

Study plan

Name of study plan: IS-EN nav.prez.18/19

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Intelligent Transport Systems

Garantor of the study branch: doc. Ing. Pavel Hrubeš, Ph.D.

Program of study: Technology in Transportation and Telecommunications

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: 104

The role of the block: Z

Code of the group: 1.S.NPIS 14/15 EN

Name of the group: 1.sem.nav.prez.IS 14/15 angličtina

Requirement credits in the group: In this group you have to gain 28 credits

Requirement courses in the group: In this group you have to complete 8 courses

Credits in the group: 28

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	ITS Mathematical Tools Jan Příkrýl	Z,ZK	4	2P+2C	Z	z
11TEF	Theoretical Physics at Transportation David Matejov, Zuzana Malá Zuzana Malá Zuzana Malá (Gar.)	Z,ZK	3	2P+1C	Z	z
12TDP	Traffic Flow Theory Vladimír Faltus	Z,ZK	3	2P+1C	Z	z
20SK	Signals and Codes Jan Příkrýl, Jindřich Sadil	Z,ZK	4	2P+1C	Z	z
20TRAS	Control and Reliability Theory in Transportation Vladimír Faltus, Tomáš Tichý	ZK	4	4P+0C	Z	z
20TSJ	Telematic Systems and their Design Pavel Hrubeš, Petr Bureš, Martin Langr, Ondřej Příbyl Petr Bureš (Gar.)	Z,ZK	6	3P+2C	Z	z
23IB	Information Security Václav Jirovský	KZ	2	2P+0C	Z	z
16EAP	Energy Analysis of Land Carriage Jaroslav Opava	KZ	2	2P+0C	Z	z

Characteristics of the courses of this group of Study Plan: Code=1.S.NPIS 14/15 EN Name=1.sem.nav.prez.IS 14/15 angličtina

11MAI	ITS Mathematical Tools	Z,ZK	4	Time series, corelation, linear regression, trend modelling, moving averages, Short-Time Fourier Transform, component principle, Huang transform.
11TEF	Theoretical Physics at Transportation	Z,ZK	3	Generalized coordinates, Lagrange's equations of the first and the second kind, Hamilton's canonical equations, Canonical transformations,ergodic system, Weekly nonintegrable Hamilton's systém, Chaos, Potencial flow, Circumfluence of cylinder, conformal transformation, and method of singularity, Laminar flow, Turbulent flow.
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 simulation models, macroscopic and statistical models. Measurement of travel time. Phantom and rubbernecking effects. Queuing theory and special theory of transport phenomena. Basic methods of traffic flow control.
20SK	Signals and Codes	Z,ZK	4	Time and frequency representation of signals. Discretization of signals, sampling, quantization and coding. Signal transmission, modulation and coding. Coding theory, information theory. Checksums and selfcorrecting codes. Cryptography protocols. MATLAB excercises. Practical applications of coding and modulation.
20TRAS	Control and Reliability Theory in Transportation	ZK	4	Advanced methods of automatic control. Methods of state space control, nonlinear control, adaptive control, fuzzy control and stochastic control. Application of these methods on vehicular control and the control of traffic flows. Predicative diagnostics, safety in the traffic vehicles, safety infrastructure, human in the transportation and traffic systems and application of safety systems in transportation.
20TSJ	Telematic Systems and their Design	Z,ZK	6	Categorization and description of telematic systems and services, split ITS system in subsystems, interface specification, steps in system analysis and design, role of standardisation.

23IB	Information Security	KZ	2
Essentials of the security, definitions, approach. Security in networked branches, systems and networks - security point of view, Risks and their assessment, effect of security on the system design.			
16EAP	Energy Analysis of Land Carriage	KZ	2
Dynamics and driving resistance of the vehicle. Types of energy - kinetic, static, thermic, chemical etc. Means of energy transformation into kinetic. Combustion engine, electric engine, steam engine, air engine. Energy accumulation means, flywheel, fuel cell. Energy recuperation. WTW energetic analysis.			

Code of the group: 2.S.NPIS 13/14

Name of the group: 2.sem.nav.prez.IS 13/14

Requirement credits in the group: In this group you have to gain 28 credits

Requirement courses in the group: In this group you have to complete 11 courses

Credits in the group: 28

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
11RZ1	Pattern Recognition 1 <i>Michal Haindl Michal Haindl Michal Haindl (Gar.)</i>	Z,ZK	3	2P+1C	L	Z
11ZDA	Data Processing <i>Ondřej Příbyl, Michal Matowicki Ondřej Příbyl Ondřej Příbyl (Gar.)</i>	Z,ZK	3	2P+1C	L	Z
14TITS	Telecommunications in ITS <i>Tomáš Zelinka, Martin Srotýř, Zdeněk Lokaj</i>	Z,ZK	3	2P+1C	L	Z
14UES	Artificial Intelligence and Expert Systems in Transport <i>Tomáš Brandejský</i>	ZK	2	2P+0C	L	Z
20ARR	Risk Analysis and Management <i>Vladimír Faltus</i>	Z,ZK	2	1P+1C	L	Z
23IV	Intelligent Vehicle and Safety <i>Václav Jirovský Václav Jirovský</i>	Z,ZK	2	1P+1C	L	Z
20EMI	Economy and Management of ITS Projects <i>Jiří Růžička, Jakub Rajnoch, František Kopecký</i>	KZ	3	2P+1C	L	Z
14DMS	Traffic Modelling and Simulation <i>Jan Krčál, Filip Müller</i>	Z	4	1P+3C	L	Z
16TAJ	Technological Aspects of Quality <i>Jaroslav Machan, Přemysl Toman</i>	Z	2	2P+0C	L	Z
20IDFS	Identification Systems <i>Petr Bureš Petr Bureš</i>	Z	2	2P+0C	L	Z
22APN	Analysis and Prevention of Traffic Accidents <i>Michal Frydryn, Zdeněk Svatý</i>	Z	2	1P+1C	L	Z

Characteristics of the courses of this group of Study Plan: Code=2.S.NPIS 13/14 Name=2.sem.nav.prez.IS 13/14

11RZ1	Pattern Recognition 1	Z,ZK	3
Elements of pattern recognition. Basic PR concepts. Bayesian decision theory. Learning theory. Parametric classifiers. Context classifiers. Classification quality estimation. Vector support machines. Non-parametric classifiers. Feature selection. Cluster analysis.			
11ZDA	Data Processing	Z,ZK	3
Specific problems of the field of processing of traffic data. Data preprocessing and analysis for use in additional applications.			
14TITS	Telecommunications in ITS	Z,ZK	3
Specific legislative conditions for telecommunications solutions designed for ITS systems, quantification of telecommunications system parameters, relation between telematic (ITS) and telecommunications performance indicators, available tools for management of required telecommunications performance indicators limits namely within the data IP based networks, Typical data telecommunications solutions (backbone and access) applied within ITS.			
14UES	Artificial Intelligence and Expert Systems in Transport	ZK	2
Introduction to artificial intelligence, work in unified state space and with related techniques.			
20ARR	Risk Analysis and Management	Z,ZK	2
The main focus of the course is to acquaint with the analysis, evaluation and control of risks in road transport, especially in relation to the tunnels. They are presented probabilistic and deterministic methods for risk assessment, human behavior in crisis situations and factors that influence it. Students are more familiar with tunnel technology and repeats the basic concepts of the theory of traffic flow.			
23IV	Intelligent Vehicle and Safety	Z,ZK	2
Content of the subject are basic terms, types of traffic injuries, restraint systems, injury biomechanics, active and passive safety.			
20EMI	Economy and Management of ITS Projects	KZ	3
The course presents basic theoretical knowledge for ITS effectiveness assessment in a lot of typical projects. The course covers methodology to obtain economy and financial models and their mutual synthesis to provide basis for feasibility studies for ITS implementation. It includes basic methods of project management with respect to the organizational and legislative aspects of ITS projects.			
14DMS	Traffic Modelling and Simulation	Z	4
Introduction to the tools for traffic simulation. Parameter modification and tuning, application in praxis.			
16TAJ	Technological Aspects of Quality	Z	2
Certification and accreditation, quality management, standards of quality management and its application, quality system creation, tools and methods of quality improvement, conformity assurance, environmental certification, workplace certification, QMS integration, classification, certification of products and producers.			
20IDFS	Identification Systems	Z	2
Basic identification systems, its technologies (barcodes, RFID, biometrics), their features, usage, security and standards. Applications of identification systems, e. g. identification of vehicles, cargo, devices and processes. Identifier as foundation of traffic telematics standardization.			

22APN	Analysis and Prevention of Traffic Accidents	Z	2
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Basic definitions, types of source materials, methods of analysis, influence of road, factors of accidents, vehicle faults etc.

Code of the group: 3.S.NPIS 19/20 EN

Name of the group: 3.sem.nav.prez. IS 19/20 angličtina

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 7 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
11MMJ	Mathematical Models and their Applications Ivan Nagy	Z,ZK	4	2P+2C	Z	z
20GIL	Geographical, Information, Localization and Navigation systems Pavel Hruběš, Zuzana Purkrábková, František Kekula	Z,ZK	6	2P+2C	Z	z
20SYN	System Engineering Zuzana Bělinová, Veronika Vlčková	Z,ZK	3	2P+1C	Z	z
12BA	Road Safety Audit Josef Kocourek, Karel Kocián, Tomáš Padělek	KZ	2	2P+0C	Z	z
20HITS	ITS Effectiveness Assessment Jakub Rajnoch, František Kopecký	KZ	2	2P+0C	Z	z
12DZP	Transport and Environment Kristýna Neubergová	Z	2	2P+0C	Z	z
16MRJ	Modelling of "Human - Machine" Interface Petr Bouchner, Alina Mashko	Z	3	2P+1C	Z	z

Characteristics of the courses of this group of Study Plan: Code=3.S.NPIS 19/20 EN Name=3.sem.nav.prez. IS 19/20 angličtina

11MMJ	Mathematical Models and their Applications	Z,ZK	4
This subject gives a preparation for introduction of the notions of stochastic model, its estimation and its use for prediction and control. It involves the basic elements from the theory of regression and state space modelling and the basic tasks connected with them. They are e.g. the state observation task and the pole assignment task. In the end, several specific examples, using the models introduced, will be listed. The applications will aim at the transportation area.			
20GIL	Geographical, Information, Localization and Navigation systems	Z,ZK	6
Introduction to GIS, model of real world, data structure for spatial data, methods of data input, digitalisation, geographics coordination systems, map projection, vector data form, raster data form, spatial relationships and algorithms, general GIS tasks, transportation domain, GIS applications. Main principles of localization, satellite localization, performance parameters, processing of positioning data, digital cartographic data for navigation, navigation systems, dynamical navigation systems, applications of navigation systems.			
20SYN	System Engineering	Z,ZK	3
Enlarged definition of system in space of engineer tasks, specification of selected types of systems versus linked tools of system analysis and projection, acquaintance with selected instruments of identification of complicated systems, specifying of selected types of system engineering tasks. Examples of system engineering's practical methods and tools.			
12BA	Road Safety Audit	KZ	2
Schedules of applications of safety assessments during the process of preparations, and of the particular realization of the road network that should minimize traffic accident risks for all those who take part in road traffic. Road safety survey. Application of European Directive 2008/96/EC on road safety infrastructure management.			
20HITS	ITS Effectiveness Assessment	KZ	2
The course presents the knowledge of strategical plans, feasibility studies of ITS systems implementation based on available information together with the assessment of different phases of ITS project.			
12DZP	Transport and Environment	Z	2
This course aims the impact of transport on environment. The accent is put mainly on noise and vibration, emission, barrier effect and energy demands. The noise measury is part and parcel of this course.			
16MRJ	Modelling of "Human - Machine" Interface	Z	3
Aspects of human -machine interaction. Summary of areas where HMI takes an important place in particular in transportation. Examples of vehicle simulators.			

Code of the group: 3.S.NPIS-V1-12/13

Name of the group: 3.sem.IS 1.výběr předmětů od 12/13

Requirement credits in the group: In this group you have to gain 2 credits

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 2

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
16VS	Vehicle Control Systems Petr Bouchner, Dmitry Rozhdestvenskiy Petr Bouchner (Gar.)	Z,ZK	2	1P+1C	Z	z
20PTA	Advanced Telematic Applications Jiří Růžička, Jakub Rajnoch Jakub Rajnoch (Gar.)	Z,ZK	2	1P+1C	Z	z

20ZZZ	Railway Interlocking Systems <i>Martin Leso, Dušan Kamenický</i>	Z,ZK	2	1P+1C	Z	z
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Characteristics of the courses of this group of Study Plan: Code=3.S.NPIS-V1-12/13 Name=3.sem.IS 1.výběr předmětů od 12/13

16VS	Vehicle Control Systems	Z,ZK	2			
Basic features of regulatory technology and theory of control. Elementary regulators (PID), dynamic properties of a vehicle and driver as a regulator. Combustion engine control, static engine optimization, control unit requirements. Electric driver and its components. DC devices, asynchronous engines, synchronous engines - principles, construction, elementary features and operation. Hybrid drive control to obtain the optimal efficiency. Car communication bus (CAN, LIN, FlexRay, ISOBus, KWP2000 protocols etc). Control, safety, communication and comfort electronic systems in a car. The practice is performed with real and simulated systems, car system communication, laboratory experiments and control on selected electric devices.						
20PTA	Advanced Telematic Applications	Z,ZK	2			
The course presents basic knowledge and description of ITS systems and services for public transport, e.g. for public transport companies, for users of public transport, for public transport integrators, etc. and or freight transport, e.g. dangerous goods transport, transport of animals, etc.						
20ZZZ	Railway Interlocking Systems	Z,ZK	2			
This course reassume on the course "Railway interlocking plants". With basic knowledge about parts Railway interlocking plants, this course describes function and concept railway interlocking systems. The main aim is observe on modern electronic systems and other systems with high level of railway control automation. Deal of this course will be focused on interoperability of control and command in railway.						

Code of the group: 3.S.NPIS-V2-12/13

Name of the group: 3.sem.IS 2.výběr předmětů od 12/13

Requirement credits in the group: In this group you have to gain 2 credits

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 2

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
14BKA	Safety Critical Applications in ITS <i>Tomáš Brandejský Tomáš Brandejský Tomáš Brandejský (Gar.)</i>	KZ	2	2P+0C	Z	z
18STC	Special Materials and Technology <i>Jaroslav Valach</i>	KZ	2	2P+0C	Z	z

Characteristics of the courses of this group of Study Plan: Code=3.S.NPIS-V2-12/13 Name=3.sem.IS 2.výběr předmětů od 12/13

14BKA	Safety Critical Applications in ITS	KZ	2			
The need of system solution of HW and SW safety, partial specifics of safety, methods of safe systems development and safety proving. Introduction into legislative framework.						
18STC	Special Materials and Technology	KZ	2			
Basic Classification of Materials. Semiconductors. Ceramic materials. Polymers. Special kinds of Steels. Properties of Composite Materials.						

Code of the group: XNDPIS 13/14

Name of the group: Diplomová práce IS 13/14

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 1 course

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
12XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
11XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
14XIDP	Diploma Thesis (for the Field IS) <i>Tomáš Zelinka, Martin Šrotýř, Zdeněk Lokaj, Ota Hajzler</i>	KZ	22	0P+24C	L	z
15XIDP	Diploma Thesis (for the Field IS) <i>Eva Rezlerová</i>	KZ	22	0P+24C	L	z
16XIDP	Diploma Thesis (for the Field IS) <i>Josef Mik, Milan Slácky</i>	KZ	22	0P+24C	L	z
23XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
18XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
20XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
21XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
22XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z
17XIDP	Diploma Thesis (for the Field IS)	KZ	22	0P+24C	L	z

Characteristics of the courses of this group of Study Plan: Code=XNDPIS 13/14 Name=Diplomová práce IS 13/14

12XIDP	Diploma Thesis (for the Field IS)	KZ	22			
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11XIDP	Diploma Thesis (for the Field IS)	KZ	22
14XIDP	Diploma Thesis (for the Field IS)	KZ	22
15XIDP	Diploma Thesis (for the Field IS)	KZ	22
16XIDP	Diploma Thesis (for the Field IS)	KZ	22
23XIDP	Diploma Thesis (for the Field IS)	KZ	22
18XIDP	Diploma Thesis (for the Field IS)	KZ	22
20XIDP	Diploma Thesis (for the Field IS)	KZ	22
21XIDP	Diploma Thesis (for the Field IS)	KZ	22
22XIDP	Diploma Thesis (for the Field IS)	KZ	22
17XIDP	Diploma Thesis (for the Field IS)	KZ	22

Name of the block: Semestrální projekt

Minimal number of credits of the block: 16

The role of the block: ZP

Code of the group: XN IS 1.-4. 13/14

Name of the group: Projekt IS 1.-4.sem. 13/14

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 4 courses

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
11XN1	Master Project 1 <i>Magdalena Hykšová Ivan Nagy</i>	Z	2	0P+2C	Z	ZP
11XN2	Master Project 2 <i>Ivan Nagy</i>	Z	2	0P+2C	L	ZP
11X13	Master Project 3 <i>Ondřej Příbyl</i>	Z	4	0P+5C	Z	ZP
11XN4	Master Project 4 <i>Ondřej Příbyl</i>	Z	8	0P+4C	L	ZP
12XN1	Master Project 1 <i>Lukáš Hrdina, Josef Kocourek, Tomáš Padělek, Kristýna Neubergová, Zuzana Čarská, Jiří Čarský, Josef Filip, Jan Gallia, Martin Höfler,</i>	Z	2	0P+2C	Z	ZP
12XN2	Master Project 2 <i>Lukáš Hrdina, Josef Kocourek, Tomáš Padělek, Kristýna Neubergová, Zuzana Čarská, Jiří Čarský, Josef Filip, Jan Gallia, Martin Höfler,</i>	Z	2	0P+2C	L	ZP
12X13	Master Project 3	Z	4	0P+5C	Z	ZP
12XN4	Master Project 4 <i>Lukáš Hrdina, Josef Kocourek, Tomáš Padělek, Kristýna Neubergová, Zuzana Čarská, Jiří Čarský, Josef Filip, Jan Gallia, Martin Höfler,</i>	Z	8	0P+4C	L	ZP
14XN1	Master Project 1 <i>Tomáš Zelinka, Martin Šrotýř, Zdeněk Lokaj, Jan Krčál, Ota Hajzler, Jana Kaliková Jana Kaliková (Gar.)</i>	Z	2	0P+2C	Z	ZP
14XN2	Master Project 2 <i>Tomáš Zelinka, Martin Šrotýř, Zdeněk Lokaj, Jan Krčál, Ota Hajzler, Jana Kaliková</i>	Z	2	0P+2C	L	ZP
14X13	Master Project 3 <i>Tomáš Zelinka, Martin Šrotýř, Zdeněk Lokaj, Filip Müller, Ota Hajzler, Jana Kaliková</i>	Z	4	0P+5C	Z	ZP
14XN4	Master Project 4 <i>Tomáš Zelinka, Martin Šrotýř, Zdeněk Lokaj, Jan Krčál, Ota Hajzler, Jana Kaliková</i>	Z	8	0P+4C	L	ZP
15XN1	Master Project 1 <i>Eva Rezlerová, Jan Feit</i>	Z	2	0P+2C	Z	ZP
15XN2	Master Project 2 <i>Eva Rezlerová</i>	Z	2	0P+2C	L	ZP
15X13	Master Project 3 <i>Eva Rezlerová, Jan Feit</i>	Z	4	0P+5C	Z	ZP
15XN4	Master Project 4 <i>Eva Rezlerová</i>	Z	8	0P+4C	L	ZP
16XN1	Master Project 1 <i>Přemysl Toman, Dmitry Rozhdvestvenskiy, Josef Mík, Adam Orlický</i>	Z	2	0P+2C	Z	ZP
16XN2	Master Project 2 <i>Josef Mík, Adam Orlický</i>	Z	2	0P+2C	L	ZP
16X13	Master Project 3 <i>Josef Mík</i>	Z	4	0P+5C	Z	ZP
16XN4	Master Project 4 <i>Přemysl Toman, Josef Mík, Milan Sliacky, Adam Orlický</i>	Z	8	0P+4C	L	ZP

17XN1	Master Project 1 Václav Baroch, Edvard Březina, Michal Drábek, Alexandra Dvořáčková, Veronika Faifrová, Tomáš Horák, Vít Janoš, Milan Kříž, Olga Mertlová,	Z	2	0P+2C	Z	ZP
17XN2	Master Project 2 Václav Baroch, Edvard Březina, Michal Drábek, Tomáš Horák, Vít Janoš, Milan Kříž, Olga Mertlová, Zdeněk Michl, Denisa Mocková,	Z	2	0P+2C	L	ZP
17X13	Master Project 3	Z	4	0P+5C	Z	ZP
17XN4	Master Project 4 Václav Baroch, Edvard Březina, Michal Drábek, Tomáš Horák, Vít Janoš, Milan Kříž, Olga Mertlová, Zdeněk Michl, Denisa Mocková,	Z	8	0P+4C	L	ZP
18XN1	Master Project 1 Petr Zlámal, Petr Koudelka, Tomáš Fila	Z	2	0P+2C	Z	ZP
18XN2	Master Project 2	Z	2	0P+2C	L	ZP
18X13	Master Project 3	Z	4	0P+5C	Z	ZP
18XN4	Master Project 4 Petr Zlámal, Petr Koudelka, Daniel Kytýř	Z	8	0P+4C	L	ZP
20XN1	Master Project 1 Vladimír Faltus, Petr Bureš, Martin Langr, Jiří Růžička, Milan Sliacky, Patrik Horažďovský	Z	2	0P+2C	Z	ZP
20XN2	Master Project 2	Z	2	0P+2C	L	ZP
20X13	Master Project 3 Martin Langr, Jiří Růžička	Z	4	0P+5C	Z	ZP
20XN4	Master Project 4	Z	8	0P+4C	L	ZP
21XN1	Master Project 1	Z	2	0P+2C	Z	ZP
21XN2	Master Project 2 Peter Vittek, Lenka Hanáková, Vladimír Socha, Jakub Kraus, Stanislav Pleninger, Jakub Hospodka, Andrej Lališ, Slobodan Stojčić, Markéta Šedivá Kafková,	Z	2	0P+2C	L	ZP
21X13	Master Project 3	Z	4	0P+5C	Z	ZP
21XN4	Master Project 4 Petr Bureš, Peter Vittek, Lenka Hanáková, Vladimír Socha, Jakub Kraus, Stanislav Pleninger, Jakub Hospodka, Andrej Lališ, Slobodan Stojčić,	Z	8	0P+4C	L	ZP
22XN1	Master Project 1 Michal Frydrýn, Zdeněk Svatý, Karel Kocián, Tomáš Mičunek, Luboš Nouzovský	Z	2	0P+2C	Z	ZP
22XN2	Master Project 2 Michal Frydrýn, Zdeněk Svatý, Karel Kocián, Luboš Nouzovský	Z	2	0P+2C	L	ZP
22X13	Master Project 3	Z	4	0P+5C	Z	ZP
22XN4	Master Project 4 Michal Frydrýn, Zdeněk Svatý, Karel Kocián, Luboš Nouzovský	Z	8	0P+4C	L	ZP
23XN1	Master Project 1	Z	2	0P+2C	Z	ZP
23XN2	Master Project 2	Z	2	0P+2C	L	ZP
23X13	Master Project 3	Z	4	0P+5C	Z	ZP
23XN4	Master Project 4	Z	8	0P+4C	L	ZP

Characteristics of the courses of this group of Study Plan: Code=XN IS 1.-4. 13/14 Name=Projekt IS 1.-4.sem. 13/14

11XN1	Master Project 1	Z	2
11XN2	Master Project 2	Z	2
11X13	Master Project 3	Z	4
11XN4	Master Project 4	Z	8
12XN1	Master Project 1	Z	2
12XN2	Master Project 2	Z	2
12X13	Master Project 3	Z	4
12XN4	Master Project 4	Z	8
14XN1	Master Project 1	Z	2
14XN2	Master Project 2	Z	2
14X13	Master Project 3	Z	4
14XN4	Master Project 4	Z	8
15XN1	Master Project 1	Z	2
15XN2	Master Project 2	Z	2
15X13	Master Project 3	Z	4
15XN4	Master Project 4	Z	8
16XN1	Master Project 1	Z	2
16XN2	Master Project 2	Z	2
16X13	Master Project 3	Z	4
16XN4	Master Project 4	Z	8
17XN1	Master Project 1	Z	2
17XN2	Master Project 2	Z	2
17X13	Master Project 3	Z	4
17XN4	Master Project 4	Z	8

18XN1	Master Project 1	Z	2
18XN2	Master Project 2	Z	2
18X13	Master Project 3	Z	4
18XN4	Master Project 4	Z	8
20XN1	Master Project 1	Z	2
20XN2	Master Project 2	Z	2
20X13	Master Project 3	Z	4
20XN4	Master Project 4	Z	8
21XN1	Master Project 1	Z	2
21XN2	Master Project 2	Z	2
21X13	Master Project 3	Z	4
21XN4	Master Project 4	Z	8
22XN1	Master Project 1	Z	2
22XN2	Master Project 2	Z	2
22X13	Master Project 3	Z	4
22XN4	Master Project 4	Z	8
23XN1	Master Project 1	Z	2
23XN2	Master Project 2	Z	2
23X13	Master Project 3	Z	4
23XN4	Master Project 4	Z	8

List of courses of this pass:

Code	Name of the course	Completion	Credits
11MAI	ITS Mathematical Tools Time series, corelation, linear regression, trend modelling, moving averages, Short-Time Fourier Transform, component principle, Huang transform.	Z,ZK	4
11MMJ	Mathematical Models and their Applications This subject gives a preparation for introduction of the notions of stochastic model, its estimation and its use for prediction and control. It involves the basic elements from the theory of regression and state space modelling and the basic tasks connected with them. They are e.g. the state obseravation task and the pole assignment task. In the end, several specific examples, using the models introduced, will be listed. The applications will aim at the transportation area.	Z,ZK	4
11RZ1	Pattern Recognition 1 Elements of pattern recognition. Basic PR concepts. Bayesian decision theory. Learning theory. Parametric classifiers. Context classifiers. Classification quality estimation. Vector support machines. Non-parametric classifiers. Feature selection. Cluster analysis.	Z,ZK	3
11TEF	Theoretical Physics at Transportation Generalized coordinates, Lagrange's equations of the first and the second kind, Hamilton's canonical equations, Canonical transformations,ergodic system, Weekly nonintegrable Hamilton's systém, Chaos, Potencial flow, Circumfluence of cylinder, conformal transformation, and method of singularity, Laminar flow, Turbulent flow.	Z,ZK	3
11X13	Master Project 3	Z	4
11XIDP	Diploma Thesis (for the Field IS)	KZ	22
11XN1	Master Project 1	Z	2
11XN2	Master Project 2	Z	2
11XN4	Master Project 4	Z	8
11ZDA	Data Processing Specific problems of the field of processing of traffic data. Data preprocessing and analysis for use in additional applications.	Z,ZK	3
12BA	Road Safety Audit Schedules of applications of safety assessments during the process of preparations, and of the particular realization of the road network that should minimize traffic accident risks for all those who take part in road traffic. Road safety survey. Application of European Directive 2008/96/EC on road safety infrastructure management.	KZ	2
12DZP	Transport and Environment This course aims the impact of transport on environment. The accent is put mainly on noise and vibration, emission, barrier effect and energy demands. The noise measury is part and parcel of this course.	Z	2
12TDP	Traffic Flow Theory Mobility and associated human problems. Basic traffic parameters and their measurement. Estimation of quality of services. Theoretical fundamentals and applications of simulation models, macroscopic and statistical models. Measurement of travel time. Phantom and rubbernecking effekts. Queuing theory and special theory of transport phenomena. Basic methods of traffic flow control.	Z,ZK	3
12X13	Master Project 3	Z	4
12XIDP	Diploma Thesis (for the Field IS)	KZ	22
12XN1	Master Project 1	Z	2
12XN2	Master Project 2	Z	2
12XN4	Master Project 4	Z	8
14BKA	Safety Critical Applications in ITS The need of system solution of HW and SW safety, partial specifics of safety, methods of safe systems development and safety proving. Introduction into legislative framework.	KZ	2
14DMS	Traffic Modelling and Simulation Introduction to the tools for traffic simulation. Parameter modification and tuning, application in praxis.	Z	4

14TITS	Telecommunications in ITS	Z,ZK	3
Specific legislative conditions for telecommunications solutions designed for ITS systems, quantification of telecommunications system parameters, relation between telematic (ITS) and telecommunications performance indicators, available tools for management of required telecommunications performance indicators limits namely within the data IP based networks, Typical data telecommunications solutions (backbone and access) applied within ITS.			
14UES	Artificial Intelligence and Expert Systems in Transport	ZK	2
Introduction to artificial intelligence, work in unified state space and with related techniques.			
14X13	Master Project 3	Z	4
14XIDP	Diploma Thesis (for the Field IS)	KZ	22
14XN1	Master Project 1	Z	2
14XN2	Master Project 2	Z	2
14XN4	Master Project 4	Z	8
15X13	Master Project 3	Z	4
15XIDP	Diploma Thesis (for the Field IS)	KZ	22
15XN1	Master Project 1	Z	2
15XN2	Master Project 2	Z	2
15XN4	Master Project 4	Z	8
16EAP	Energy Analysis of Land Carriage	KZ	2
Dynamics and driving resistance of the vehicle. Types of energy - kinetic, static, thermic, chemical etc. Means of energy transformation into kinetic. Combustion engine, electric engine, steam engine, air engine. Energy accumulation means, flywheel, fuel cell. Energy recuperation. WTW energetic analysis.			
16MRJ	Modelling of "Human - Machine" Interface	Z	3
Aspects of human -machine interaction. Summary of areas where HMI takes an important place in particular in transportation. Examples of vehicle simulators.			
16TAJ	Technological Aspects of Quality	Z	2
Certification and accreditation, quality management, standards of quality management and its application, quality system creation, tools and methods of quality improvement, conformity assurance, environmental certification, workplace certification, QMS integration, classification, certification of products and producers.			
16VS	Vehicle Control Systems	Z,ZK	2
Basic features of regulatory technology and theory of control. Elementary regulators (PID), dynamic properties of a vehicle and driver as a regulator. Combustion engine control, static engine optimization, control unit requirements. Electric driver and its components. DC devices, asynchronous engines, synchronous engines - principles, construction, elementary features and operation. Hybrid drive control to obtain the optimal efficiency. Car communication bus (CAN, LIN, FlexRay, ISObus, KWP2000 protocole etc). Control, safety, communication and comfort electronic systems in a car. The practice is performed with real and simulated systems, car system communication, laboratory experiments and control on selected electric devices.			
16X13	Master Project 3	Z	4
16XIDP	Diploma Thesis (for the Field IS)	KZ	22
16XN1	Master Project 1	Z	2
16XN2	Master Project 2	Z	2
16XN4	Master Project 4	Z	8
17X13	Master Project 3	Z	4
17XIDP	Diploma Thesis (for the Field IS)	KZ	22
17XN1	Master Project 1	Z	2
17XN2	Master Project 2	Z	2
17XN4	Master Project 4	Z	8
18STC	Special Materials and Technology	KZ	2
Basic Classification of Materials. Semiconductors. Ceramic materials. Polymers. Special kinds of Steels. Properties of Composite Materials.			
18X13	Master Project 3	Z	4
18XIDP	Diploma Thesis (for the Field IS)	KZ	22
18XN1	Master Project 1	Z	2
18XN2	Master Project 2	Z	2
18XN4	Master Project 4	Z	8
20ARR	Risk Analysis and Management	Z,ZK	2
The main focus of the course is to acquaint with the analysis, evaluation and control of risks in road transport, especially in relation to the tunnels. They are presented probabilistic and deterministic methods for risk assessment, human behavior in crisis situations and factors that influence it. Students are more familiar with tunnel technology and repeats the basic concepts of the theory of traffic flow.			
20EMI	Economy and Management of ITS Projects	KZ	3
The course presents basic theoretical knowledge for ITS effectiveness assesment in a lot of typical projects. The course covers methodology to obtain economy and financial models and their mutual synthesis to provide basis for feasibility studies for ITS implementation. It includes basic methods of project management with respect to the organizational and legislative aspects of ITS projects.			
20GIL	Geographical, Information, Localization and Navigation systems	Z,ZK	6
Introduction to GIS, model of real world, data structure for spatial data, methods if data input, digitalisation, geographics coordination systems, map projection, vector data form, raster data form, spatial relationships and algorithms, general GIS tasks, transportation domain, GIS applications. Main principles of localization, satellite localization, performance parameters, processing of positioning data, digital cartographic data for navigation, navigation systems, dynamical navigation systems, aplications of navigation systems.			
20HITS	ITS Effectiveness Assessment	KZ	2
The course presents the knowledge of strategical plans, feasibility studies of ITS systems implementation based on available information together with the assessment of different phases of ITS project.			
20IDFS	Identification Systems	Z	2
Basic identification systems, its technologies (barcodes, RFID, biometrics), their features, usage, security and standards. Applications of identification systems, e. g. identifaciton of vehicles, cargo, devices and processes. Identifier as foundation of traffic telematics standardization.			
20PTA	Advanced Telematic Applications	Z,ZK	2
The course presents basic knowledge and description of ITS systems and services for public transport, e.g. for public transport companies, for users of public transport, for public transport integrators, etc. and or freight transport, e.g. dangerous goods transport, transport of animals, etc.			

20SK	Signals and Codes	Z,ZK	4
Time and frequency representation of signals. Discretization of signals, sampling, quantization and coding. Signal transmission, modulation and coding. Coding theory, information theory. Checksums and selfcorrecting codes. Cryptography protocols. MATLAB excercises. Practical applications of coding and modulation.			
20SYN	System Engineering	Z,ZK	3
Enlarged definition of system in space of engineer tasks, specification of selected types of systems versus linked tools of system analysis and projection, acquaintance with selected instruments of identification of complicated systems, specifying of selected types of system engineering tasks. Examples of system engineering's practical methods and tools.			
20TRAS	Control and Reliability Theory in Transportation	ZK	4
Advanced methods of automatic control. Methods of state space control, nonlinear control, adaptive control, fuzzy control and stochastic control. Application of these methods on vehicular control and the control of traffic flows. Predicative diagnostics, safety in the traffic vehicles, safety infrastructure, human in the transportation and traffic systems and application of safety systems in transportation.			
20TSJ	Telematic Systems and their Design	Z,ZK	6
Categorization and description of telematic systems and services, split ITS system in subsystems, interface specification, steps in system analysis and design, role of standardisation.			
20X13	Master Project 3	Z	4
20XIDP	Diploma Thesis (for the Field IS)	KZ	22
20XN1	Master Project 1	Z	2
20XN2	Master Project 2	Z	2
20XN4	Master Project 4	Z	8
20ZZZ	Railway Interlocking Systems	Z,ZK	2
This course reassume on the course "Railway interlocking plants". With basic knowledge about parts Railway interlocking plants, this course describes function and koncept railway interlocking systems. The main aim is observe on modern electronic systems and other systems with high level of railway control automation. Deal of this course will be focused on interoperability of control and command in railway.			
21X13	Master Project 3	Z	4
21XIDP	Diploma Thesis (for the Field IS)	KZ	22
21XN1	Master Project 1	Z	2
21XN2	Master Project 2	Z	2
21XN4	Master Project 4	Z	8
22APN	Analysis and Prevention of Traffic Accidents	Z	2
Basic definitions, types of source materials, methods of analysis, influence of road, factors of accidents, vehicle faults etc.			
22X13	Master Project 3	Z	4
22XIDP	Diploma Thesis (for the Field IS)	KZ	22
22XN1	Master Project 1	Z	2
22XN2	Master Project 2	Z	2
22XN4	Master Project 4	Z	8
23IB	Information Security	KZ	2
Essentials of the security, definitions, approacjh. Security in networked branches, systems and networks - security point of view, Riscs and their assesment, effect of security on the system design.			
23IV	Intelligent Vehicle and Safety	Z,ZK	2
Content of the subject are basic terms, types of traffic injuries, restraint systems, injury biomechanics, active and passive safety.			
23X13	Master Project 3	Z	4
23XIDP	Diploma Thesis (for the Field IS)	KZ	22
23XN1	Master Project 1	Z	2
23XN2	Master Project 2	Z	2
23XN4	Master Project 4	Z	8

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Generated: day 09. 04. 2020, time 20:41.