Study plan

Name of study plan: Master Full-Time IS (joint degree) from 2024/25

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-EN-21/22
Name of the group: 1st Sem. Master Full-Time IS (EN) from 2021/22
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:

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
11MAI-E	**ITS Mathematical Tools** *Jan Přikryl* ***Jan Přikryl*** *Jan Přikryl (Gar.)*	Z,ZK	4	2P+2C	Z	z
16DITS-E	**Vehicles within ITS** *Jan Leistner, Filip Kotas, David Lehet, Jaroslav Machan*	Z,ZK	4	2P+2C	Z	z
20GINS-E	**Geographical, information, localization and navigation systems** *Petr Bureš, František Kekula, Pavel Hrubeš, Zuzana Purkrábková* ***Pavel Hrubeš***	Z,ZK	6	3P+3C	Z	z
20TSJ-E	**Telematic systems and their design** *Petr Bureš, Ondřej Přibyl* ***Petr Bureš***	Z,ZK	6	3P+2C	Z	z

Characteristics of the courses of this group of Study Plan: Code=1S-NP-IS-EN-21/22 Name=1st Sem. Master Full-Time IS (EN) from 2021/22

11MAI-E	ITS Mathematical Tools	Z,ZK	4
Series, Fourier Series. Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analysis to PDE. Fundamentals of Numerical Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following models as ODEs.			
16DITS-E	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 concept phase, functional dependences and structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy transformations leading to kinetic one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.			
20GINS-E	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 of transport and telecommunication. It introduces students to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitization methods, and a number of other GIS related technologies such as problem mapping, webmap, etc.			
20TSJ-E	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 management, etc.			

Code of the group: 1S-NP-IS-EN-V-21/22
Name of the group: 1st Sem. Master Full-Time IS (EN) Alternative from 2021/22
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
12TDP-E	**Traffic Flow Theory** *Vladimír Faltus*	Z,ZK	3	2P+1C	Z	z
16ESDP-E	**Electronic systems in modern vehicles** *Dmitrij Rožděstvenský, Petr Bouchner*	Z,ZK	3	2P+1C	Z	z
20MZZ-E	**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-EN-V-21/22 Name=1st Sem. Master Full-Time IS (EN) Alternative from 2021/22

12TDP-E	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, statistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation between traffic models and traffic flow management.

16ESDP-E	Electronic systems in modern vehicles	Z,ZK	3

Advanced vehicle systems, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propulsion, its components, basic characteristics and control. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.). Safety, communication and comfort electronic vehicle systems. Practical exercises with real and simulated systems.

20MZZ-E	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.

Code of the group: 2S-NP-IS-EN-21/22
Name of the group: 2nd Sem. Master Full-Time IS (EN) 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 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-E	**C-ITS Systems** *Zdeněk Lokaj, Tomáš Zelinka, Miroslav Vaniš* ***Zdeněk Lokaj*** *Zdeněk Lokaj (Gar.)*	Z,ZK	6	3P+3C	L	z
14PAM-E	**Programming and modelling** *Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala* ***Vít Fábera*** *Vít Fábera (Gar.)*	Z,ZK	4	2P+2C	L	z
14PD-E	**Data processing** *Miroslav Vaniš, Martin Šrotýř* ***Michal Jeřábek*** *Michal Jeřábek (Gar.)*	Z,ZK	6	2P+4C	L	z
14PPRP-E	**Computer Aided Project Management** *Marek Kalika* ***Marek Kalika*** *Marek Kalika (Gar.)*	KZ	2	0P+2C	L	z
20BITS-E	**Safety and reliability of ITS Systems** *Vladimír Faltus, Tomáš Tichý Tomáš Tichý (Gar.)*	KZ	3	2P+1C	L	z

Characteristics of the courses of this group of Study Plan: Code=2S-NP-IS-EN-21/22 Name=2nd Sem. Master Full-Time IS (EN) from 2021/22

14CITS-E	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 properties and specifics. Course will also cover signal processing.

14PAM-E	Programming and modelling	Z,ZK	4

Object oriented programming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, recursion, complexity, Lindenmeyer's grammars, paralism in nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, model types As-Is a To-Be, acquisition of analytical sources for modelling, BPMN language, SW Bizagi, model creation and life cycle.

14PD-E	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 open systems.

14PPRP-E	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, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of the project outline (activities, restrictions, assignments, calendars etc.) Project planning and optimization - time, resources.

20BITS-E	Safety and reliability of ITS Systems	KZ	3

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-EN-V-21/22
Name of the group: 2nd Sem. Master Full-Time IS (EN) Alternative from 2021/22
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-E	**Microsimulation Models** *Jan Mejstřík* ***Jan Mejstřík*** *Jan Mejstřík (Gar.)*	KZ	3	0P+3C	L	z
16SHMI-E	**Simulation and HMI** *Petr Bouchner, Stanislav Novotný, Tereza Kunclová, Michal Cenkner Stanislav Novotný (Gar.)*	Z,ZK	3	2P+1C	L	z
20ITSR-E	**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-EN-V-21/22 Name=2nd Sem. Master Full-Time IS (EN) Alternative from 2021/22

14MIM-E	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 of algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing security equipment, and PT preference. Algorithms will be designed, applied, and tested by students themselves.			
16SHMI-E	Simulation and HMI	Z,ZK	3
Simulation for the systems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for ITS. Simulation theory with application of computing equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle dynamics, on-land carriage in particular. Virtual reality systems.			
20ITSR-E	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-EN-21/22
Name of the group: 3rd Sem. Master Full-Time IS (EN) 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-E	**Mathematical Methods for Data Analysis** *Magdalena Hykšová, Ivan Nagy* ***Magdalena Hykšová*** *Magdalena Hykšová (Gar.)*	Z,ZK	6	3P+3C	Z	z
20AIMI-E	**Application of ITS in Urban Engineering** *Tomáš Tichý, Dagmar Kočárková, Josef Kocourek, Josef Filip, Jiří Růžička* ***Tomáš Tichý***	Z,ZK	6	3P+3C	Z	z
20SYIN-E	**System Engineering** *Zuzana Bělinová* ***Zuzana Bělinová***	Z,ZK	6	4P+2C	Z	z
20HEI-E	**Evaluation and Economics of ITS** *Jakub Rajnoch* ***Jakub Rajnoch***	KZ	3	2P+1C	Z	z

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

11MMAD-E	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-E	Application of ITS in Urban Engineering	Z,ZK	6
The course focuses mainly on the issue of the installation of engineering networks in the area, coordination of engineering activities in the area, organization of the public space, concept of public space solutions, design of systems for traffic and transport telematics management, coordination of transport modes - automobil, pedestrian, MHD, cyclo, modes etc. New approaches to the development of Smart and green approaches Promoting into Public.			
20SYIN-E	System Engineering	Z,ZK	6
Enhanced system definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of selected types of system engineering tasks, definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic management system, context of sustainable development.			

20HEI-E	Evaluation and Economics of ITS	KZ	3

Introduction of subject is devoted to the basics of system approach to development of ITS architecture and fundamentals in the field of economic attributes connected with development of ITS. Subsequently, the basic principles of system and application creation in the technical field are discussed, defining the penetration of the technical solution into the economy. The subject is terminated by a detailed breakdown of case studies.

Code of the group: 3S-NP-IS-EN-V-21/22
Name of the group: 3rd Sem. Master Full-Time IS (EN) Alternative from 2021/22
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
16KSD-E	**Quality and reliability in area of transportation means and systems** *Jan Leistner, Filip Kotas, David Lehet, Jaroslav Machan*	Z,ZK	3	2P+1C	Z	z
20PRZP-E	**Computer aided railway traffic control** *Dušan Kamenický **Dušan Kamenický***	Z,ZK	3	2P+1C	Z	z
20TVHD-E	**Telematics in Public Transport** *Patrik Horažďovský, Milan Sliacky **Milan Sliacky***	Z,ZK	3	2P+1C	Z	z

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

16KSD-E	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 quality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabilization and improvement. Students will work on real problems in the QFD laboratory.

20PRZP-E	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 railway traffic management, including 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, which must be included in the systems for automation of railway traffic control using computer technologies.

20TVHD-E	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-EN-21/22
Name of the group: Thesis Master Full-Time IS (EN) 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:

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
11XNDS-E	**Master Thesis for study programme IS** *Jan Přikryl, Bohumil Kovář **Jan Přikryl** Bohumil Kovář (Gar.)*	Z	16	0P+16C	L	z
12XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
14XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
15XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
16XNDS-E	**Master Thesis for study programme IS** *Stanislav Novotný*	Z	16	0P+16C	L	z
17XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
18XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
20XNDS-E	**Master Thesis for study programme IS** *Martin Leso*	Z	16	0P+16C	L	z
21XNDS-E	**Master Thesis for study programme IS**	Z	16	0P+16C	L	z
22XNDS-E	**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-EN-21/22 Name=Thesis Master Full-Time IS (EN) from 2021/22

11XNDS-E	Master Thesis for study programme IS	Z	16
12XNDS-E	Master Thesis for study programme IS	Z	16
14XNDS-E	Master Thesis for study programme IS	Z	16

15XNDS-E	Master Thesis for study programme IS	Z	16
16XNDS-E	Master Thesis for study programme IS	Z	16
17XNDS-E	Master Thesis for study programme IS	Z	16
18XNDS-E	Master Thesis for study programme IS	Z	16
20XNDS-E	Master Thesis for study programme IS	Z	16
21XNDS-E	Master Thesis for study programme IS	Z	16
22XNDS-E	Master Thesis for study programme IS	Z	16

Code of the group: XP-NP-IS-EN-21/22
Name of the group: Praxis Master Full-Time IS (EN) 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-E	**Training course for study programme IS** *Jan Přikryl, Bohumil Kovář, Evženie Uglickich* ***Jan Přikryl*** *Bohumil Kovář (Gar.)*	Z	4	0P+4C	L	z
12XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
14XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
15XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
16XPXS-E	**Training course for study programme IS** *Josef Mík*	Z	4	0P+4C	L	z
17XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
18XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
20XPXS-E	**Training course for study programme IS** *Jiří Růžička*	Z	4	0P+4C	L	z
21XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z
22XPXS-E	**Training course for study programme IS**	Z	4	0P+4C	L	z

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

11XPXS-E	Training course for study programme IS	Z	4
12XPXS-E	Training course for study programme IS	Z	4
14XPXS-E	Training course for study programme IS	Z	4
15XPXS-E	Training course for study programme IS	Z	4
16XPXS-E	Training course for study programme IS	Z	4
17XPXS-E	Training course for study programme IS	Z	4
18XPXS-E	Training course for study programme IS	Z	4
20XPXS-E	Training course for study programme IS	Z	4
21XPXS-E	Training course for study programme IS	Z	4
22XPXS-E	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-EN-21/22
Name of the group: Research Groups Master Full-Time IS (EN) from 2021/22
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-E	**Master project 1 for study programme IS** *Jan Přikryl, Bohumil Kovář, Evženie Uglickich* ***Jan Přikryl*** *Evženie Uglickich (Gar.)*	Z	5	0P+4C	Z	ZP

12XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
14XN1S-E	**Master project 1 for study programme IS** *Martin Šrotýř Martin Šrotýř (Gar.)*	Z	5	0P+4C	Z	ZP
15XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
16XN1S-E	**Master project 1 for study programme IS** *Jan Leistner, David Lehet, Tereza Kunclová*	Z	5	0P+4C	Z	ZP
17XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
18XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
20XN1S-E	**Master project 1 for study programme IS** *Martin Leso*	Z	5	0P+4C	Z	ZP
21XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
22XN1S-E	**Master project 1 for study programme IS**	Z	5	0P+4C	Z	ZP
11XN2S-E	**Master project 2 for study programme IS** *Jan Přikryl, Bohumil Kovář, Evženie Uglickich **Jan Přikryl** Jan Přikryl (Gar.)*	Z	6	0P+4C	L	ZP
12XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
14XN2S-E	**Master project 2 for study programme IS** *Zdeněk Lokaj, Tomáš Zelinka, Martin Šrotýř*	Z	6	0P+4C	L	ZP
15XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
16XN2S-E	**Master project 2 for study programme IS** *Jan Leistner, David Lehet, Tereza Kunclová*	Z	6	0P+4C	L	ZP
17XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
18XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
20XN2S-E	**Master project 2 for study programme IS** *Martin Leso*	Z	6	0P+4C	L	ZP
21XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
22XN2S-E	**Master project 2 for study programme IS**	Z	6	0P+4C	L	ZP
11XN3S-E	**Master project 3 for study programme IS** *Jan Přikryl **Jan Přikryl** Jan Přikryl (Gar.)*	Z	6	0P+4C	Z	ZP
12XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
14XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
15XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
16XN3S-E	**Master project 3 for study programme IS** *Petr Bouchner, Naďa Tylová*	Z	6	0P+4C	Z	ZP
17XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
18XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
20XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
21XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
22XN3S-E	**Master project 3 for study programme IS**	Z	6	0P+4C	Z	ZP
11XN4S-E	**Master project 4 for study programme IS** *Jan Přikryl, Bohumil Kovář **Jan Přikryl** Bohumil Kovář (Gar.)*	Z	10	0P+8C	L	ZP
12XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
14XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
15XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
16XN4S-E	**Master project 4 for study programme IS** *Stanislav Novotný*	Z	10	0P+8C	L	ZP
17XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
18XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
20XN4S-E	**Master project 4 for study programme IS** *Martin Leso*	Z	10	0P+8C	L	ZP
21XN4S-E	**Master project 4 for study programme IS**	Z	10	0P+8C	L	ZP
22XN4S-E	**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-EN-21/22 Name=Research Groups Master Full-Time IS (EN) from 2021/22

11XN1S-E	Master project 1 for study programme IS	Z	5
12XN1S-E	Master project 1 for study programme IS	Z	5
14XN1S-E	Master project 1 for study programme IS	Z	5
15XN1S-E	Master project 1 for study programme IS	Z	5
16XN1S-E	Master project 1 for study programme IS	Z	5
17XN1S-E	Master project 1 for study programme IS	Z	5
18XN1S-E	Master project 1 for study programme IS	Z	5
20XN1S-E	Master project 1 for study programme IS	Z	5
21XN1S-E	Master project 1 for study programme IS	Z	5

22XN1S-E	Master project 1 for study programme IS	Z	5
11XN2S-E	Master project 2 for study programme IS	Z	6
12XN2S-E	Master project 2 for study programme IS	Z	6
14XN2S-E	Master project 2 for study programme IS	Z	6
15XN2S-E	Master project 2 for study programme IS	Z	6
16XN2S-E	Master project 2 for study programme IS	Z	6
17XN2S-E	Master project 2 for study programme IS	Z	6
18XN2S-E	Master project 2 for study programme IS	Z	6
20XN2S-E	Master project 2 for study programme IS	Z	6
21XN2S-E	Master project 2 for study programme IS	Z	6
22XN2S-E	Master project 2 for study programme IS	Z	6
11XN3S-E	Master project 3 for study programme IS	Z	6
12XN3S-E	Master project 3 for study programme IS	Z	6
14XN3S-E	Master project 3 for study programme IS	Z	6
15XN3S-E	Master project 3 for study programme IS	Z	6
16XN3S-E	Master project 3 for study programme IS	Z	6
17XN3S-E	Master project 3 for study programme IS	Z	6
18XN3S-E	Master project 3 for study programme IS	Z	6
20XN3S-E	Master project 3 for study programme IS	Z	6
21XN3S-E	Master project 3 for study programme IS	Z	6
22XN3S-E	Master project 3 for study programme IS	Z	6
11XN4S-E	Master project 4 for study programme IS	Z	10
12XN4S-E	Master project 4 for study programme IS	Z	10
14XN4S-E	Master project 4 for study programme IS	Z	10
15XN4S-E	Master project 4 for study programme IS	Z	10
16XN4S-E	Master project 4 for study programme IS	Z	10
17XN4S-E	Master project 4 for study programme IS	Z	10
18XN4S-E	Master project 4 for study programme IS	Z	10
20XN4S-E	Master project 4 for study programme IS	Z	10
21XN4S-E	Master project 4 for study programme IS	Z	10
22XN4S-E	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-EN
Name of the group: Master Full-Time IS (EN) 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-E	**Foreign Language - English 1** *Dana Boušová, Jitka Heřmanová, Marie Michlová, Lenka Monková, Peter Morpuss, Markéta Vojanová, Eva Rezlerová, Markéta Musilová*	Z	0	0P+2C	Z	v
15JIF1-E	**Foreign Language - French 1** *Irena Veselková*	Z	0	0P+2C	Z	v
15JIN1-E	**Foreign Language - German 1** *Eva Rezlerová, Martina Navrátilová, Jana Štikarová*	Z	0	0P+2C	Z	v
15JIR1-E	**Foreign Language - Russian 1** *Marie Michlová*	Z	0	0P+2C	Z	v
15JIS1-E	**Foreign Language - Spanish 1** *Nina Hricsina Puškinová*	Z	0	0P+2C	Z	v
15JIA2-E	**Foreign Language - English 2** *Eva Rezlerová*	Z	0	0P+2C	L	v
15JIF2-E	**Foreign Language - French 2** *Irena Veselková*	Z	0	0P+2C	L	v
15JIN2-E	**Foreign Language - German 2** *Eva Rezlerová, Martina Navrátilová, Jana Štikarová*	Z	0	0P+2C	L	v
15JIR2-E	**Foreign Language - Russian 2** *Marie Michlová*	Z	0	0P+2C	L	v

15JIS2-E	**Foreign Language - Spanish 2** *Nina Hricsina Puškinová*	Z	0	0P+2C	L	v
15JIA3-E	**Foreign Language - English 3** *Jitka Heřmanová, Marie Michlová, Lenka Monková, Peter Morpuss, Markéta Vojanová, Eva Rezlerová, Markéta Musilová*	Z	0	0P+2C	Z	v
15JIF3-E	**Foreign Language - French 3** *Irena Veselková*	Z	0	0P+2C	Z	v
15JIN3-E	**Foreign Language - German 3** *Eva Rezlerová, Martina Navrátilová, Jana Štikarová*	Z	0	0P+2C	Z	v
15JIR3-E	**Foreign Language - Russian 3** *Marie Michlová*	Z	0	0P+2C	Z	v
15JIS3-E	**Foreign Language - Spanish 3** *Nina Hricsina Puškinová*	Z	0	0P+2C	Z	v
15JIA4-E	**Foreign Language - English 4** *Eva Rezlerová*	Z	0	0P+2C	L	v
15JIF4-E	**Foreign Language - French 4** *Irena Veselková*	Z	0	0P+2C	L	v
15JIN4-E	**Foreign Language - German 4** *Eva Rezlerová, Martina Navrátilová, Jana Štikarová*	Z	0	0P+2C	L	v
15JIR4-E	**Foreign Language - Russian 4** *Marie Michlová*	Z	0	0P+2C	L	v
15JIS4-E	**Foreign Language - Spanish 4** *Nina Hricsina Puškinová*	Z	0	0P+2C	L	v

Characteristics of the courses of this group of Study Plan: Code=VP-NP-IS-EN Name=Master Full-Time IS (EN) voluntary

15JIA1-E	Foreign Language - English 1	Z	0
Work on specialised texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communication skills. Active use of foreign language in presentations within students´ specialization field both in verbal and written forms. Language laboratory environment used alternatively as a tool for active learning (Programmes - English Connections, English Library, the Internet).			
15JIF1-E	Foreign Language - French 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN1-E	Foreign Language - German 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR1-E	Foreign Language - Russian 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS1-E	Foreign Language - Spanish 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIA2-E	Foreign Language - English 2	Z	0
Work on specialised texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communication skills. Active use of foreign language in presentations within students´ specialization field both in verbal and written form. Language laboratory environment used alternatively as a tool for active learning (Programmes - English Connections, English Library, the Internet).			
15JIF2-E	Foreign Language - French 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN2-E	Foreign Language - German 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR2-E	Foreign Language - Russian 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS2-E	Foreign Language - Spanish 2	Z	0
Basic structures of Spanish language, communication in everyday life, study, work, leisere time activities, introducing myself, phonetics of Spanish language, writing skills.			
15JIA3-E	Foreign Language - English 3	Z	0
Presentation skills - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Optional courses for certificates FCE, CAE.			
15JIF3-E	Foreign Language - French 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN3-E	Foreign Language - German 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR3-E	Foreign Language - Russian 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS3-E	Foreign Language - Spanish 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIA4-E	Foreign Language - English 4	Z	0
Presentation Skills - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Optional courses for certificates FCE, CAE.			

15JIF4-E	Foreign Language - French 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN4-E	Foreign Language - German 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR4-E	Foreign Language - Russian 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS4-E	Foreign Language - Spanish 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
11MAI-E	ITS Mathematical Tools	Z,ZK	4
Series, Fourier Series. Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analysis to PDE. Fundamentals of Numerical Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following models as ODEs.			
11MMAD-E	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.			
11XN1S-E	Master project 1 for study programme IS	Z	5
11XN2S-E	Master project 2 for study programme IS	Z	6
11XN3S-E	Master project 3 for study programme IS	Z	6
11XN4S-E	Master project 4 for study programme IS	Z	10
11XNDS-E	Master Thesis for study programme IS	Z	16
11XPXS-E	Training course for study programme IS	Z	4
12TDP-E	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, statistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation between traffic models and traffic flow management.			
12XN1S-E	Master project 1 for study programme IS	Z	5
12XN2S-E	Master project 2 for study programme IS	Z	6
12XN3S-E	Master project 3 for study programme IS	Z	6
12XN4S-E	Master project 4 for study programme IS	Z	10
12XNDS-E	Master Thesis for study programme IS	Z	16
12XPXS-E	Training course for study programme IS	Z	4
14CITS-E	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 properties and specifics. Course will also cover signal processing.			
14MIM-E	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 of algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing security equipment, and PT preference. Algorithms will be designed, applied, and tested by students themselves.			
14PAM-E	Programming and modelling	Z,ZK	4
Object oriented programming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, recursion, complexity, Lindenmeyer's grammars, paralism in nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, model types As-Is a To-Be, acquisition of analytical sources for modelling, BPMN language, SW Bizagi, model creation and life cycle.			
14PD-E	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 open systems.			
14PPRP-E	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, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of the project outline (activities, restrictions, assignments, calendars etc.) Project planning and optimization - time, resources.			
14XN1S-E	Master project 1 for study programme IS	Z	5
14XN2S-E	Master project 2 for study programme IS	Z	6
14XN3S-E	Master project 3 for study programme IS	Z	6
14XN4S-E	Master project 4 for study programme IS	Z	10
14XNDS-E	Master Thesis for study programme IS	Z	16
14XPXS-E	Training course for study programme IS	Z	4

15JIA1-E	Foreign Language - English 1	Z	0
Work on specialised texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communication skills. Active use of foreign language in presentations within students´ specialization field both in verbal and written forms. Language laboratory environment used alternatively as a tool for active learning (Programmes - English Connections, English Library, the Internet).			
15JIA2-E	Foreign Language - English 2	Z	0
Work on specialised texts and technical terminology. Lexical-grammatical structures of higher command. Formal language. Improvement of communication skills. Active use of foreign language in presentations within students´ specialization field both in verbal and written form. Language laboratory environment used alternatively as a tool for active learning (Programmes - English Connections, English Library, the Internet).			
15JIA3-E	Foreign Language - English 3	Z	0
Presentation skills - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Optional courses for certificates FCE, CAE.			
15JIA4-E	Foreign Language - English 4	Z	0
Presentation Skills - expert technical discourse and style. Analysis of expert texts and their production. Preparation for overseas work engagement. Optional courses for certificates FCE, CAE.			
15JIF1-E	Foreign Language - French 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIF2-E	Foreign Language - French 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIF3-E	Foreign Language - French 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIF4-E	Foreign Language - French 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN1-E	Foreign Language - German 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN2-E	Foreign Language - German 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN3-E	Foreign Language - German 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIN4-E	Foreign Language - German 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR1-E	Foreign Language - Russian 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR2-E	Foreign Language - Russian 2	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR3-E	Foreign Language - Russian 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIR4-E	Foreign Language - Russian 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS1-E	Foreign Language - Spanish 1	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS2-E	Foreign Language - Spanish 2	Z	0
Basic structures of Spanish language, communication in everyday life, study, work, leisere time activities, introducing myself, phonetics of Spanish language, writing skills.			
15JIS3-E	Foreign Language - Spanish 3	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15JIS4-E	Foreign Language - Spanish 4	Z	0
Basic structures of foreign language, communication in everyday life, study, work, leiser time activities, introducing myself, phonetics of foreign language, writing skills, in advanced groups texts with professional topics.			
15XN1S-E	Master project 1 for study programme IS	Z	5
15XN2S-E	Master project 2 for study programme IS	Z	6
15XN3S-E	Master project 3 for study programme IS	Z	6
15XN4S-E	Master project 4 for study programme IS	Z	10
15XNDS-E	Master Thesis for study programme IS	Z	16
15XPXS-E	Training course for study programme IS	Z	4

16DITS-E	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 concept phase, functional dependences and structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy transformations leading to kinetic one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.			
16ESDP-E	Electronic systems in modern vehicles	Z,ZK	3
Advanced vehicle systems, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propulsion, its components, basic characteristics and control. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.). Safety, communication and comfort electronic vehicle systems. Practical exercises with real and simulated systems.			
16KSD-E	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 quality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabilization and improvement. Students will work on real problems in the QFD laboratory.			
16SHMI-E	Simulation and HMI	Z,ZK	3
Simulation for the systems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for ITS. Simulation theory with application of computing equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle dynamics, on-land carriage in particular. Virtual reality systems.			
16XN1S-E	Master project 1 for study programme IS	Z	5
16XN2S-E	Master project 2 for study programme IS	Z	6
16XN3S-E	Master project 3 for study programme IS	Z	6
16XN4S-E	Master project 4 for study programme IS	Z	10
16XNDS-E	Master Thesis for study programme IS	Z	16
16XPXS-E	Training course for study programme IS	Z	4
17XN1S-E	Master project 1 for study programme IS	Z	5
17XN2S-E	Master project 2 for study programme IS	Z	6
17XN3S-E	Master project 3 for study programme IS	Z	6
17XN4S-E	Master project 4 for study programme IS	Z	10
17XNDS-E	Master Thesis for study programme IS	Z	16
17XPXS-E	Training course for study programme IS	Z	4
18XN1S-E	Master project 1 for study programme IS	Z	5
18XN2S-E	Master project 2 for study programme IS	Z	6
18XN3S-E	Master project 3 for study programme IS	Z	6
18XN4S-E	Master project 4 for study programme IS	Z	10
18XNDS-E	Master Thesis for study programme IS	Z	16
18XPXS-E	Training course for study programme IS	Z	4
20AIMI-E	Application of ITS in Urban Engineering	Z,ZK	6
The course focuses mainly on the issue of the installation of engineering networks in the area, coordination of engineering activities in the area, organization of the public space, concept of public space solutions, design of systems for traffic and transport telematics management, coordination of transport modes - automobil, pedestrian, MHD, cyclo, modes etc. New approaches to the development of Smart and green approaches Promoting into Public.			
20BITS-E	Safety and reliability of ITS Systems	KZ	3
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			
20GINS-E	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 of transport and telecommunication. It introduces students to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitization methods, and a number of other GIS related technologies such as problem mapping, webmap, etc.			
20HEI-E	Evaluation and Economics of ITS	KZ	3
Introduction of subject is devoted to the basics of system approach to development of ITS architecture and fundamentals in the field of economic attributes connected with development of ITS. Subsequently, the basic principles of system and application creation in the technical field are discussed, defining the penetration of the technical solution into the economy. The subject is terminated by a detailed breakdown of case studies.			
20ITSR-E	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.			
20MZZ-E	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.			
20PRZP-E	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 railway traffic management, including 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, which must be included in the systems for automation of railway traffic control using computer technologies.			
20SYIN-E	System Engineering	Z,ZK	6
Enhanced system definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of selected types of system engineering tasks, definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic management system, context of sustainable development.			
20TSJ-E	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 management, etc.			

20TVHD-E	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.			
20XN1S-E	Master project 1 for study programme IS	Z	5
20XN2S-E	Master project 2 for study programme IS	Z	6
20XN3S-E	Master project 3 for study programme IS	Z	6
20XN4S-E	Master project 4 for study programme IS	Z	10
20XNDS-E	Master Thesis for study programme IS	Z	16
20XPXS-E	Training course for study programme IS	Z	4
21XN1S-E	Master project 1 for study programme IS	Z	5
21XN2S-E	Master project 2 for study programme IS	Z	6
21XN3S-E	Master project 3 for study programme IS	Z	6
21XN4S-E	Master project 4 for study programme IS	Z	10
21XNDS-E	Master Thesis for study programme IS	Z	16
21XPXS-E	Training course for study programme IS	Z	4
22XN1S-E	Master project 1 for study programme IS	Z	5
22XN2S-E	Master project 2 for study programme IS	Z	6
22XN3S-E	Master project 3 for study programme IS	Z	6
22XN4S-E	Master project 4 for study programme IS	Z	10
22XNDS-E	Master Thesis for study programme IS	Z	16
22XPXS-E	Training course for study programme IS	Z	4

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