski R., Szczepański E. [i.in.]: Road vehicle sequencing problem in a railroad intermodal terminal – simulation research, w: Bulletin of the Polish Academy of Sciences, Technical Sciences, vol. 68, nr 5, 2020, ss. 1135-1148. 5) Szczepański E., Jachimowski R., Izdebski M. [i.in.]: Warehouse location problem in supply chain designing: a simulation analysis, w: Archives of Transport, vol. 50, nr 2, 2019, ss. 101-110.
Website of the course	–
D. ***Student's activity***	
Number of ECTS credits	3
Number of hours of student's work to achieve effects of education	*80 hours, including: work on lectures 15 hours, work on projects 15 hours, studying the literature of the subject 7 hours, consultations 3 hours (including consultations in*

	the field of design works 2 hours), preparation for a pass 7 hours, execution of design works outside class hours 32 hours, defense of a project works 1 hour.
Number of ECTS credits on the course with direct participation of academic teacher	*1.5 ECTS points (34 hours, including: work on lectures 15 hours, work on projects 15 hours, consultations 3 hours, defense of a project works 1 hour*
Number of ECTS credits on practical activities on the course	*2.0 ECTS points (50 hours, including: work on projects 15 hours, consultations in the field of design works 2 hours, execution project works outside of 32 hours of classes, defense of a project works 1 hour)*
E. ***Additional information***	
Notes	*As long as it does not cause changes in the relationship of a given subject with the directional effects in the content of education, changes may be introduced on an ongoing basis, taking into account the latest scientific achievements.*
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