### Study plan

## Name of study plan: Master Full-Time IS (CS) from 2023/24

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Intelligent Transport Systems Type of study: Follow-up master full-time Required credits: 120 Elective courses credits: 0 Sum of credits in the plan: 120 Note on the plan:

Name of the block: Compulsory courses Minimal number of credits of the block: 93 The role of the block: Z

Code of the group: 1S-NP-IS-CS-20/21 Name of the group: 1st Sem. Master Full-Time IS (CS) from 2020/21 Requirement credits in the group: In this group you have to gain 22 credits Requirement courses in the group: In this group you have to complete 5 courses Credits in the group: 22 Note on the group:

#### Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) **ITS Mathematical Tools** 11MAI Z,ZK 2P+2C 7 4 7 Jan P ikryl Jan P ikryl Jan P ikryl (Gar.) Vehicles within ITS 16DITS Z,ZK 4 2P+2C Ζ Ζ Jan Leistner, Filip Kotas, David Lehet, Jaroslav Machan Geographical, information, localization and navigation systēms 20GINS Ζ Z,ZK 6 3P+3C Ζ Pavel Hrubeš, Petr Bureš, Zuzana Purkrábková, František Kekula Pavel Hrubeš Telematic systems and their design 20TSJ Ζ Z,ZK 6 3P+2C Ζ Pavel Hrubeš, Martin Langr Martin Langr ΚZ Ζ 23TBSS 2 2P+0C Z **Technology and Security of Sensor Networks**

# Characteristics of the courses of this group of Study Plan: Code=1S-NP-IS-CS-20/21 Name=1st Sem. Master Full-Time IS (CS) from 2020/21

11MAI ITS Mathematical Tools	Z,ZK	4				
Series, Fourier Series. Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analy	sis to PDE. Fund	amentals of				
Numerical Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following models as ODEs.						
16DITS Vehicles within ITS	Z,ZK	4				
Design of the vehicle with focus on its use and function in frame of ITS. User requirement analyses. Economic aspects. Process of constructions in a	a concept phase,	functional				
dependences and structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy tra	nsformations lead	ling to kinetic				
one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.						
20GINS Geographical, information, localization and navigation systems	Z,ZK	6				
The subject is specialized in problems of work with applications of geographic information systems with special attention to the specialization in the field o	f transport and tel	ecommunication.				
It introduces students to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and dig	itization methods	, and a number				
of other GIS related technologies such as problem mapping, webmap, etc.						
20TSJ Telematic systems and their design	Z,ZK	6				
Gradual detailed analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management,	traffic manageme	ent, etc.				
23TBSS Technology and Security of Sensor Networks	KZ	2				
The course focuses on the safety of data collection in new areas of sensor networks. Principles of sensor networks, sensors of electrical and non-electric quantities, interfaces for						
sensor connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Smart C	City					

### Code of the group: 1S-NP-IS-CS-V-20/21

Name of the group: 1st Sem. Master Full-Time IS (CS) Alternative from 2020/21

#### Requirement credits in the group: In this group you have to gain 3 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 3 Note on the group:

Note on the gr						
Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
12TDP	Traffic Flow Theory Vladimír Faltus	Z,ZK	3	2P+1C	z	Z
16ESDP	Electronic systems in modern vehicles Petr Bouchner, Dmitrij Rožd stvenský	Z,ZK	3	2P+1C	Z	Z
20MZZ	Modern techniques of safety control of moving railway vehicles Martin Leso Martin Leso	Z,ZK	3	2P+1C	Z	Z

# Characteristics of the courses of this group of Study Plan: Code=1S-NP-IS-CS-V-20/21 Name=1st Sem. Master Full-Time IS (CS) Alternative from 2020/21

12TDP	Traffic Flow Theory	Z,ZK	3				
Mobility and associated human problems. Basic traffic parameters and their measurement. Estimation of quality of services. Theoretical fundamentals and applications of mathematical							
models. Macroscopic, s	tatistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation I	between traffic mo	odels and traffic				
flow management.							
16ESDP	Electronic systems in modern vehicles	Z,ZK	3				
Advanced vehicle syste	ms, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propul	sion, its compone	ents, basic				
characteristics and cont	trol. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.)	. Safety, commun	ication and				
comfort electronic vehic	le systems. Practical exercises with real and simulated systems.						
20MZZ	Modern techniques of safety control of moving railway vehicles	Z,ZK	3				
ERTMS / ETCS concepts, ETCS architecture and interface descriptions, ERTMS system level, infrastructure and mobile part of the system, linking to stationary security systems,							
operating and application modes of the system, infrastructure orientation, interface (DMI), integration of the ETCS mobile part into the driving vehicle, GSM-R functional specification,							
testing and legislation.	testing and legislation.						

#### Code of the group: 2S-NP-IS-CS-20/21

### Name of the group: 2nd Sem. Master Full-Time IS (CS) from 2020/21 Requirement credits in the group: In this group you have to gain 21 credits Requirement courses in the group: In this group you have to complete 5 courses Credits in the group: 21

#### Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
14CITS	C-ITS Systems Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k Lokaj (Gar.)	Z,ZK	6	3P+3C	L	Z
14PAM	<b>Programming and modelling</b> Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala <b>Vít Fábera</b> Vít Fábera (Gar.)	Z,ZK	4	2P+2C	L	Z
14PD	Data processing Miroslav Vaniš, Martin Šrotý, Michal Je ábek Martin Šrotý Martin Šrotý (Gar.)	Z,ZK	6	2P+4C	L	Z
14PPRP	Computer Aided Project Management Marek Kalika Marek Kalika Marek Kalika (Gar.)	KZ	2	0P+2C	L	Z
20BITS	Safety and reliability of ITS Systems Vladimír Faltus, Tomáš Tichý	KZ	3	2P+1C	L	Z

# Characteristics of the courses of this group of Study Plan: Code=2S-NP-IS-CS-20/21 Name=2nd Sem. Master Full-Time IS (CS) from 2020/21

14CITS	C-ITS Systems	Z,ZK	6			
Detailed description of C-ITS systems architecture, description of use-cases - urban and rural applications, principles of C-ITS funcionality with focus on data exchange (CAM, DENM,						
IVI) and C-ITS security	architecture. Status quo and modern trends of wireless telecommunication solutions ITS-G5 and LTE-V and description of its	s properties and s	pecifics. Course			
will also cover signal pr	ocessing.					
14PAM	Programming and modelling	Z,ZK	4			
Object oriented program	nning, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, rec	ursion, complexit	, Lindenmeyer's			
grammars, paralism in r	nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, mode	l types As-Is a To-	Be, acquisition			
of analytical sources for	modelling, BPMN language, SW Bizagi, model creation and life cycle.					
14PD	Data processing	Z,ZK	6			
Students will learn about tools for data processing and analysis, using practical examples to try out the most common options used in data processing, including advanced options for						
presenting the results of analyses. In advanced methods, students will also perform specific analysis using Bayesian networks. Students will then independently perform data analysis						
on data from existing or	ben systems.					

14PPRP	Computer Aided Project Management	KZ	2			
What is the project? The basic terms a concepts of project management. Life cycle of the project and its phased approach. Analysis and specification of the assignment, activity						
definition, stages, object	tives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of th	e project outline (	activities,			
restrictions, assignment	s, calendars etc.) Project planning and optimization - time, resources.					
20BITS	Safety and reliability of ITS Systems	KZ	3			
The basic concepts of s	The basic concepts of safety and reliability in the job and application. Basic schema and types of diagnostic systems including reliability diagnostics of technical equipment and ITS.					
Investigation of acceptability and reliability prediction, traffic crity and sensitivity analysis. Neural Networks and other optimization algorithms and ETA, FMEA failure analysis. HMI in						
traffic including operator testing on simulator and in real-world situatiation						

#### Code of the group: 2S-NP-IS-CS-V-20/21

Name of the group: 2nd Sem. Master Full-Time IS (CS) Alternative from 2020/21 Requirement credits in the group: In this group you have to gain 3 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 3 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
14MIM	Microsimulation Models Jan Kr ál Jan Kr ál Jan Kr ál (Gar.)	KZ	3	0P+3C	L	Z
16SHMI	Simulation and HMI Stanislav Novotný, Tereza Kunclová, Michal Cenkner	Z,ZK	3	2P+1C	L	Z
20ITSR	ITS - R Martin Leso Martin Leso (Gar.)	Z,ZK	3	2P+1C	L	Z

# Characteristics of the courses of this group of Study Plan: Code=2S-NP-IS-CS-V-20/21 Name=2nd Sem. Master Full-Time IS (CS) Alternative from 2020/21

14MIM	Microsimulation Models	KZ	3			
Basic knowledge of traffic modeling and simulation will be broaded by the application of traffic control algorithms to traffic microsimulation models used in ITS. These include, for						
example, the proposal o	f algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing secu	rity equipment, an	d PT preference.			
Algorithms will be desig	ned, applied, and tested by students themselves.					
16SHMI	Simulation and HMI	Z,ZK	3			
Simulation for the system	ns in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graph	nics for ITS. Simul	ation theory with			
application of computing	g equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehi	icle dynamics, on	-land carriage in			
particular. Virtual reality	systems.					
20ITSR	ITS - R	Z,ZK	3			
The introduction is devoted to description of the architecture and interface of the system with the ITS-R concept, the communication interface of the system, principles of ensuring						
functional and security features are defined. The principles of ERTMS / ETCS application level 3, UGTMS, CBTC are discussed in detail. Current and future communication technologies						
are described.						

#### Code of the group: 3S-NP-IS-CS-21/22

Name of the group: 3rd Sem. Master Full-Time IS (CS) from 2021/22 Requirement credits in the group: In this group you have to gain 21 credits Requirement courses in the group: In this group you have to complete 4 courses Credits in the group: 21

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
11MMAD	Mathematical Methods for Data Analysis Pavla Pecherková, Tetiana Reznychenko, Evženie Uglickich, Ivan Nagy Pavla Pecherková Ivan Nagy (Gar.)	Z,ZK	6	3P+3C	z	Z
20AIMI	Application of ITS in Urban Engineering Tomáš Tichý, Josef Kocourek, Dagmar Ko árková, Ji í R ži ka, Josef Filip Tomáš Tichý	Z,ZK	6	3P+3C	Z	Z
20SYIN	System Engineering Zuzana B linová, Veronika VI ková <b>Zuzana B linová</b>	Z,ZK	6	4P+2C	Z	Z
20HEI	Evaluation and Economics of ITS František Kopecký František Kopecký	KZ	3	2P+1C	Z	Z

# Characteristics of the courses of this group of Study Plan: Code=3S-NP-IS-CS-21/22 Name=3rd Sem. Master Full-Time IS (CS) from 2021/22

11MMAD	Mathematical Methods for Data Analysis	Z,ZK	6		
Stocastic modelling, estimation, prediction, filtration, control, methods of data analysis: k-means, DBSCAN, naive Bayes, decision trees, support vector machine.					

20AIMI	Application of ITS in Urban Engineering			Z	,ZK	6
The course focuses main	ly on the issue of the installation of engineering networks in the area, coordination of engine	eering activities in	the area, or	ganization c	f the public sp	ace, concept
of public space solutions	, design of systems for traffic and transport telematics management, coordination of trans	port modes - auto	mobil, pede	strian, MHD	), cyclo, modes	s etc. New
approaches to the devel	opment of Smart and green approaches Promoting into Public.					
20SYIN	System Engineering			Z	,ZK	6
Enhanced system defini	tion in engineering tasks, specification of selected system types against related tools of sy	stem analysis and	d design, ref	inement of	selected types	of system
engineering tasks, defin	tion of system strategy, connection to science-based methodological basics of transport, s	strategic thinking	processes, s	trategic ma	nagement syst	em, context
of sustainable developm	ent.					
20HEI	Evaluation and Economics of ITS				KZ	3
Introduction of subject is	devoted to the basics of system approach to development of ITS architecture and fundament	entals in the field o	f economic a	attributes co	onnected with o	development
of ITS. Subsequently, the	e basic principles of system and application creation in the technical field are discussed, d	efining the penetr	ation of the f	echnical so	lution into the	economy.
The subject is terminate	d by a detailed breakdown of case studies.					
Code of the ar	oup: 3S-NP-IS-CS-V-21/22					
0	oup: 3rd Sem. Master Full-Time IS (CS) Alternative 1	rom 2021	22			
0			22			
Requirement c	redits in the group: In this group you have to gain 3 c	redits				
Requirement c	ourses in the group: In this group you have to comple	ete 1 cours	se			
Credits in the c						
Note on the gro	•					
	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their	Completion	Credits	Scope	Semester	Role
	members)					
	Tutors, <b>authors</b> and guarantors (gar.)					
16KSD	Quality and reliability in area of transportation means and	774	3	2P+1C	7	z
TORSD	<b>systems</b> Jan Leistner, Filip Kotas, David Lehet, Jaroslav Machan	Z,ZK	3	26+10		Z
	Computer aided railway traffic control					
20PRZP	Dušan Kamenický <b>Dušan Kamenický</b>	Z,ZK	3	2P+1C	Z	Z

# Characteristics of the courses of this group of Study Plan: Code=3S-NP-IS-CS-V-21/22 Name=3rd Sem. Master Full-Time IS (CS) Alternative from 2021/22

Z.ZK

2P+1C

3

Ζ

z

16KSD	Quality and reliability in area of transportation means and systems	Z,ZK	3		
Quality methods used for design, manufacturing and operation. Methods QFD, DFM, DFA, DFS. Longtime testing. FMEA method. Operation reliability. Methods for process optimizing,					
process design and qua	ality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabiliz	ation and improve	ement. Students		
will work on real proble	ns in the QFD laboratory.				
20PRZP	Computer aided railway traffic control	Z,ZK	3		
Introduction is devoted	to clarifying the reasons and basic principles of automation of the management of railway transport. It explains the structure of	of railway traffic m	anagement,		
including the main princ	iples applied in the management of railway traffic. The main part is devoted to detailed description of the individual compone	nts of the system	, which must be		
included in the systems	for automation of railway traffic control using computer technologies.				
20TVHD	Telematics in Public Transport	Z,ZK	3		
Ticketing and information systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport preferences; vehicle					
position monitoring; legislative framework; standardization, certification and interoperability.					

#### Code of the group: XD-NP-IS-CS-21/22

20TVHD

**Telematics in Public Transport** 

Milan Sliacky Milan Sliacky

Name of the group: Thesis Master Full-Time IS (CS) from 2021/22 Requirement credits in the group: In this group you have to gain 16 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 16 Note on the group:

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) 11XNDS Ζ 0P+16C 16 L Master Thesis for study programme IS 7 12XNDS Ζ 0P+16C L Master Thesis for study programme IS 16 Ζ Master Thesis for study programme IS Zden k Lokaj, Tomáš Zelinka, Vít Pábera, Martin Šrotý , Jan Kr ál, Jana Kaliková, Jan Zelenka Ζ 14XNDS 16 0P+16C L Ζ 15XNDS 7 0P+16C L 16 Master Thesis for study programme IS 7 Master Thesis for study programme IS 16XNDS Ζ 0P+16C L 16 Ζ Petr Bouchner, Stanislav Novotný, Tereza Kunclová, Josef Mík 17XNDS Ζ 0P+16C L 16 Ζ Master Thesis for study programme IS 18XNDS Ζ L 16 0P+16C Master Thesis for study programme IS Ζ

20XNDS	Master Thesis for study programme IS Martin Leso, Milan Sliacky	Z	16	0P+16C	L	Z
21XNDS	Master Thesis for study programme IS	Z	16	0P+16C	L	Z
22XNDS	Master Thesis for study programme IS	Z	16	0P+16C	L	Z
23XNDS	Master Thesis for study programme IS	Z	16	0P+16C	L	Z

Characteristics of the courses of this group of Study Plan: Code=XD-NP-IS-CS-21/22 Name=Thesis Master Full-Time IS (CS) from 2021/22

2021/22			
11XNDS	Master Thesis for study programme IS	Z	16
12XNDS	Master Thesis for study programme IS	Z	16
14XNDS	Master Thesis for study programme IS	Z	16
15XNDS	Master Thesis for study programme IS	Z	16
16XNDS	Master Thesis for study programme IS	Z	16
17XNDS	Master Thesis for study programme IS	Z	16
18XNDS	Master Thesis for study programme IS	Z	16
20XNDS	Master Thesis for study programme IS	Z	16
21XNDS	Master Thesis for study programme IS	Z	16
22XNDS	Master Thesis for study programme IS	Z	16
23XNDS	Master Thesis for study programme IS	Z	16

Code of the group: XP-NP-IS-CS-21/22 Name of the group: Praxis Master Full-Time IS (CS) from 2021/22 Requirement credits in the group: In this group you have to gain 4 credits Requirement courses in the group: In this group you have to complete 1 course Credits in the group: 4 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
11XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
12XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
14XPXS	Training course for study programme IS Vít Fábera, Jana Kaliková	Z	4	0P+4C	L	Z
15XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
16XPXS	Training course for study programme IS Josef Mik	Z	4	0P+4C	L	Z
17XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
18XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
20XPXS	Training course for study programme IS Ji f R ži ka	Z	4	0P+4C	L	Z
21XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
22XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z
23XPXS	Training course for study programme IS	Z	4	0P+4C	L	Z

Characteristic	s of the courses of this group of Study Plan: Code=XP-NP-IS-CS-21/22 Name=P	Praxis Master Full-Time IS (CS)	from 2021/22
11XPXS	Training course for study programme IS	Z	4
12XPXS	Training course for study programme IS	Z	4
14XPXS	Training course for study programme IS	Z	4
15XPXS	Training course for study programme IS	Z	4
16XPXS	Training course for study programme IS	Z	4
17XPXS	Training course for study programme IS	Z	4
18XPXS	Training course for study programme IS	Z	4
20XPXS	Training course for study programme IS	Z	4
21XPXS	Training course for study programme IS	Z	4
22XPXS	Training course for study programme IS	Z	4
23XPXS	Training course for study programme IS	Z	4

Name of the block: Semestrální projekt Minimal number of credits of the block: 27 The role of the block: ZP

### Code of the group: X2-NP-IS-CS-20/21 Name of the group: Research Groups Master Full-Time IS (CS) from 2020/21 Requirement credits in the group: In this group you have to gain 27 credits Requirement courses in the group: In this group you have to complete 4 courses Credits in the group: 27

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
11XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
12XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
14XN1S	Master project 1 for study programme IS Zden k Lokaj, Tomáš Zelinka, Martin Šrotý	Z	5	0P+4C	Z	ZP
15XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
16XN1S	Master project 1 for study programme IS Milan Sliacky, Josef Mik	Z	5	0P+4C	Z	ZP
17XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
18XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
20XN1S	Master project 1 for study programme IS Pavel Hrubeš, Martin Leso, Ji í R ži ka, Ji í Brož	Z	5	0P+4C	Z	ZP
21XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
22XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
23XN1S	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
11XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
12XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
14XN2S	Master project 2 for study programme IS Vít Fábera Vít Fábera (Gar.)	Z	6	0P+4C	L	ZP
15XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
16XN2S	Master project 2 for study programme IS Petr Bouchner, Michal Cenkner, Milan Sliacky	Z	6	0P+4C	L	ZP
17XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
18XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
20XN2S	Master project 2 for study programme IS Pavel Hrubeš, Martin Leso, Ji í R ži ka	Z	6	0P+4C	L	ZP
21XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
22XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
23XN2S	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
11XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
12XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
14XN3S	Master project 3 for study programme IS Zden k Lokaj, Tomáš Zelinka, Vít Fábera, Martin Šrotý	Z	6	0P+4C	Z	ZP
15XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
16XN3S	Master project 3 for study programme IS Petr Bouchner, Josef Mík, Dmitry Rozhdestvenskiy	Z	6	0P+4C	Z	ZP
17XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
18XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
20XN3S	Master project 3 for study programme IS Martin Leso, Ji í R ži ka, Milan Sliacky	Z	6	0P+4C	Z	ZP
21XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
22XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
23XN3S	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
11XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
12XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
14XN4S	Master project 4 for study programme IS Zden k Lokaj, Tomáš Zelinka, Vít Fábera, Martin Šrotý , Jan Zelenka	Z	10	0P+8C	L	ZP
15XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
16XN4S	Master project 4 for study programme IS Petr Bouchner, Stanislav Novotný, Josef Mík	Z	10	0P+8C	L	ZP
17XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP

18XN4S	Master project 4 for study programme IS Nela Kr má ová	Z	10	0P+8C	L	ZP
20XN4S	Master project 4 for study programme IS Martin Leso, Ji í R ži ka, Milan Sliacky	Z	10	0P+8C	L	ZP
21XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
22XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
23XN4S	Master project 4 for study programme IS	Z	10	0P+8C	L	ZP

Characteristics of the courses of this group of Study Plan: Code=X2-NP-IS-CS-20/21 Name=Research Groups Master Full-Time IS (CS) from 2020/21

from 2020/21			
11XN1S	Master project 1 for study programme IS	Z	5
12XN1S	Master project 1 for study programme IS	Z	5
14XN1S	Master project 1 for study programme IS	Z	5
15XN1S	Master project 1 for study programme IS	Z	5
16XN1S	Master project 1 for study programme IS	Z	5
17XN1S	Master project 1 for study programme IS	Z	5
18XN1S	Master project 1 for study programme IS	Z	5
20XN1S	Master project 1 for study programme IS	Z	5
21XN1S	Master project 1 for study programme IS	Z	5
22XN1S	Master project 1 for study programme IS	Z	5
23XN1S	Master project 1 for study programme IS	Z	5
11XN2S	Master project 2 for study programme IS	Z	6
12XN2S	Master project 2 for study programme IS	Z	6
14XN2S	Master project 2 for study programme IS	Z	6
15XN2S	Master project 2 for study programme IS	Z	6
16XN2S	Master project 2 for study programme IS	Z	6
17XN2S	Master project 2 for study programme IS	Z	6
18XN2S	Master project 2 for study programme IS	Z	6
20XN2S	Master project 2 for study programme IS	Z	6
21XN2S	Master project 2 for study programme IS	Z	6
22XN2S	Master project 2 for study programme IS	Z	6
23XN2S	Master project 2 for study programme IS	Z	6
11XN3S	Master project 3 for study programme IS	Z	6
12XN3S	Master project 3 for study programme IS	Z	6
14XN3S	Master project 3 for study programme IS	Z	6
15XN3S	Master project 3 for study programme IS	Z	6
16XN3S	Master project 3 for study programme IS	Z	6
17XN3S	Master project 3 for study programme IS	Z	6
18XN3S	Master project 3 for study programme IS	Z	6
20XN3S	Master project 3 for study programme IS	Z	6
21XN3S	Master project 3 for study programme IS	Z	6
22XN3S	Master project 3 for study programme IS	Z	6
23XN3S	Master project 3 for study programme IS	Z	6
11XN4S	Master project 4 for study programme IS	Z	10
12XN4S	Master project 4 for study programme IS	Z	10
14XN4S	Master project 4 for study programme IS	Z	10
15XN4S	Master project 4 for study programme IS	Z	10
16XN4S	Master project 4 for study programme IS	Z	10
17XN4S	Master project 4 for study programme IS	Z	10
18XN4S	Master project 4 for study programme IS	Z	10
20XN4S	Master project 4 for study programme IS	Z	10
21XN4S	Master project 4 for study programme IS	Z	10
22XN4S	Master project 4 for study programme IS	Z	10
23XN4S	Master project 4 for study programme IS	Z	10
			. •

Name of the block: Elective courses Minimal number of credits of the block: 0 The role of the block: V

Code of the group: VP-NP-IS-CS Name of the group: Master Full-Time IS (CS) voluntary Requirement credits in the group: Requirement courses in the group:

### Credits in the group: 0 Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
15JIA1	Foreign Language - English 1 Markéta Musilová, Dana Boušová, Jitka He manová, Marie Michlová, Lenka Monková, Peter Morpuss, Eva Rezlerová	Z	0	0P+2C	Z	V
I5JIF1	Foreign Language - French 1 Irena Veselková	Z	0	0P+2C	Z	V
5JIN1	Foreign Language - German 1 Eva Rezlerová, Martina Navrátilová, Jana Štikarová	Z	0	0P+2C	Z	V
5JIR1	Foreign Language - Russian 1 Marie Michlová	Z	0	0P+2C	Z	V
5JIS1	Foreign Language - Spanish 1 Nina Hricsina Puškinová	Z	0	0P+2C	Z	V
5JIA2	Foreign Language - English 2 Eva Rezlerová	Z	0	0P+2C	L	V
5JIF2	Foreign Language - French 2	Z	0	0P+2C	L	V
5JIN2	Foreign Language - German 2 Eva Rezlerová, Martina Navrátilová, Jana Štikarová	Z	0	0P+2C	L	V
5JIR2	Foreign Language - Russian 2 Marie Michlová	Z	0	0P+2C	L	V
5JIS2	Foreign Language - Spanish 2 Nina Hricsina Puškinová	Z	0	0P+2C	L	V
5JIA3	Foreign Language - English 3 Markéta Musilová, Dana Boušová, Jitka He manová, Marie Michlová, Lenka Monková, Peter Morpuss, Eva Rezlerová, Markéta Vojanová	Z	0	0P+2C	z	V
5JIF3	Foreign Language - French 3 Irena Veselková	Z	0	0P+2C	Z	V
5JIN3	Foreign Language - German 3 Eva Rezlerová, Martina Navrátilová, Jana Štikarová	Z	0	0P+2C	Z	V
5JIR3	Foreign Language - Russian 3 Marie Michlová	Z	0	0P+2C	Z	V
5JIS3	Foreign Language - Spanish 3	Z	0	0P+2C	Z	V
5JIA4	Foreign Language - English 4 Eva Rezlerová	Z	0	0P+2C	L	V
5JIF4	Foreign Language - French 4	Z	0	0P+2C	L	V
5JIN4	Foreign Language - German 4 Eva Rezlerová, Martina Navrátilová, Jana Štikarová	Z	0	0P+2C	L	V
5JIR4	Foreign Language - Russian 4 Marie Michlová	Z	0	0P+2C	L	V
5JIS4	Foreign Language - Spanish 4	Z	0	0P+2C	L	V
	of the courses of this group of Study Plan: Code=VP-NP-IS-CS Nam	ne=Master Fu	II-Time IS	6 (CS) vo	luntary	
inguage in presentat	Foreign Language - English 1 exts and technical terminology. Lexical-grammatical structures of higher command. Formal la tions within students' specialization field both in verbal and written forms. Language laborato sh Connections, English Library, the Internet).					
5JIF1	Foreign Language - French 1				Z	0

	Toreign Language - Trench T	L 7	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		
15JIN1	Foreign Language - German 1	Z	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		
15JIR1	Foreign Language - Russian 1	Z	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		
15JIS1	Foreign Language - Spanish 1	Z	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		
15JIA2	Foreign Language - English 2	Z	0
Work on specialised tex	ts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of commur	ication skills. Activ	ve use of foreign
language in presentation	ns within students' specialization field both in verbal and written form. Language laboratory environment used alternatively as a to	ool for active learni	ing (Programmes
- English Connections,	English Library, the Internet).		
15JIF2	Foreign Language - French 2	Z	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		
15JIN2	Foreign Language - German 2	Z	0
Basic structures of fore	ign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	lage, writing skills	, in advanced
groups texts with profes	ssional topics.		

15JIR2	Foreign Language - Russian 2	7	0
	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	_	
groups texts with profes		age, mang etaile	, in adranood
15JIS2	Foreign Language - Spanish 2	7	0
	nish language, communication in everyday life, study, work, leisere time activities, introducing myself, phonetics of Spanish la	_	-
15JIA3	Foreign Language - English 3	7	0
	ert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. C	-	-
FCE, CAE.	en technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. C		or certificates
15JIF3	Foreign Language - French 3	7	0
	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	_	-
groups texts with profes		age, mang erane	, in duranced
15JIN3	Foreign Language - German 3	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIR3	Foreign Language - Russian 3	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIS3	Foreign Language - Spanish 3	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIA4	Foreign Language - English 4	Z	0
Presentation Skills - exp	pert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement.	Optional courses	for certificates
FCE, CAE.			
15JIF4	Foreign Language - French 4	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIN4	Foreign Language - German 4	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIR4	Foreign Language - Russian 4	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		
15JIS4	Foreign Language - Spanish 4	Z	0
Basic structures of forei	gn language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langu	age, writing skills	, in advanced
groups texts with profes	sional topics.		

### List of courses of this pass:

Code	Name of the course	Completion	Credits
11MAI	ITS Mathematical Tools	Z,ZK	4
Series, Fourier Series.	Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fou	rier Analysis to PDE. Fundan	nentals of
Numeric	al Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-folk	owing models as ODEs.	
11MMAD	Mathematical Methods for Data Analysis	Z,ZK	6
Stocastic mode	lling, estimation, prediction, filtration, control, methods of data analysis: k-means, DBSCAN, naive Bayes, decision	trees, support vector machine	e.
11XN1S	Master project 1 for study programme IS	Z	5
11XN2S	Master project 2 for study programme IS	Z	6
11XN3S	Master project 3 for study programme IS	Z	6
11XN4S	Master project 4 for study programme IS	Z	10
11XNDS	Master Thesis for study programme IS	Z	16
11XPXS	Training course for study programme IS	Z	4
12TDP	Traffic Flow Theory	Z,ZK	3
•	Iman problems. Basic traffic parameters and their measurement. Estimation of quality of services. Theoretical fundar		
models. Macroscopic, sta	tistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Re	elation between traffic model	s and traffi
	flow management.		
12XN1S	Master project 1 for study programme IS	Z	5
12XN2S	Master project 2 for study programme IS	Z	6
12XN3S	Master project 3 for study programme IS	Z	6
12XN4S	Master project 4 for study programme IS	Z	10
12XNDS	Master Thesis for study programme IS	Z	16
12XPXS	Training course for study programme IS	Z	4
14CITS	C-ITS Systems	Z,ZK	6
	TS systems architecture, description of use-cases - urban and rural applications, principles of C-ITS funcionality wit		
VI) and C-ITS security ar	chitecture. Status quo and modern trends of wireless telecommunication solutions ITS-G5 and LTE-V and description	on of its properties and speci	fics. Cours
	will also cover signal processing.		

14MIM		1	1
	Microsimulation Models	KZ	3
-	e of traffic modeling and simulation will be broaded by the application of traffic control algorithms to traffic microsimulation models us bal of algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing security		
kample, the propo	Algorithms will be designed, applied, and tested by students themselves.	equipment, and P	i preieren
		7 71/	4
14PAM	Programming and modelling	Z,ZK	4
	ogramming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, recurs m in nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, model ty		
raminais, paralis	of analytical sources for modelling, BPMN language, SW Bizagi, model creation and life cycle.	pes AS-15 a 10-De	, acquisiti
14PD		7 71/	
	Data processing about tools for data processing and analysis, using practical examples to try out the most common options used in data processing,	Z,ZK	6 d antiona
	about tools for data processing and analysis, using practical examples to try out the most common options used in data processing, ults of analyses. In advanced methods, students will also perform specific analysis using Bayesian networks. Students will then indep	•	•
resenting the rest	on data from existing open systems.	endenity perioriti (	lata anaig
14PPRP		KZ	2
	Computer Aided Project Management ect? The basic terms a concepts of project management. Life cycle of the project and its phased approach. Analysis and specification		
	es, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of the		
deminion, stage	restrictions, assignments, calendars etc.) Project planning and optimization - time, resources.		aouvidos,
14XN1S	Master project 1 for study programme IS	Z	5
14XN2S		Z	6
_	Master project 2 for study programme IS		-
14XN3S	Master project 3 for study programme IS	Z	6
14XN4S	Master project 4 for study programme IS	Z	10
14XNDS	Master Thesis for study programme IS	Z	16
14XPXS	Training course for study programme IS	Z	4
15JIA1	Foreign Language - English 1	Z	0
	ed texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communica	-	
	esentations within students' specialization field both in verbal and written forms. Language laboratory environment used alternatively		
0 0 1	(Programmes - English Connections, English Library, the Internet).		
15JIA2	Foreign Language - English 2	Z	0
	ed texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communica	-	-
	tations within students' specialization field both in verbal and written form. Language laboratory environment used alternatively as a tool f		
0 0 1	- English Connections, English Library, the Internet).	0.	Ū
15JIA3	Foreign Language - English 3	Z	0
	s - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Op	1	-
	FCE, CAE.		oortinout
15JIA4	Foreign Language - English 4	Z	0
	s - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Op		-
resentation okin	FCE, CAE.		certificat
15JIF1	Foreign Language - French 1	7	0
	of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua	L 2	
		ne writing skills in	advance
Dasic structures		ge, writing skills, ir	advance
	groups texts with professional topics.		1
15JIF2	groups texts with professional topics. Foreign Language - French 2	Z	0
15JIF2	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua	Z	0
15JIF2 Basic structures o	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z ge, writing skills, ir	0 n advance
15JIF2 Basic structures o 15JIF3	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3	Z ge, writing skills, ir	0 n advance
15JIF2 Basic structures o 15JIF3	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	Z ge, writing skills, ir	0 n advance
15JIF2 Basic structures of 15JIF3 Basic structures of	groups texts with professional topics.  Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z       ge, writing skills, in       Z       ge, writing skills, in	0 n advance 0 n advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4	Z ge, writing skills, ir Z ge, writing skills, ir Z	0 n advanc 0 n advanc
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	Z ge, writing skills, ir Z ge, writing skills, ir Z	0 n advance 0 n advance 0
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of	groups texts with professional topics.  Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       ge, writing skills, ir	0 n advance 0 n advance 0 n advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1	Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       Z	0 a advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1	groups texts with professional topics.  Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       Z	0 a advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1 Basic structures of	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z       ge, writing skills, ir	0 a advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1	groups texts with professional topics.  Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       ge, writing skills, ir       Z       Z	0 a advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1 Basic structures of 15JIN2	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z       ge, writing skills, ir       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z	0 advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1 Basic structures of 15JIN2	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 2	Z       ge, writing skills, ir       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z	0 advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1 Basic structures of 15JIN2	groups texts with professional topics. Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics. Foreign Language - German 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua	Z       ge, writing skills, ir       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z	0 advance 0 advance 0 advance 0 advance
15JIF2 Basic structures of 15JIF3 Basic structures of 15JIF4 Basic structures of 15JIN1 Basic structures of 15JIN2 Basic structures of 15JIN2	groups texts with professional topics.  Foreign Language - French 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 3 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - French 4 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - German 1 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.  Foreign Language - German 2 of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign langua groups texts with professional topics.	Z       ge, writing skills, ir       Z       Z       Ge, writing skills, ir       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z       Z	0       advance       0       0       0       0       0       0       0
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15JIR4 Basic structures of	Foreign Language - Russian 4	Z e writing skills in	0 advanced
	groups texts with professional topics.	c, writing skills, i	
15JIS1	Foreign Language - Spanish 1	Z	0
Basic structures of	f foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	e, writing skills, ir	advanced
	groups texts with professional topics.		1
15JIS2	Foreign Language - Spanish 2	Z	0
	res of Spanish language, communication in everyday life, study, work, leisere time activities, introducing myself, phonetics of Spanish	language, writing	1
15JIS3 Basic structures of	Foreign Language - Spanish 3 f foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	Z e writing skills in	0 advanced
	groups texts with professional topics.	c, writing skills, i	aavaneea
15JIS4	Foreign Language - Spanish 4	Z	0
	f foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language	e, writing skills, ir	advanced
	groups texts with professional topics.		1
15XN1S	Master project 1 for study programme IS	Z	5
15XN2S	Master project 2 for study programme IS	Z	6
15XN3S	Master project 3 for study programme IS	Z	6
15XN4S	Master project 4 for study programme IS	<u>Z</u>	10
15XNDS	Master Thesis for study programme IS	Z	16
15XPXS	Training course for study programme IS	Z	4
16DITS	Vehicles within ITS	Z,ZK	4
-	whicle with focus on its use and function in frame of ITS. User requirement analyses. Economic aspects. Process of constructions in a I structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy transf		
dependences and	one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.		g to kinetic
16ESDP	Electronic systems in modern vehicles	Z,ZK	3
Advanced vehic	le systems, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propulsi		nts, basic
characteristics a	nd control. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.).	Safety, communio	ation and
401/00	comfort electronic vehicle systems. Practical exercises with real and simulated systems.	7 71/	-
16KSD	Quality and reliability in area of transportation means and systems ed for design, manufacturing and operation. Methods QFD, DFM, DFA, DFS. Longtime testing. FMEA method. Operation reliability. Me	Z,ZK	3
zuality methods us		enious ior proces	
	d quality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabilization	and improveme	ni. Siudenis
	d quality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabilization will work on real problems in the QFD laboratory.	and improveme	ni. Siudenis
		and improveme	3
process design an 16SHMI Simulation for the s	will work on real problems in the QFD laboratory. Simulation and HMI ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics fi	Z,ZK or ITS. Simulation	3 theory with
process design an 16SHMI Simulation for the s	will work on real problems in the QFD laboratory. Simulation and HMI ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics fouting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle of	Z,ZK or ITS. Simulation	3 theory with
process design an 16SHMI Simulation for the s application of comp	will work on real problems in the QFD laboratory. Simulation and HMI ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for buting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle of particular. Virtual reality systems.	Z,ZK or ITS. Simulation dynamics, on-lan	3 theory wit d carriage in
16SHMI 36SHMI Simulation for the s application of comp 16XN1S	will work on real problems in the QFD laboratory. Simulation and HMI ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for buting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle or particular. Virtual reality systems. Master project 1 for study programme IS	Z,ZK or ITS. Simulation dynamics, on-lan Z	3 theory with carriage in 5
16SHMI Simulation for the s application of comp 16XN1S 16XN2S	will work on real problems in the QFD laboratory.         Simulation and HMI         ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for puting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle or particular. Virtual reality systems.         Master project 1 for study programme IS         Master project 2 for study programme IS	Z,ZK or ITS. Simulation Jynamics, on-Ian Z Z	3 n theory with carriage in 5 6
16SHMI Simulation for the s application of comp 16XN1S 16XN2S 16XN3S	will work on real problems in the QFD laboratory.         Simulation and HMI         ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for pouting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle or particular. Virtual reality systems.         Master project 1 for study programme IS         Master project 2 for study programme IS         Master project 3 for study programme IS	Z,ZK or ITS. Simulation dynamics, on-lan Z Z Z	3 theory with carriage in 5 6 6
16SHMI Simulation for the s application of comp 16XN1S 16XN2S 16XN3S 16XN3S 16XN4S	will work on real problems in the QFD laboratory.         Simulation and HMI         ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for buting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle or particular. Virtual reality systems.         Master project 1 for study programme IS         Master project 2 for study programme IS         Master project 3 for study programme IS         Master project 4 for study programme IS	Z,ZK or ITS. Simulatio dynamics, on-lan Z Z Z Z Z	3 theory with carriage in 5 6 6 10
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20HEI	Evaluation and Economics of ITS	KZ	3
	ect is devoted to the basics of system approach to development of ITS architecture and fundamentals in the field of economic attribute	es connected with c	levelopmer
of ITS. Subseque	ntly, the basic principles of system and application creation in the technical field are discussed, defining the penetration of the technic The subject is terminated by a detailed breakdown of case studies.	cal solution into the	economy.
20ITSR	ITS - B	Z,ZK	3
	is devoted to description of the architecture and interface of the system with the ITS-R concept, the communication interface of the s	1 '	-
unctional and secu	rity features are defined. The principles of ERTMS / ETCS application level 3, UGTMS, CBTC are discussed in detail. Current and futur are described.	re communication t	echnologie
20MZZ	Modern techniques of safety control of moving railway vehicles	Z,ZK	3
	concepts, ETCS architecture and interface descriptions, ERTMS system level, infrastructure and mobile part of the system, linking to		1
	ication modes of the system, infrastructure orientation, interface (DMI), integration of the ETCS mobile part into the driving vehicle, G		-
	testing and legislation.		
20PRZP	Computer aided railway traffic control	Z,ZK	3
Introduction is de	voted to clarifying the reasons and basic principles of automation of the management of railway transport. It explains the structure of	railway traffic mar	agement,
ncluding the main	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components	of the system, wh	ich must b
	included in the systems for automation of railway traffic control using computer technologies.		1
20SYIN	System Engineering	Z,ZK	6
-	definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement definition of autom strategies of transport, strategies thicking processors, strategies of transport, strategies thicking processors, strategies of transport, strategies and the selected system types against related tools of system analysis and design, refinement		-
engineering tasks,	definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic of sustainable development.	management syst	em, conte
20TSJ	Telematic systems and their design	Z,ZK	6
	ed analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management		
20TVHD	Telematics in Public Transport	Z,ZK	3
	nation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public		-
<b>3</b>	position monitoring; legislative framework; standardization, certification and interoperability.		,
20XN1S	Master project 1 for study programme IS	Z	5
20XN2S	Master project 2 for study programme IS	Z	6
20XN3S	Master project 3 for study programme IS	Z	6
20XN4S	Master project 4 for study programme IS	Z	10
20XNDS	Master Thesis for study programme IS	Z	16
20XPXS	Training course for study programme IS	Z	4
21XN1S	Master project 1 for study programme IS	Z	5
21XN10	Master project 1 for study programme IS	Z	6
21XN3S	Master project 2 for study programme IS	Z	6
21XN35 21XN4S	Master project 3 for study programme IS Master project 4 for study programme IS	Z	10
21XNDS	Master Thesis for study programme IS	Z	16
21XPXS		Z	4
	Training course for study programme IS	Z	
22XN1S	Master project 1 for study programme IS		5
22XN2S	Master project 2 for study programme IS	Z	6
22XN3S	Master project 3 for study programme IS	Z	6
22XN4S	Master project 4 for study programme IS	Z	10
22XNDS	Master Thesis for study programme IS	Z	16
22XPXS	Training course for study programme IS	Z	4
23TBSS	Technology and Security of Sensor Networks	KZ	2
	ses on the safety of data collection in new areas of sensor networks. Principles of sensor networks, sensors of electrical and non-electrical and non-electrical and non-electrical and non-electrical and non-electrical and sensor networks.		erfaces for
	sor connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT	-	F
23XN1S	Master project 1 for study programme IS	Z	5
23XN2S	Master project 2 for study programme IS	Z	6
23XN3S	Master project 3 for study programme IS	Z	6
23XN4S	Master project 4 for study programme IS	Z	10
23XNDS	Master Thesis for study programme IS	Z	16
23XPXS	Training course for study programme IS	Z	4

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