Description of course	
Code of course	**1160-TR000-MSA-0103**
Name of course	**Transport Modelling and 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	Subject common for the faculty
Place of teaching of course	Warsaw University of Technology, Faculty of Transport, Department of Transport Systems Engineering and Logistics
Place of realization of course	Not applicable
Coordinator of course	Professor Marianna Jacyna, Department of Transport Systems Engineering and Logistics, Faculty of Transport, Warsaw University of Technology

B. *General characteristic of the course*

Group/Block of courses	Major subjects
Level of course	Intermediate level
Type of course	Obligatory 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, exercises: 24.

C. *Effects of education and manner of teaching*

Purpose of course	To achieve by the student the knowledge and skills necessary for transport modeling and planning including the creation of traffic models, distribution of traffic flows in the transport network and knowledge of tools to support transport planning

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	Has theoretical knowledge of organizing and planning traffic in a transportation network and of decision models for traffic organizing, equilibrium models in the Nash sense and in the Stackelberg sense as well as computer tools and techniques to support decision-making in transport planning.	I.P7S_WG.o	Tr2A_W04
W02	Has theoretical knowledge of the stages of the four-step model construction and the interpretation of issues related to traffic generation, including: traffic generation model; spatial traffic distribution model; modal split model; network traffic distribution model; transport network model - GIS vector representation; model verification.	I.P7S_WG.o	Tr2A_W04
W03			
Assumed learning outcomes in terms of skills			
U01	Be able to write formally a decision model for organizing traffic, including models in the Nash and Stackelberg sense, and is able to apply multi-criteria assessment to choose the best variant of the transport system development.	I.P7S_UW.o. III.P7S_UW.o	Tr2A_U04 Tr2A_U11
U02	Is able to develop the stages of a four-stage traffic model for a selected area of the transport network and then plan and model	I.P7S_UW.o. III.P7S_UW.o	Tr2A_U06 Tr2A_U11

	public transport using computer-aided tools such as PTV Visum.		
	Assumed learning outcomes in the field of social competences		
KS01	Is prepared to acknowledge the importance of knowledge in solving cognitive and practical problems, in particular those related to transport, as well as consulting experts in case of difficulties in solving these problems.	I.P7S_KK	Tr2A_K02

Form of didactic studies and number of hours	*Lecture*	*Exercise*	*Laboratory*	*Project*	*Other*
On a weekly plan	1	1	0	0	0
Throughout the semester	15	15	0	0	0

Contents of education - separately for each form of didactic studies	*Lecture:* 1. The concept of traffic organizing in the transport network and transport planning. 2. Decision models of traffic organization; equilibrium in the sense of Nash and Stackelberg. 3. Planning and modeling of contemporary transport systems. Examples of practical application. Generalized travel cost - utility function of a specific way of traveling. Travel needs. Transport behavior and preferences. 4. Types of models and tools used in the analysis of transport systems and processes. Analytical deterministic models based on HCM (analytical deterministic tools). Macroscopic, mesoscopic and microscopic simulation models. 5. Stages of constructing a four-stage model - traffic generation model; model of spatial distribution of traffic; model of division of transport tasks, model of network traffic distribution; transport network model - GIS vector mapping; model verification (verification of partial models). Practical examples. 6. Network attributes, section resistance function expressing travel time in the network. Investments - technical variants, forecast horizons. 7. Computer tools and techniques to support decision-making in transport planning, including methods of multi-criteria decision support - definitions, procedures, practical examples. *Exercises*: Decision models for traffic organisation in a network - formalising the notation. Division of traffic tasks - calculation example, determination of traffic generation potentials. Selection of a development variant using the multi-criteria evaluation method. Modeling of the public transport network in PTV Visum software: coding of the road network and communication areas, coding of the public transport network, traffic distribution in the network, development of the demand matrix for individual and public transport, determination of transport performance.
Teaching methods	*Lecture*: Lecture using MS PowerPoint multimedia presentations, with lots of graphical objects and practical examples. *Exercises*: Interactive methods of analysis and formulation of decision models, methods and tools of computer technology.

Methods of verification of effects of education	
No. effect	***Methods of verification***
Assumed learning outcomes in terms of knowledge	
W01	Lecture - written colloquium in the form of open questions or test questions. In both cases the student is required to answer at least 51% of the questions concerning the given educational result.
W02	Lecture - written colloquium in the form of open questions or test questions. In both cases the student is required to answer at least 51% of the questions concerning the given educational result.
Assumed learning outcomes in terms of skills	
U01	Exercises: a colloquium containing a task on formulating traffic organization decision models and a task on multi-criteria evaluation of transport system development alternatives. Each of the tasks must be passed with 51% to receive a grade of three.

U02	Exercises: on the basis of a correctly executed public transport communication project for a selected network area in PTV Visum and an oral answer to 3 out of 5 questions.
Assumed learning outcomes in the field of social competences	
KS01	Oral interview during project completion

Methods of evaluation	*Lecture*: Written colloquium. *Exercises*: Written colloquium and a design exercise done in PTV VISUM (individually or in groups), on the basis of which the final grade of the exercises is given. *Integrated Assessment*: The final grade of the course: is given as the arithmetic mean of the grade from the lecture and the grade from the auditory exercises.
Exam	*No*
Literature	Basic literature: 1) Ortúzar J., Willumsen L.: Modelling Transport, 4th Edition, Wiley, 2011. 2) Jacyna, M., Wasiak, M. (Eds.): Simulation model to support designing a sustainable national transport system. Index Copernicus, Warszawa 2014. 3) The PTV Visum Online Help: https://cgi.ptvgroup.com/vision-help/VISUM_2020_ENG/ *Supplementary literature*: 1) Jacyna M. i inni, A holistic approach to modelling of the ecological domestic transport system, A. Ibeas (eds.): 18th Pan-American Conference of Traffic and Transportation Engineering and Logistics (PANAM 2014), 2014, ISBN 978-84-617-0085-1, Santander, 2014, pp. 1–16. 2) Jacyna M., Wasiak M., Kłodawski M., Gołębiowski P., Construction of freight transport model for transport planning in urban agglomerations, Journal of KONES, 2016, Vol. 23 (4), pp. 143–150, DOI 10.5604/12314005.1217200 3) Jacyna M., Wasiak M., Kłodawski M., Gołębiowski P., Modelling of Bicycle Traffic in the Cities Using VISUM, Procedia Engineering, Vol. 187, 2017, pp. 435–441. 4) Jacyna M., Wasiak M., Lewczuk K., Kłodawski M., Simulation model of transport system of Poland as a tool for developing sustainable transport, Archives of Transport, Vol. 31(3), 2015, pp. 23–35, DOI: 10.5604/08669546.1146982 5) Jacyna M., Żochowska R., Sobota A., Wasiak M.: Scenario Analyses of Exhaust Emissions Reduction through the Introduction of Electric Vehicles into the City, Energies, 2021, Vol. 14, nr 7, s.1-33. DOI:10.3390/en14072030 6) Żochowska R., Karoń G.: ITS services packages as a tool for managing traffic congestion in cities. In: A. Sładkowski, W. Pamuła, Intelligent transportation systems – problems and perspectives, Springer, 2016, pp. 81-103 (Studies in Systems, Decision and Control ; Vol. 32, pp. 2198-4182)
Website of the course	–

D. *Student's activity*

Number of ECTS credits	2
Number of hours of student's work to achieve effects of education	*60 hours, including: the work during lectures 15 hours, the work during classes 15 hours, studying the literature 9 hours, consultations 3 hours, participation in the colloquia 2 hours, preparation for the colloquia from the lectures 8 hours, preparation for the colloquia from classes 8 hours.*
Number of ECTS credits on the course with direct participation of academic teacher	*1.5 ECTS (35 hours, including: work at lectures 15 hours, work at classes 15 hours, consultations 3 hours, participation in seminars 2 hours)*
Number of ECTS credits on practical activities on the course	*0*

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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