

Study plan

Name of study plan: IS nav.prez. 12/13- Karimova

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Intelligent Transport Systems

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

Program of study: Program Socrates-Erasmus

Type of study: Follow-up master full-time

Required credits: 72

Elective courses credits: 48

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses

Minimal number of credits of the block: 28

The role of the block: Z

Code of the group: 2.S.NPIS 11/12

Name of the group: 2.sem.nav.prez.IS od 11/12

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) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
22APN	Analysis and Prevention of Traffic Accidents	Z	2	1P+1C	L	Z
20ARR	Risk Analysis and Management	Z,ZK	2	1P+1C	L	Z
14DMS	Traffic Modelling and Simulation	Z	4	1P+3C	L	Z
20EMI	Economy and Management of ITS Projects	KZ	3	2P+1C	L	Z
20IDFS	Identification Systems Petr Bureš	Z	2	2P+0C	L	Z
16IV	Intelligent Vehicle and Safety	Z,ZK	2	1+1	L	Z
23IV	Intelligent Vehicle and Safety	Z,ZK	2	1P+1C	L	Z
11RZ1	Pattern Recognition 1	Z,ZK	3	2P+1C	L	Z
16TAJ	Technological Aspects of Quality	Z	2	2P+0C	L	Z
14TITS	Telecommunications in ITS	Z,ZK	3	2P+1C	L	Z
14UES	Artificial Intelligence and Expert Systems in Transport	ZK	2	2P+0C	L	Z
11ZDA	Data Processing Ondřej Píbyl	Z,ZK	3	2P+1C	L	Z

Characteristics of the courses of this group of Study Plan: Code=2.S.NPIS 11/12 Name=2.sem.nav.prez.IS od 11/12

22APN	Analysis and Prevention of Traffic Accidents Basic definitions, types of source materials, methods of analysis, influence of road, factors of accidents, vehicle faults etc.	Z	2
20ARR	Risk Analysis and Management 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.	Z,ZK	2
14DMS	Traffic Modelling and Simulation Introduction to the tools for traffic simulation. Parameter modification and tuning, application in praxis.	Z	4
20EMI	Economy and Management of ITS Projects 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.	KZ	3
20IDFS	Identification Systems 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.	Z	2

16IV	Intelligent Vehicle and Safety Content of the subject are basic terms, types of traffic injuries, restraint systems, injury biomechanics, active and passive safety.	Z,ZK	2
23IV	Intelligent Vehicle and Safety Content of the subject are basic terms, types of traffic injuries, restraint systems, injury biomechanics, active and passive safety.	Z,ZK	2
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
16TAJ	Technological Aspects of Quality 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.	Z	2
14TITS	Telecommunications in ITS 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.	Z,ZK	3
14UES	Artificial Intelligence and Expert Systems in Transport Introduction to artificial intelligence, work in unified state space and with related techniques.	ZK	2
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

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. 12/13

Name of the group: Projekt IS 1.-4.sem. 12/13

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) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
11XN1	Master Project 1	Z	2	0P+2C	Z	ZP
12XN1	Master Project 1 Zuzana arská, Dagmar Ko árková, Karolína Moudrá, Kristýna Neubergová, Martin Jacura, Vojt ch Novotný, Ond ej Trešl, David Vodák, Tomáš Javo ík,	Z	2	0P+2C	Z	ZP
13XN1	Master Project 1	Z	2	0+2	Z	ZP
14XN1	Master Project 1 Ota Hájzler, Jana Kaliková	Z	2	0P+2C	Z	ZP
15XN1	Master Project 1 Eva Rezlerová	Z	2	0P+2C	Z	ZP
21XN1	Master Project 1	Z	2	0P+2C	Z	ZP
17XN1	Master Project 1 Václav Baroch, Edvard B ezina, Michal Drábek, Alexandra Dvo áková, Veronika Faiřrová, Tomáš Horák, Vít Janoš, Milan K íž, Olga Mertlová,	Z	2	0P+2C	Z	ZP
18XN1	Master Project 1	Z	2	0P+2C	Z	ZP
20XN1	Master Project 1	Z	2	0P+2C	Z	ZP
23XN1	Master Project 1	Z	2	0P+2C	Z	ZP
22XN1	Master Project 1 Michal Frydrýn, Karel Kocián, Tomáš Mi unek, Luboš Nouzovský, Zden k Svatý	Z	2	0P+2C	Z	ZP
16XN1	Master Project 1 Josef Mík, Adam Orlický, Jaroslav Machan	Z	2	0P+2C	Z	ZP
23XN2	Master Project 2	Z	2	0P+2C	L	ZP
22XN2	Master Project 2	Z	2	0P+2C	L	ZP
21XN2	Master Project 2	Z	2	0P+2C	L	ZP
20XN2	Master Project 2	Z	2	0P+2C	L	ZP
18XN2	Master Project 2	Z	2	0P+2C	L	ZP
17XN2	Master Project 2	Z	2	0P+2C	L	ZP
16XN2	Master Project 2	Z	2	0P+2C	L	ZP
15XN2	Master Project 2	Z	2	0P+2C	L	ZP
13XN2	Master Project 2	Z	2	0+2	L	ZP

14XN2	Master Project 2	Z	2	0P+2C	L	ZP
12XN2	Master Project 2	Z	2	0P+2C	L	ZP
11XN2	Master Project 2	Z	2	0P+2C	L	ZP
21X13	Master Project 3	Z	4	0P+5C	Z	ZP
22X13	Master Project 3	Z	4	0P+5C	Z	ZP
23X13	Master Project 3	Z	4	0P+5C	Z	ZP
11X13	Master Project 3 <i>Ond ej P íbyl</i>	Z	4	0P+5C	Z	ZP
12X13	Master Project 3	Z	4	0P+5C	Z	ZP
18X13	Master Project 3	Z	4	0P+5C	Z	ZP
14X13	Master Project 3 <i>Ota Hajzler, Jana Kalíková, Tomáš Zelinka, Zden k Lokaj, Martin Šrotý, Jan Kr ál</i>	Z	4	0P+5C	Z	ZP
15X13	Master Project 3 <i>Eva Rezlerová</i>	Z	4	0P+5C	Z	ZP
16X13	Master Project 3 <i>Adam Orlický</i>	Z	4	0P+5C	Z	ZP
17X13	Master Project 3	Z	4	0P+5C	Z	ZP
20X13	Master Project 3	Z	4	0P+5C	Z	ZP
13X13	Master Project 3	Z	4	0+5	Z	ZP
15XN4	Master Project 4	Z	8	0P+4C	L	ZP
16XN4	Master Project 4	Z	8	0P+4C	L	ZP
12XN4	Master Project 4	Z	8	0P+4C	L	ZP
11XN4	Master Project 4 <i>Ond ej P íbyl</i>	Z	8	0P+4C	L	ZP
23XN4	Master Project 4	Z	8	0P+4C	L	ZP
22XN4	Master Project 4	Z	8	0P+4C	L	ZP
21XN4	Master Project 4	Z	8	0P+4C	L	ZP
20XN4	Master Project 4	Z	8	0P+4C	L	ZP
14XN4	Master Project 4	Z	8	0P+4C	L	ZP
17XN4	Master Project 4	Z	8	0P+4C	L	ZP
18XN4	Master Project 4	Z	8	0P+4C	L	ZP

Characteristics of the courses of this group of Study Plan: Code=XN IS 1.-4. 12/13 Name=Projekt IS 1.-4.sem. 12/13

11XN1	Master Project 1	Z	2
12XN1	Master Project 1	Z	2
13XN1	Master Project 1	Z	2
14XN1	Master Project 1	Z	2
15XN1	Master Project 1	Z	2
21XN1	Master Project 1	Z	2
17XN1	Master Project 1	Z	2
18XN1	Master Project 1	Z	2
20XN1	Master Project 1	Z	2
23XN1	Master Project 1	Z	2
22XN1	Master Project 1	Z	2
16XN1	Master Project 1	Z	2
23XN2	Master Project 2	Z	2
22XN2	Master Project 2	Z	2
21XN2	Master Project 2	Z	2
20XN2	Master Project 2	Z	2
18XN2	Master Project 2	Z	2
17XN2	Master Project 2	Z	2
16XN2	Master Project 2	Z	2
15XN2	Master Project 2	Z	2
13XN2	Master Project 2	Z	2
14XN2	Master Project 2	Z	2
12XN2	Master Project 2	Z	2
11XN2	Master Project 2	Z	2
21X13	Master Project 3	Z	4
22X13	Master Project 3	Z	4
23X13	Master Project 3	Z	4
11X13	Master Project 3	Z	4

12X13	Master Project 3	Z	4
18X13	Master Project 3	Z	4
14X13	Master Project 3	Z	4
15X13	Master Project 3	Z	4
16X13	Master Project 3	Z	4
17X13	Master Project 3	Z	4
20X13	Master Project 3	Z	4
13X13	Master Project 3	Z	4
15XN4	Master Project 4	Z	8
16XN4	Master Project 4	Z	8
12XN4	Master Project 4	Z	8
11XN4	Master Project 4	Z	8
23XN4	Master Project 4	Z	8
22XN4	Master Project 4	Z	8
21XN4	Master Project 4	Z	8
20XN4	Master Project 4	Z	8
14XN4	Master Project 4	Z	8
17XN4	Master Project 4	Z	8
18XN4	Master Project 4	Z	8

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 28

The role of the block: P

Code of the group: 1.S.NPIS 11/12

Name of the group: 1.sem.nav.prez.IS od 11/12

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
16EAP	Energy Analysis of Land Carriage <i>Jaroslav Opava</i>	KZ	2	2P+0C	Z	P
23IB	Information Security	KZ	2	2P+0C	Z	P
11MAI	ITS Mathematical Tools <i>Jan P ikryl, Jan P ikryl (Gar.)</i>	Z,ZK	4	2P+2C	Z	P
20SK	Signals and Codes <i>Jan P ikryl, Jind ich Sadil</i>	Z,ZK	4	2P+1C	Z	P
20TSJ	Telematic systems and their design <i>Martin Langr, Ond ej P ibyl, Petr Bureš, Pavel Hrubeš</i>	Z,ZK	6	3P+2C	Z	P
11TEF	Theoretical Physics at Transportation <i>David Matejov, Zuzana Malá Zuzana Malá Zuzana Malá (Gar.)</i>	Z,ZK	3	2P+1C	Z	P
12TDP	Traffic Flow Theory <i>Vladimír Faltus</i>	Z,ZK	3	2P+1C	Z	P
20TRAS	Control and Reliability Theory in Transportation	ZK	4	4P+0C	Z	P

Characteristics of the courses of this group of Study Plan: Code=1.S.NPIS 11/12 Name=1.sem.nav.prez.IS od 11/12

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.
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 assesment, effect of security on the system design.
11MAI	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.
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 exercises. Practical applications of coding and modulation.
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 management, etc.
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, Potential 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 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.			
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.			

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 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.			
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.			
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 system, Chaos, Potential flow, Circumfluence of cylinder, conformal transformation, and method of singularity, Laminar flow, Turbulent flow.			
11X13	Master Project 3	Z	4
11XN1	Master Project 1	Z	2
11XN2	Master Project 2	Z	2
11XN4	Master Project 4	Z	8
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.			
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, statistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation between traffic models and traffic flow management.			
12X13	Master Project 3	Z	4
12XN1	Master Project 1	Z	2
12XN2	Master Project 2	Z	2
12XN4	Master Project 4	Z	8
13X13	Master Project 3	Z	4
13XN1	Master Project 1	Z	2
13XN2	Master Project 2	Z	2
14DMS	Traffic Modelling and Simulation	Z	4
Introduction to the tools for traffic simulation. Parameter modification and tuning, application in praxis.			
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
14XN1	Master Project 1	Z	2
14XN2	Master Project 2	Z	2
14XN4	Master Project 4	Z	8
15X13	Master Project 3	Z	4
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.			
16IV	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.			
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.			
16X13	Master Project 3	Z	4

16XN1	Master Project 1	Z	2
16XN2	Master Project 2	Z	2
16XN4	Master Project 4	Z	8
17X13	Master Project 3	Z	4
17XN1	Master Project 1	Z	2
17XN2	Master Project 2	Z	2
17XN4	Master Project 4	Z	8
18X13	Master Project 3	Z	4
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.			
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. identificaiton of vehicles, cargo, devices and processes. Identifier as foundation of traffic telematics standardization.			
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
Gradual detailed analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, traffic management, etc.			
20X13	Master Project 3	Z	4
20XN1	Master Project 1	Z	2
20XN2	Master Project 2	Z	2
20XN4	Master Project 4	Z	8
21X13	Master Project 3	Z	4
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
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, approach. 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
23XN1	Master Project 1	Z	2
23XN2	Master Project 2	Z	2
23XN4	Master Project 4	Z	8

For updated information see <http://bilakniha.cvut.cz/en/FF.html>

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