Description of course	
Code of course	**1160-TR000-MSA-0107**
Name of course	***Traffic Management and Control***
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 to the field of studies*
Place of teaching of course	*Warsaw University of Technology, Faculty of Transport, Division of Traffic Control and Transport Infrastructure*
Place of realization of course	*Not applicable*
Coordinator of course	*Phd. Przemysław Ilczuk Division of Traffic Control and Transport Infrastructure, Faculty of Transport, Warsaw University of Technology*
B. *General characteristic of the course*	
Group/*Block of courses*	*Field subjects*
Level of course	*Intermediate 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	*Non*
Limit of students	*Lecture: 100 people.*
C. *Effects of education and manner of teaching*	
Purpose of course	*Developing knowledge of the methods and functions of direction (management) and traffic control in rail, road and air transport. Acquiring the ability to analyse and build complex systems of direction and traffic control.*

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	Is familiar with the development trends of traffic control and direction (management) functions and measures.	I.P7S_WG.o I.P7S_WK	Tr2A_W11
W02	Is familiar with traffic control methods and measures: at isolated junctions, on routes and on networks of junctions, on motorways and motorways. It knows the methods and measures methods and measures for individual motor vehicle control. Is familiar with centralised traffic control and management systems. Is familiar with the requirements and methods for assessing the safety and efficiency of rail and air traffic. Is familiar with the effectiveness indicators of road traffic control. Is familiar with the elements of queuing processes in road traffic. Is familiar with issues related to priorities for public transport vehicles. Is familiar with hierarchical systems of railway traffic control and direction. Is familiar with methods and means of air traffic management. Is familiar with man-machine relations in traffic control.	I.P7S_WG.o	Tr2A_W06 Tr2A_W10
Assumed learning outcomes in terms of skills			
U01	Can determine the characteristics and technical and functional requirements of a safe and efficient command and control	I.P7S_UW.o III.P7S_UW.o	Tr2A_U08 Tr2A_U14

	system. Be able to analyse the classification of a command and control system in relation to its effectiveness.		
U02	Can identify basic EU and national documents (laws, regulations, instructions, etc.) and standards which are the basis for information exchange within project teams.	I.P7S_UW.o III.P7S_UW.o	Tr2A_U02
Assumed learning outcomes in the field of social competences			
KS01	Understands the importance of the efficiency of transport direction and control systems.	I.P7S_KR	Tr2A_K05

Form of didactic studies and number of hours	*Lecture*	*Exercise*	*Laboratory*	*Project*	*Other*
On a weekly plan	2	0	0	0	0
Throughout the semester	30	0	0	0	0

Contents of education - separately for each form of didactic studies	*Rail transport market structure: legislature, national safety authority, infrastructure managers, carriers, producers, permits to operate on the railway market, certification, safety management system.* *Basic formal and legal regulations: selected issues of the Railway Transport Act and higher and lower level acts, tasks of the Railway Transport Office.* *Infrastructure and rolling stock: railway network and its components, classification of railway vehicles, classification of railway products.* *Interoperability: subsystems, essential requirements, subsystem authorisation, TSIs, UTK President's List.* *Safety of the railway system: concepts of safety integrity, common safety methods.* *Traffic control: installation objectives, purpose, operating modes, construction and basics of signalling; traffic detectors; acyclic signalling; coordination of signalling. Intelligent transport systems. EU directive ITS. Frame architecture. Trans-European transport network TEN-T.* *Traffic management on the provincial, national and motorway road network. The role of GDDKiA. National Traffic Management System: traffic management centre, information for drivers, meteorological protection, safety systems. Tasks of the GITD, CANARD, toll collection systems and weighing of vehicles in traffic.* *Urban traffic management. Traffic control systems, alternative routes, parking systems, V2X, monitoring systems, red light, truck identification, object gauge protection. Master application and traffic management centre. Examples of urban ITS. Public transport management. Traffic surveillance systems, local and central priority, traffic control, passenger information, transport on demand, ticketing systems, security systems. Cost of ITS solutions.* *Traffic modeling in micro and macro scale. Wiedemann's traffic model. The 4-stadium traffic model. Case study analysis of road solutions on the basis of simulation tools.* *Formal and legal basis: structure and scope of aviation law; international and community civil aviation organisations and agencies: ICAO, EU/EASA; civil aviation authorities, institutions and entities.* *Structure of the air transport market: air carriers, ground handling agents, aircraft manufacturers, airport and aerodrome operators; ATM/ATS air traffic management services, size and characteristics of the air transport market, SWOT analysis and forecasts.* *Air traffic and air transport infrastructure and environment: airspace structure, Airborne ground facilities (COM, SUR, NAV, VAN, MET, DP).* *Air traffic and transport management: processes, public service, certification, Safety Management System, Compliance Monitoring System, integration.* *Single European Sky (SES) concept: objectives and principles, components: FUA, FAB, SESAR, RVSM, A-CDM, ACE, ATMAP.*
Teaching methods	*Lecture with problems presented for independent solution (quick or as homework). Lecture in the form of audiovisual presentation, independent problem solving, discussion.*

Methods of verification of effects of education	
No. effect	***Methods of verification***
Assumed learning outcomes in terms of knowledge	
W01	Examination. In the examination, students are asked one or two questions (issues) relating to the range of knowledge imparted. At least a partially correct answer to each question is required.
W02	Examination. In the examination, students are asked one or two questions (issues) relating to the range of knowledge imparted. At least a partially correct answer to each question is required.
Assumed learning outcomes in terms of skills	
U01	Each of the exam questions will include an extension to test the skill level. In addition, short test questions may be asked in class to test the skills or also questions to inspire conversations or discussions with students in this area.
U02	Each of the exam questions will include an extension to test the skill level. In addition, short test questions may be asked in class to test the skills or also questions to inspire conversations or discussions with students in this area.
Assumed learning outcomes in the field of social competences	
KS01	One of the examination questions will include an extension on social competences. In addition, short review questions relating to social competences may be asked in class.

Methods of evaluation	Written examination.
Exam	*Yes*
Literature	1. *Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union (OJ L 138, 26.5.2016, pp. 44-101).* 2. *Commission Regulation (EU) No 1301/2014 of 18 November 2014 on technical specifications for interoperability of the energy subsystem of the rail system in the Union Text with EEA relevance (OJ L 356, 12.12.2014, pp. 179-227, as amended).* 3. *Commission Regulation (EU) No 1299/2014 of 18 November 2014 concerning the technical specifications for interoperability relating to the infrastructure subsystem of the rail system in the European Union (Text with EEA relevance)Text with EEA relevance (OJ L 356, 12.12.2014, pp. 1-109, as amended).* 4. *Commission Regulation (EU) 2016/919 of 27 May 2016 on the technical specification for interoperability relating to the control-command and signalling subsystems of the rail system in the European Union (OJ L 158, 15.6.2016, p. 1-79, as amended).* 5. *Commission Regulation (EU) No 1302/2014 of 18 November 2014 on the technical specification for interoperability relating to the rolling stock subsystem - locomotives and passenger rolling stock of the rail system in the European Union (OJ L 356, 12.12.2014, p. 228-393, as amended).* 6. *Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on a common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009 (OJ L 121, 3.5.2013, pp. 8-25, as amended).* 7. *Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport* 8. *EN 50126 Railway applications - The specification and demonstration of reliability, availability, maintainability and safety (RAMS)* 9. *ICAO Annex 14 and ICAO Doc: 9137, 9157, 9184, 977.* 10. *IATA ADRM; 4. ACI Airport Forecasting Manual.* 11. *FAA AC:l50/5060-5.*
Website of the course	None
D. ***Student's activity***	
Number of ECTS credits	2

Number of hours of student's work to achieve effects of education	*55 hours, including: the work at the lectures 30 hours, reading the literature 10 hours, preparation for the exam 12 hours, consultations 1 hour, participation in the exam 2 hours.*
Number of ECTS credits on the course with direct participation of academic teacher	*1.5 points. ECTS (33 hours, including: lecture work - 30 hours, consultations - 1 hour, participation in examination - 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.*
Date of last edition	2021-08-23 16:32