## Study plan

## Name of study plan: navaz. mag. PRE program IS v EN 23/24

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Intelligent Transport Systems

Type of study: Follow-up master full-time

Required credits: 76

Elective courses credits: 44 Sum of credits in the plan: 120

Note on the plan:

Name of the block: Semestrální projekt Minimal number of credits of the block: 27

The role of the block: ZP

Code of the group: XN IS EN 1-4 21/22

Name of the group: Projekty nav.prez.1.-4.sem (od) 21/22 programu IS v EN 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  Evženie Uglickich, Bohumil Ková, Jan Pikryl Bohumil Ková 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	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  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	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
23XN1S-E	Master project 1 for study programme IS	Z	5	0P+4C	Z	ZP
11XN2S-E	Master project 2 for study programme IS Evženie Uglickich, Bohumil Ková, Jan Pikryl Jan Pikryl Jan Pikryl (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	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	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	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
23XN2S-E	Master project 2 for study programme IS	Z	6	0P+4C	L	ZP
11XN3S-E	Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP

Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 3 for study programme IS	Z	6	0P+4C	Z	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS  Martin Leso	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
Master project 4 for study programme IS	Z	10	0P+8C	L	ZP
	Master project 3 for study programme IS  Master project 4 for study programme IS	Master project 3 for study programme IS  Master project 4 for study programme IS	Master project 3 for study programme IS  Master project 4 for study programme	Master project 3 for study programme IS  Master project 4 for study programme	Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 3 for study programme IS       Z       6       0P+4C       Z         Master project 4 for study programme IS       Z       6       0P+4C       Z         Master project 4 for study programme IS       Z       10       0P+8C       L         Master project 4 for study programme IS       Z       10       0P+8C       L         Master project 4 for study programme IS       Z       10       0P+8C       L         Master project 4 for study programme IS       Z       10       0P+8C       L </td

Characteristics of the courses of this group of Study Plan: Code=XN IS EN 1-4 21/22 Name=Projekty nav.prez.1.-4.sem (od) 21/22 programu IS v EN

programu IS v EN			
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
23XN1S-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
23XN2S-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
23XN3S-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
23XN4S-E	Master project 4 for study programme IS	Z	10

Name of the block: Compulsory courses Minimal number of credits of the block: 49

The role of the block: Z

Code of the group: 1.S.NPIS EN 21/22

Name of the group: 1.sem.nav.prez (od) 21/22 - program IS v EN

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 P ikryl Jan P ikryl (Gar.)	Z,ZK	4	2P+2C	Z	Z
16DITS-E	Vehicles within ITS 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	Z,ZK	6	3P+3C	Z	Z
20TSJ-E	Telematic systems and their design Petr Bureš, Ond ej P ibyl	Z,ZK	6	3P+2C	Z	Z
23TBSS-E	Technology and Security of Sensor Networks  Václav Jirovský Václav Jirovský (Gar.)	KZ	2	2P+0C	Z	Z

# Characteristics of the courses of this group of Study Plan: Code=1.S.NPIS EN 21/22 Name=1.sem.nav.prez (od) 21/22 - program IS v EN

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	ysis to PDE. Funda	amentals of
Numerical Mathematic	es. 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, f	unctional
dependences and stru	cture of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy tra	ansformations lead	ling to kinetic
one. Propulsion syster	ns / traditional and alternative ones. Life-cycle analysis.		
20GINS-E	Geographical, information, localization and navigation systems	Z,ZK	6
The subject is specializ	ed in problems of work with applications of geographic information systems with special attention to the specialization in the field o	of transport and tele	ecommunication
It introduces students	to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and di	gitization methods	, and a number
of other GIS related te	chnologies such as problem mapping, webmap, etc.		
20TSJ-E	Telematic systems and their design	Z,ZK	6
Gradual detailed analy	sis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management,	traffic manageme	nt, etc.
23TBSS-E	Technology and Security of Sensor Networks	KZ	2
The course focuses or	the safety of data collection in new areas of sensor networks. Principles of sensor networks, sensors of electrical and non-el	ectric quantities, ir	nterfaces for
sensor connection, co	mmunication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Smart (	City	

Code of the group: 1.S.NPIS VYBEN 21/22

Name of the group: 1.sem.nav.prez (od) 21/22 výb r p edm tu - program IS v EN

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:

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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 Rožd stvenský, Petr Bouchner	Z,ZK	3	2P+1C	Z	Z
20MZZ-E	Modern techniques of safety control of moving railway vehicles  Martin Leso	Z,ZK	3	2P+1C	Z	Z

#### Characteristics of the courses of this group of Study Plan: Code=1.S.NPIS VYBEN 21/22 Name=1.sem.nav.prez (od) 21/22 výb r p edm tu program IS v EN

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 mathematica 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

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

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,

Code of the group: 2.S.NPIS EN 21/22

Name of the group: 2.sem.nav.prez (od) 21/22 - program IS v EN

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 Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš <b>Zden k Lokaj</b> Zden k 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 Šrotý Michal Je ábek Michal Je ábek (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 Vladimir Faltus. Tomáš Tichý Tomáš Tichý (Gar.)	KZ	3	2P+1C	L	Z

#### Characteristics of the courses of this group of Study Plan: Code=2.S.NPIS EN 21/22 Name=2.sem.nav.prez (od) 21/22 - program IS v ΕN

14CITS-F C-ITS Systems 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.

Programming and modelling

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.

Data processing

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

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 ΚZ

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: 2.S.NPIS VYBEN 21/22

Name of the group: 2.sem.nav.prez (od) 21/22 výb r p edm tu - program IS v EN

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 Mejst ík Jan Mejst ík Jan Mejst ík (Gar.)	KZ	3	0P+3C	L	Z
16SHMI-E	Simulation and HMI Tereza Kunclová, Petr Bouchner, Stanislav Novotný, 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=2.S.NPIS VYBEN 21/22 Name=2.sem.nav.prez (od) 21/22 výb r p edm tu - program IS v EN

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

## List of courses of this pass:

Code	Name of the course	Completion	Credits
11MAI-E	ITS Mathematical Tools	Z,ZK	4
Series, Fourier S	Series. Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analys	sis to PDE. Fundar	nentals of
N	lumerical Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following mod	els as ODEs.	
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
12TDP-E	Traffic Flow Theory	Z,ZK	3
Mobility and assoc	iated human problems. Basic traffic parameters and their measurement. Estimation of quality of services. Theoretical fundamentals an	d applications of m	nathematica
models. Macrosco	pic, statistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation bet	ween traffic model	s 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
14CITS-E	C-ITS Systems	Z,ZK	6
Detailed description	on of C-ITS systems architecture, description of use-cases - urban and rural applications, principles of C-ITS funcionality with focus on	data exchange (C	AM, DENM
IVI) and C-ITS sec	curity architecture. Status quo and modern trends of wireless telecommunication solutions ITS-G5 and LTE-V and description of its pr	operties and speci	fics. Course
	will also cover signal processing.		
14MIM-E	Microsimulation Models	KZ	3
Basic knowledg	e of traffic modeling and simulation will be broaded by the application of traffic control algorithms to traffic microsimulation models us	ed in ITS. These in	clude, for
example, the propo	osal 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
	ogramming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, recurs		-
grammars, paralis	sm in nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, model ty	pes 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
	about tools for data processing and analysis, using practical examples to try out the most common options used in data processing,	•	•
presenting the res	ults of analyses. In advanced methods, students will also perform specific analysis using Bayesian networks. Students will then independent of analysis using Bayesian networks.	endently perform d	ata analysis
	on data from existing open systems.		

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14PPRP-E	Computer Aided Project Management  ct? The basic terms a concents of project management. Life cycle of the project and its phased approach. Analysis and specification of	KZ	2
	ct? The basic terms a concepts of project management. Life cycle of the project and its phased approach. Analysis and specification of the solutions, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of the		
dominion, diago	restrictions, assignments, calendars etc.) Project planning and optimization - time, resources.	project datime (	aouvinoo,
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 2 for study programme IS	Z	6
14XN4S-E	Master project 3 for study programme IS	Z	10
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15XN1S-E	Master project 1 for study programme IS		5
15XN2S-E	Master project 2 for study programme IS	Z	6
15XN3S-E	Master project 3 for study programme IS	<u>Z</u>	6
15XN4S-E	Master project 4 for study programme IS	Z	10
16DITS-E	Vehicles within ITS	Z,ZK	4
•	hicle with focus on its use and function in frame of ITS. User requirement analyses. Economic aspects. Process of constructions in a discount of the contract		
dependences and	structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy transfer one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.	ormations leadin	g to kinetic
16ESDP-E		Z,ZK	3
	Electronic systems in modern vehicles e systems, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propulsi	•	1
	e systems, electromobility, vzi and vzv, autonomous unving. Combustion engine control and electronic control units. Electric propulsi in control. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.). S	•	
characteristics a	comfort electronic vehicle systems. Practical exercises with real and simulated systems.	balety, communic	battori ariu
16SHMI-E	Simulation and HMI	Z,ZK	3
	rstems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics for		
	uting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle d		•
,,	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 Z	10
17XN1S-E	Master project 4 for study programme IS	<u>Z</u>	5
17XN13-E		Z	6
	Master project 2 for study programme IS		
17XN3S-E	Master project 3 for study programme IS	Z	6
17XN4S-E	Master project 4 for study programme IS	Z	10
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
20BITS-E	Safety and reliability of ITS Systems	KZ	3
The basic concept	s of safety and reliability in the job and application. Basic schema and types of diagnostic systems including reliability diagnostics of te	echnical equipme	nt and ITS
Investigation of ac	eptability and reliability prediction, traffic crity and sensitivity analysis. Neural Networks and other optimization algorithms and ETA, Fl	MEA failure ana	ysis. HMI i
	traffic including operator testing on simulator and in real-world situatiation		1
JOCINIC E	Geographical, information, localization and navigation systems		
20GINS-E		Z,ZK	6
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23TBSS-E	Technology and Security of Sensor Networks	KZ	2		
The course focuses on the safety of data collection in new areas of sensor networks. Principles of sensor networks, sensors of electrical and non-electric quantities, interfaces for					
sensor connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Smart City					
23XN1S-E	Master project 1 for study programme IS	Z	5		
23XN2S-E	Master project 2 for study programme IS	Z	6		
23XN3S-E	Master project 3 for study programme IS	Z	6		
23XN4S-E	Master project 4 for study programme IS	Z	10		

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