Study plan

Name of study plan: navaz. mag. PRE program SC 20/21 (pro studenty, kte í absolvují n které p edm ty 1.ro . na UTEP)

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Smart Cities Type of study: Follow-up master full-time Required credits: 60 Elective courses credits: 0 Sum of credits in the plan: 60 Note on the plan:

Name of the block: Semestrální projekt Minimal number of credits of the block: 8 The role of the block: ZP

Code of the group: XN SC 1-2 20/21 Name of the group: Projekty nav.prez.1.-2.sem na FD programu SC Requirement credits in the group: In this group you have to gain 8 credits Requirement courses in the group: In this group you have to complete 2 courses Credits in the group: 8 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
11XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
12XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
14XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
15XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
16XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
17XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
18XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
20XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
21XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
22XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
23XN1C	Thesis 1	Z	4	0P+4C	Z	ZP
11XN2C	Thesis 2	Z	4	0P+4C	L	ZP
12XN2C	Thesis 2	Z	4	0P+4C	L	ZP
14XN2C	Thesis 2	Z	4	0P+4C	L	ZP
15XN2C	Thesis 2	Z	4	0P+4C	L	ZP
16XN2C	Thesis 2	Z	4	0P+4C	L	ZP
17XN2C	Thesis 2	Z	4	0P+4C	L	ZP
18XN2C	Thesis 2	Z	4	0P+4C	L	ZP
20XN2C	Thesis 2	Z	4	0P+4C	L	ZP
21XN2C	Thesis 2	Z	4	0P+4C	L	ZP
22XN2C	Thesis 2	Z	4	0P+4C	L	ZP
23XN2C	Thesis 2	Z	4	0P+4C	L	ZP

Characteristics of the courses of this group of Study Plan: Code=XN SC 1-2 20/21 Name=Projekty nav.prez.1.-2.sem na FD programu SC

11XN1C Thesis 1 Z 12XN1C Thesis 1 Z 14XN1C Thesis 1 Z 15XN1C Thesis 1 Z 16XN1C Thesis 1 Z 17XN1C Thesis 1 Z 18XN1C Thesis 1 Z 18XN1C Thesis 1 Z		4 4 4 4 4 4 4
14XN1C Thesis 1 Z 15XN1C Thesis 1 Z 16XN1C Thesis 1 Z 17XN1C Thesis 1 Z 18XN1C Thesis 1 Z	· · ·	4 4 4
15XN1C Thesis 1 Z 16XN1C Thesis 1 Z 17XN1C Thesis 1 Z 18XN1C Thesis 1 Z	· · · · · · · · · · · · · · · · · · ·	4 4
16XN1C Thesis 1 Z 17XN1C Thesis 1 Z 18XN1C Thesis 1 Z	<u>.</u>	4
17XN1C Thesis 1 Z 18XN1C Thesis 1 Z		-
18XN1C Thesis 1 Z		4
		4
20XN1C Thesis 1 Z		4
21XN1C Thesis 1 Z		4
22XN1C Thesis 1 Z		4
23XN1C Thesis 1 Z		4
11XN2C Thesis 2 Z		4
12XN2C Thesis 2 Z		4
14XN2C Thesis 2 Z		4
15XN2C Thesis 2 Z		4
16XN2C Thesis 2 Z		4
17XN2C Thesis 2 Z		4
18XN2C Thesis 2 Z		4
20XN2C Thesis 2 Z		4
21XN2C Thesis 2 Z		4
22XN2C Thesis 2 Z		4
23XN2C Thesis 2 Z		4

Name of the block: Compulsory courses in the program Minimal number of credits of the block: 50 The role of the block: P

Code of the group: 1.S.NPSC FD 20/21

Name of the group: 1.s.nav.prez 20/21 - program SC pro studenty UTEP (p edm ty FD) Requirement credits in the group: In this group you have to gain 12 credits Requirement courses in the group: In this group you have to complete 2 courses Credits in the group: 12 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
20AIMI	Application of ITS in Urban Engineering Ji í R ži ka, Josef Filip, Tomáš Tichý	Z,ZK	6	3P+3C	Z	Р
20GINS	Geographical, information, localization and navigation systems Pavel Hrubeš, Petr Bureš, Zuzana Purkrábková, František Kekula	Z,ZK	6	3P+3C	Z	Р

Characteristics of the courses of this group of Study Plan: Code=1.S.NPSC FD 20/21 Name=1.s.nav.prez 20/21 - program SC pro studenty UTEP (p edm ty FD)

20AIMI	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, concep					
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 deve	lopment of Smart and green approaches Promoting into Public.				
20GINS	Geographical, information, localization and navigation systems	Z,ZK	6		
The subject is specialized in problems of work with applications of geographic information systems with special attention to the specialization in the field 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.					

Code of the group: 1.S.NPSC UTEP 20/21

Name of the group: 1.s.nav.prez 20/21 SC:p edm ty z SC+IS(EN) pro studenty, kte í 17SCF nebo 17TSC absolvují na UTEP

Requirement credits in the group: In this group you have to gain at least 12 credits Requirement courses in the group: In this group you have to complete at least 2 courses Credits in the group: 12

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
17SCF	Smart Cities Fundamentals	Z,ZK	6	3P+2C	Z	Р
17TSC	Technologies for Smart Cities	Z,ZK	6	3P+2C	Z	Р
11MAI	ITS Mathematical Tools Jan P ikryl Jan P ikryl Jan P ikryl (Gar.)	Z,ZK	4	2P+2C	Z	Р
12TDP	Traffic Flow Theory Vladimír Faltus	Z,ZK	3	2P+1C	Z	Р
16ESDP	Electronic systems in modern vehicles Petr Bouchner, Dmitrij Rožd stvenský	Z,ZK	3	2P+1C	Z	Р
20MZZ	Modern techniques of safety control of moving railway vehicles Martin Leso	Z,ZK	3	2P+1C	Z	Ρ
16DITS	Vehicles within ITS David Lehet, Jaroslav Machan	Z,ZK	4	2P+2C	Z	Р
20TSJ	Telematic systems and their design Pavel Hrubeš, Martin Langr	Z,ZK	6	3P+2C	Z	Р
23TBSS	Technology and Security of Sensor Networks Václav Jirovský Václav Jirovský Václav Jirovský (Gar.)	KZ	2	2P+0C	Z	Р
11MMAD	Mathematical Methods for Data Analysis Pavla Pecherková, Tetiana Reznychenko, Evženie Uglickich, Ivan Nagy Pavla Pecherková Ivan Nagy (Gar.)	Z,ZK	6	3P+3C	Z	Ρ
16KSD	Quality and reliability in area of transportation means and systems David Lehet, Jaroslav Machan	Z,ZK	3	2P+1C	Z	Ρ
20PRZP	Computer aided railway traffic control Dušan Kamenický	Z,ZK	3	2P+1C	Z	Р
20TVHD	Telematics in Public Transport Milan Sliacky	Z,ZK	3	2P+1C	Z	Р
20SYIN	System Engineering Zuzana B linová, Veronika VI ková	Z,ZK	6	4P+2C	Z	Р
20HEI	Evaluation and Economics of ITS František Kopecký	KZ	3	2P+1C	Z	Р

Characteristics of the courses of this group of Study Plan: Code=1.S.NPSC UTEP 20/21 Name=1.s.nav.prez 20/21 SC:p edm ty z SC+IS(EN) pro studenty, kte í 17SCF nebo 17TSC absolvují na UTEP

17SCF	Smart Cities Fundamentals	Z,ZK	6
The main smart city con	ponents will be described (intelligent transport systems, smart grids, smart buildings, smart lighting, e-governance, etc.) togeth	er with their inte	gration methods
by using existing interna	ational standards to achieve the synergies among different sectors. The quality of life for different city residents is understood a	s the main criter	ial function.
17TSC	Technologies for Smart Cities	Z,ZK	6
Each presented techno	ogy will be described through performance parameters like safety, reliability, integrity, continuity, etc. New business models of	echnologies' imp	lementation
and operation will be int	roduced to provide advanced deployment decision-making. Legal aspects of technologies' assessment (e.g. GDPR) will be provide advanced deployment decision-making.	esented for selec	ted application
areas.			
11MAI	ITS Mathematical Tools	Z,ZK	4
Series, Fourier Series. I	Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analys	is to PDE. Funda	mentals of
Numerical Mathematics	. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following models as ODEs.		
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 a	and applications	of mathematical
models. Macroscopic, s	tatistical and microscopic models. Theory of shock waves, queuing theory and special theory of traffic phenomena. Relation be	etween traffic mo	dels and traffic
flow management.			
16ESDP	Electronic systems in modern vehicles	Z,ZK	3
Advanced vehicle syste	ms, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propulsi	on, its compone	nts, basic
	rol. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.).	Safety, communi	cation and
comfort electronic vehic	le systems. Practical exercises with real and simulated systems.		
20MZZ	Modern techniques of safety control of moving railway vehicles	Z,ZK	3
ERTMS / ETCS concep	ts, ETCS architecture and interface descriptions, ERTMS system level, infrastructure and mobile part of the system, linking to	stationary secur	ity systems,
operating and application	on modes of the system, infrastructure orientation, interface (DMI), integration of the ETCS mobile part into the driving vehicle,	GSM-R function	al specification,
testing and legislation.			
16DITS	Vehicles within ITS	Z,ZK	4
Design of the vehicle wi	th focus on its use and function in frame of ITS. User requirement analyses. Economic aspects. Process of constructions in a	concept phase, f	unctional
	ture of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy trans	sformations lead	ing to kinetic
one. Propulsion system	s / traditional and alternative ones. Life-cycle analysis.		
20TSJ	Telematic systems and their design	Z,ZK	6
Gradual detailed analys	is of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr	affic manageme	nt, etc.
23TBSS	Technology and Security of Sensor Networks	KZ	2
The course focuses on	the safety of data collection in new areas of sensor networks. Principles of sensor networks, sensors of electrical and non-elective	tric quantities, in	iterfaces for
sensor connection, corr	munication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Smart Cit	y	
11MMAD	Mathematical Methods for Data Analysis	Z,ZK	6
Stocastic modelling, est	imation, prediction, filtration, control, methods of data analysis: k-means, DBSCAN, naive Bayes, decision trees, support vector	or machine.	

16KSD	Quality and reliability in area of transportation means and systems	Z,ZK	3				
Quality methods used for design, manufacturing and operation. Methods QFD, DFM, DFA, DFS. Longtime testing. FMEA method. Operation reliability. Methods for process optimizing,							
process design and qua	ality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabiliz	ation and improve	ement. Students				
will work on real probler	ms in the QFD laboratory.						
20PRZP	Computer aided railway traffic control	Z,ZK	3				
Introduction is devoted	to clarifying the reasons and basic principles of automation of the management of railway transport. It explains the structure	, of railway traffic m	anagement,				
including the main princ	siples applied in the management of railway traffic. The main part is devoted to detailed description of the individual compone	ents of the system	, which must be				
included in the systems	s for automation of railway traffic control using computer technologies.						
20TVHD	Telematics in Public Transport	Z,ZK	3				
Ticketing and information	n systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Pu	, Iblic Transport pre	ferences; vehicle				
position monitoring; leg	islative framework; standardization, certification and interoperability.						
20SYIN	System Engineering	Z,ZK	6				
Enhanced system defin	ition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinen	nent of selected ty	/pes of system				
engineering tasks, defir	nition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strate	egic management	system, context				
of sustainable development.							
20HEI	Evaluation and Economics of ITS	KZ	3				
Introduction of subject is devoted to the basics of system approach to development of ITS architecture and 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 terminate	The subject is terminated by a detailed breakdown of case studies.						

Code of the group: 2.S.NPSC FD 20/21 Name of the group: 2.s.nav.prez 20/21 - program SC pro studenty UTEP (p edm ty FD) Requirement credits in the group: In this group you have to gain 14 credits Requirement courses in the group: In this group you have to complete 4 courses Credits in the group: 14 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
14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3	2P+1C	L	Р
17SU	Smart Urbanism	Z,ZK	6	2P+3C	L	Р
14FCL	Future Cities Laboratory	KZ	3	0P+3C	L	Р
17PJMG	Project Management	KZ	2	2P+0C	L	Р

Characteristics of the courses of this group of Study Plan: Code=2.S.NPSC FD 20/21 Name=2.s.nav.prez 20/21 - program SC pro studenty UTEP (p edm ty FD)

14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3			
Status quo and trends in telecommunications systems applied in cyber infrastructure, technical, economical and legal aspects of telecommunications networks design and services						
provisioning, identification	on and quantification of hiererchical telecommunications networks and services performance, telecommunication services dedi	icated for transpor	t and specifically			
Smart Cities solutions.						
17SU	Smart Urbanism	Z,ZK	6			
Urban metabolism and	ecology, urban morphology and land use, urban society: demography, mobility, social transtition, urban space and places, urb	ban flows, urban r	nodeling, impact			
of technology innovation	ns on urban transition.					
14FCL	Future Cities Laboratory	KZ	3			
Future cities system arc	hitecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wirele	ss telco solutions	dedicated for			
C-ITS systems (ITS-G5,	LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters	s assessment, tec	hnical properties			
evaluaiton, methods of data collection and processing.						
17PJMG	Project Management	KZ	2			
Basic terms of the project management, project management standards, organizational structures and processess in the project management, life-cycle of the project, risk analysis,						
projects in transport and transport infrastructure and their specifics, feasibility study and CBA, project evaluation, PPP projects.						

Code of the group: 2.S.NPSC UTEP 20/21

Name of the group: 2.s.nav.prez 20/21 SC: p edm ty z SC+IS(EN) pro ty, kte í 11SMCD nebo 17SCAR absolvují na UTEP

Requirement credits in the group: In this group you have to gain at least 9 credits Requirement courses in the group: In this group you have to complete at least 2 courses

Credits in the group: 9

Note on the aroup:

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
11SMCD	Smart Cities Design Ond ej P ibyl, Michal Matowicki Ond ej P ibyl Ond ej P ibyl (Gar.)	Z,ZK	6	3P+2C	L	Р

Sustainable Cities and Regions	Z,ZK	3	2P+1C	L	Р
C-ITS Systems Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k Lokaj (Gar.)	Z,ZK	6	3P+3C	L	Р
Microsimulation Models Jan Kr ál Jan Kr ál Jan Kr ál (Gar.)	KZ	3	0P+3C	L	Р
ITS - R Martin Leso (Gar.)	Z,ZK	3	2P+1C	L	Р
Programming and modelling Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala Vít Fábera Vít Fábera (Gar.)	Z,ZK	4	2P+2C	L	Р
Data processing Miroslav Vaniš, Martin Šrotý Martin Šrotý Martin Šrotý (Gar.)	Z,ZK	6	2P+4C	L	Р
Computer Aided Project Management Marek Kalika Marek Kalika Marek Kalika (Gar.)	KZ	2	0P+2C	L	Р
Safety and reliability of ITS Systems Tomáš Tichý, Vladimír Faltus	KZ	3	2P+1C	L	Р
	C C-ITS Systems Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k Lokaj (Gar.) Microsimulation Models Jan Kr ál Jan Kr ál Jan Kr ál (Gar.) ITS - R Martin Leso Martin Leso (Gar.) Programming and modelling Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala Vít Fábera Vít Fábera (Gar.) Data processing Miroslav Vaniš, Martin Šrotý Martin Šrotý Martin Šrotý (Gar.) Computer Aided Project Management Marek Kalika Marek Kalika (Gar.) Safety and reliability of ITS Systems	C-ITS Systems Z,ZK Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k Lokaj Z,ZK Microsimulation Models KZ Jan Kr ál Jan Kr ál Jan Kr ál (Gar.) KZ ITS - R Z,ZK Martin Leso Martin Leso (Gar.) Z,ZK Programming and modelling Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala Vít Fábera Vít Z,ZK Data processing Z,ZK Miroslav Vaniš, Martin Šrotý Martin Šrotý Martin Šrotý (Gar.) Z,ZK Computer Aided Project Management KZ Marek Kalika Marek Kalika Marek Kalika (Gar.) KZ	C-ITS Systems Z,ZK 6 Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k Lokaj Z,ZK 6 Microsimulation Models Jan Kr ál Jan Kr ál Jan Kr ál (Gar.) KZ 3 ITS - R Z,ZK 3 Martin Leso Martin Leso (Gar.) Z,ZK 3 Programming and modelling Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala Vít Fábera Vít Z,ZK 4 Vít Fábera (Gar.) Data processing Z,ZK 6 Computer Aided Project Management KZ 2 Marek Kalika Marek Kalika Marek Kalika (Gar.) KZ 3	C-ITS Systems Zden k Lokaj, Tomáš Zelinka, Miroslav Vaniš Zden k Lokaj Zden k LokajZ,ZK63P+3CMicrosimulation Models Jan Kr ál Jan Kr ál Jan Kr ál (Gar.)KZ30P+3CITS - R Martin Leso Martin Leso (Gar.)Z,ZK32P+1CProgramming and modelling Vít Fábera, Tomáš Brandejský, Marek Kalika, Martin Fiala Vít Fábera Vít Fábera (Gar.)Z,ZK42P+2CData processing Miroslav Vaniš, Martin Šrotý Martin Šrotý Martin Šrotý (Gar.)Z,ZK62P+4CComputer Aided Project Management Marek Kalika Marek Kalika (Gar.)KZ20P+2CSafety and reliability of ITS SystemsKZ32P+1C	Cubic <thc< td=""></thc<>

Characteristics of the courses of this group of Study Plan: Code=2.S.NPSC UTEP 20/21 Name=2.s.nav.prez 20/21 SC: p edm ty z SC+IS(EN) pro ty, kte í 11SMCD nebo 17SCAR absolvují na UTEP

11SMCD	Smart Cities Design	Z,ZK	6				
Introduction to smart ci	ites, systém analysis and design fundamentals, usage of UML for system design, principles of complex systems, modeling us	ing multiagent sy	stems in the SW				
environment AnyLogic,	application on a small scale real world problem.						
17SCAR	Sustainable Cities and Regions	Z,ZK	3				
Cities in antiquity and ir	the middle ages, renaissance ideal of a perfect city, 19. and 20. century cities, modern city planning, sustainability as a cond	ept, historical dev	elopment of				
transportation in cities, modern transportation systems, logistics as a concept, supply chain, logistics center, city logistics.							
14CITS	C-ITS Systems	Z,ZK	6				
Detailed description of	C-ITS systems architecture, description of use-cases - urban and rural applications, principles of C-ITS funcionality with focus	on data exchang	e (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 s	pecifics. Course				
will also cover signal pr	ocessing.						
14MIM	Microsimulation Models	KZ	3				
Basic knowledge of traf	fic modeling and simulation will be broaded by the application of traffic control algorithms to traffic microsimulation models us	ed in ITS. These	include, for				
example, the proposal of	f algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing secur	ity equipment, an	d PT preference.				
Algorithms will be desig	ned, applied, and tested by students themselves.						
20ITSR	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	eatures are defined. The principles of ERTMS / ETCS application level 3, UGTMS, CBTC are discussed in detail. Current and fu	uture communicat	ion technologies				
are described.							
14PAM	Programming and modelling	Z,ZK	4				
Object oriented program	nming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, rec	ursion, 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 fo	r modelling, BPMN language, SW Bizagi, model creation and life cycle.						
14PD	Data processing	Z,ZK	6				
Students will learn abo	t tools for data processing and analysis, using practical examples to try out the most common options used in data processir	ng, including adva	nced options for				
presenting the results of	f analyses. In advanced methods, students will also perform specific analysis using Bayesian networks. Students will then inc	ependently perfo	rm data analysis				
on data from existing o	pen systems.						
14PPRP	Computer Aided Project Management	KZ	2				
What is the project? Th	e basic terms a concepts of project management. Life cycle of the project and its phased approach. Analysis and specificatio	n of the assignme	ent, activity				
definition, stages, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of the project outline (activities,							
restrictions, assignmen	ts, calendars etc.) Project planning and optimization - time, resources.						
20BITS	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 accepta	ability and reliability prediction, traffic crity and sensitivity analysis. Neural Networks and other optimization algorithms and ET	A, FMEA failure a	nalysis. HMI in				
traffic including operato	traffic including operator testing on simulator and in real-world situatiation						

Code of the group: 2.S.NPSC VYB 20/21

Name of the group: 2.s.nav.prez 20/21 výb r p edm tu - program SC 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
16SHMI	Simulation and HMI Stanislav Novotný, Tereza Kunclová, Michal Cenkner	Z,ZK	3	2P+1C	L	Ρ
17AMOL	Application of Operations Research Methods in Logistics Alena Rybi ková, Josef Volek Alena Rybi ková (Gar.)	Z,ZK	3	2P+1C	L	Р

Characteristics of the courses of this group of Study Plan: Code=2.S.NPSC VYB 20/21 Name=2.s.nav.prez 20/21 výb r p edm tu - program SC

16SHMI	Simulation and HMI	Z,ZK	3
Simulation for the syste	ms in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graph	hics for ITS. Simul	ation theory with
application of computin	g 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.		
17AMOL	Application of Operations Research Methods in Logistics	Z,ZK	3
Exact, heuristic, metahe	uristic methods. Static and dynamic shortest path problem. Location analysis, P&R/K&R facilities location. Travelling s	salesman problem	with constraints.
Assignment problem ar	d matching algorithms. Decision making in urban transport. Design of urban transport lines. Scheduling in public transport.		

Name of the block: Compulsory elective courses Minimal number of credits of the block: 2 The role of the block: PV

Code of the group: 1.S.NPSC FA 20/21 Name of the group: 1.s.nav.prez (od) 20/21 - program SC - p edm ty z FA Requirement credits in the group: In this group you have to gain at least 2 credits (at most 7) Requirement courses in the group: In this group you have to complete at least 1 course (at most 3) 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
500EKL3	Ecology III - Social Ecology Petr Klápšt Petr Klápšt (Gar.)	KZ	2	2P+0C	Z	PV
500U3	Urbanism III - Theory	ZK	2	1P+1C	Z	PV
555UP1	Planning 1 - Urban Planning Petr Klápšt , Jakub Vorel, Karel Maier Jakub Vorel Jakub Vorel (Gar.)	ZK	3	2P+1C	Z	PV

Characteristics of the courses of this group of Study Plan: Code=1.S.NPSC FA 20/21 Name=1.s.nav.prez (od) 20/21 - program SC p edm ty z FA

500EKL3	Ecology III - Social Ecology	KZ	2
Social Ecology: The sub	ject deals with the relationship of man and the environment in landscape and settlements. It acquaints students with selecte	d methods of soci	io-ecological
research and participati	on of citizens in the formation of the rural environment, the city and its socio-spatial structure. The theoretical part of the subj	ject is based on c	oncrete practical
examples, which are pro	pressed by the students and present them during the semester.		
500U3	Urbanism III - Theory	ZK	2
The course introduces t	he student to the most important urban theories and ways of thinking about the city from the 19th century to the present. In l	ectures and semi	nars, the student
is led to think critically ir	n order to be able to analyze, evaluate, compare and recognize the practical effects of these theories on the development of	European cities.	
555UP1	Planning 1 - Urban Planning	ZK	3
In the course of Urban F	Planning I, we teach students on how the cities were planned from ancient times to the present and how discipline itself have	e evolved in the co	ourse of time. By
using the real examples	, we describe urban planning as a complex process with numerous feedbacks that evolves in time and involves various actors	with different value	ues and interests
and resources. The cour	rse presents general principles and concepts of European spatial planning and planning system in the Czech Republic provid	ding students with	practical insight
into relevant planning do	ocuments, legislation and institutions. Special lectures focus on actual topics: planning of urban ecosystems and participatory p	lanning. At the end	d of the semester
students will be evaluate	ed based on the presentation and discussion of their seminar work via TEAMS or in classroom. In their seminar works students	will analyse and o	critically evaluate
selected case of plannir	ng process in one of the following domains: Urban mobility, Housing, Public services, Ecosystems, Economic activities, Cultu	ral heritage.	

List of courses of this pass:

Code	Name of the course	Completion	Credits
11MAI	ITS Mathematical Tools	Z,ZK	4
Series, Fourier S	ereies. Discrete Fourier Transform. Segmentation of signals, windows, localization. Short-term Fourier Transform. From Fourier Analys	sis to PDE. Fundan	nentals of
N	umerical Mathematics. Numerical solutions to ODEs and PDEs. Continuous traffic flow models described by PDE. Car-following mod	els as ODEs.	
11MMAD	Mathematical Methods for Data Analysis	Z,ZK	6
Stocasti	c modelling, estimation, prediction, filtration, control, methods of data analysis: k-means, DBSCAN, naive Bayes, decision trees, supp	ort vector machine	э.
11SMCD	Smart Cities Design	Z,ZK	6
Introduction to sma	rt cities, systém analysis and design fundamentals, usage of UML for system design, principles of complex systems, modeling using	multiagent system	is in the SW
	environment AnyLogic, application on a small scale real world problem.		
	T : 4		
11XN1C	Thesis 1	Z	4
11XN1C 11XN2C	Thesis 1 Thesis 2	Z Z	4
		Z Z Z,ZK	4 4 3
11XN2C 12TDP	Thesis 2	1 '	4
11XN2C 12TDP Mobility and associ	Thesis 2 Traffic Flow Theory	d applications of m	4 3 athematical

		_	
12XN1C	Thesis 1	Z	4
12XN2C	Thesis 2	Z	4
14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3
-	ends in telecommunications systems applied in cyber infrastructure, technical, economical and legal aspects of telecommunications r	-	
provisioning, identif	ication and quantification of hiererchical telecommunications networks and services performance, telecommunication services dedicate	ed for transport and	specifically
140170	Smart Cities solutions.	7 71/	6
14CITS	C-ITS Systems n of C-ITS systems architecture, description of use-cases - urban and rural applications, principles of C-ITS funcionality with focus on	Z,ZK	6 AM DENM
	urity architecture. Status guo and modern trends of wireless telecommunication solutions ITS-G5 and LTE-V and description of its pro-		
,	will also cover signal processing.		
14FCL	Future Cities Laboratory	KZ	3
	em architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireless	telco solutions de	dicated for
C-ITS systems (ITS	-G5, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters as	sessment, technica	al properties
	evaluaiton, methods of data collection and processing.		
14MIM	Microsimulation Models	KZ	3
-	e of traffic modeling and simulation will be broaded by the application of traffic control algorithms to traffic microsimulation models use		
example, the propos	sal of algorithms for actuated signal control, pedestrian preference, dynamic network routing, road line traffic control, crossing security e	equipment, and PT	preterence.
14PAM	Algorithms will be designed, applied, and tested by students themselves.	Z.ZK	4
	Programming and modelling gramming, dynamic memory allocation, inheritage, generic programming, STL, abstract data types, programming techniques, recursi	,	
	n in nature and in real systems, paralel computer systems, paralel programming, discrete simulation, models of processes, model ty		
grammare, parane	of analytical sources for modelling, BPMN language, SW Bizagi, model creation and life cycle.		acquicition
14PD	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, i		-
presenting the resu	Its of analyses. In advanced methods, students will also perform specific analysis using Bayesian networks. Students will then indepe	endently perform d	ata analysis
	on data from existing open systems.		
14PPRP	Computer Aided Project Management	KZ	2
	ect? The basic terms a concepts of project management. Life cycle of the project and its phased approach. Analysis and specification	-	
definition, stage	s, objectives and measurability. Risk events and risk planning. Project change management during implementation. Preparation of th	e project outline (a	ictivities,
14XN1C	restrictions, assignments, calendars etc.) Project planning and optimization - time, resources. Thesis 1	Z	1
			4
14XN2C	Thesis 2	Z	4
15XN1C	Thesis 1	<u>Z</u>	4
15XN2C	Thesis 2	Z	4
16DITS	Vehicles within ITS	Z,ZK	4
-	whicle with focus on its use and function in frame of ITS. User requirement analyses. Economic aspects. Process of constructions in a I structure of the designed object. Creation of functional models. Energy management and storages for ground vehicles, energy trans		
	one. Propulsion systems / traditional and alternative ones. Life-cycle analysis.		
16ESDP	Electronic systems in modern vehicles	Z,ZK	3
	le systems, electromobility, V2I and V2V, autonomous driving. Combustion engine control and electronic control units. Electric propuls	,	
characteristics a	nd control. Management of hybrid propulsion for attaining its optimal efficiency. Vehicle communication bus (CAN, LIN, FlexRay etc.).	Safety, communic	ation and
	comfort electronic vehicle systems. Practical exercises with real and simulated systems.		
16KSD	Quality and reliability in area of transportation means and systems	Z,ZK	3
-	ed for design, manufacturing and operation. Methods QFD, DFM, DFA, DFS. Longtime testing. FMEA method. Operation reliability. M		
process design and	d quality improvement (Six Sigma etc.). Certification and accreditation, quality management, tools and methods for quality stabilizatio	n and improvemer	nt. Students
4001114	will work on real problems in the QFD laboratory.	7 71/	0
16SHMI	Simulation and HMI ystems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphics	Z,ZK	3
	buting equipment. Creating computing models. Mechanic and dynamic systems and their mathematical models. Simulation of vehicle		
	particular. Virtual reality systems.	aynamico, en lane	ournage in
16XN1C	Thesis 1	Z	4
16XN2C	Thesis 2	Z	4
17AMOL	Application of Operations Research Methods in Logistics	Z,ZK	3
	taheuristic methods. Static and dynamic shortest path problem. Location analysis, P&R/K&R facilities location. Travelling sales		-
A	ssignment problem and matching algorithms. Decision making in urban transport. Design of urban transport lines. Scheduling in public	lic transport.	
17PJMG	Project Management	KZ	2
Basic terms of the	project management, project management standards, organizational structures and processess in the project management, life-cycl	e of the project, ris	sk analysis,
	projects in transport and transport infrastructure and their specifics, feasibility study and CBA, project evaluation, PPP project		
17SCAR	Sustainable Cities and Regions	Z,ZK	3
Cities in antiquity	and in the middle ages, renaissance ideal of a perfect city, 19. and 20. century cities, modern city planning, sustainability as a conce	pt, historical devel	opment of
47005	transportation in cities, modern transportation systems, logistics as a concept, supply chain, logistics center, city logistics.	7 71/	
17SCF	Smart Cities Fundamentals	Z,ZK	6 on mothods
-	components will be described (intelligent transport systems, smart grids, smart buildings, smart lighting, e-governance, etc.) together international standards to achieve the synergies among different sectors. The quality of life for different city residents is understood a	-	
17SU	Smart Urbanism	Z,ZK	6
	and ecology, urban morphology and land use, urban society: demography, mobility, social transtition, urban space and places, urban		
	of technology innovations on urban transition.	,	J. 1

and one reflect will be	choology will be described through performance parameters like safety, reliability, integrity, continuity, etc. New business models of tech		
and operation will b	e introduced to provide advanced deployment decision-making. Legal aspects of technologies' assessment (e.g. GDPR) will be presen	ted for selecte	d applicatio
	areas.	7	4
17XN1C	Thesis 1	<u>Z</u>	4
17XN2C	Thesis 2	Z	4
18XN1C	Thesis 1	Z	4
18XN2C	Thesis 2	Z	4
20AIMI	Application of ITS in Urban Engineering	Z,ZK	6
he 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 sp	ace, conc
of public space sol	utions, design of systems for traffic and transport telematics management, coordination of transport modes - automobil, pedestrian, MI	HD, cyclo, mod	es etc. Ne
	approaches to the development of Smart and green approaches Promoting into Public.		
20BITS	Safety and reliability of ITS Systems	ΚZ	3
-	s of safety and reliability in the job and application. Basic schema and types of diagnostic systems including reliability diagnostics of tec		
Investigation of acc	eptability and reliability prediction, traffic crity and sensitivity analysis. Neural Networks and other optimization algorithms and ETA, FM	IEA failure ana	lysis. HMI
	traffic including operator testing on simulator and in real-world situatiation		
20GINS	Geographical, information, localization and navigation systems	Z,ZK	6
	alized in problems of work with applications of geographic information systems with special attention to the specialization in the field of transplant of the specialization of		
t introduces studen	ts to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitization of the storage models of the storage mode	on methods, a	nd a numb
· · - · · · · ·	of other GIS related technologies such as problem mapping, webmap, etc.		
20HEI	Evaluation and Economics of ITS	KZ	3
	ect is devoted to the basics of system approach to development of ITS architecture and fundamentals in the field of economic attributes c		
of ITS. Subsequent	tly, the basic principles of system and application creation in the technical field are discussed, defining the penetration of the technical	solution into th	e econom
	The subject is terminated by a detailed breakdown of case studies.		
20ITSR	ITS - R	Z,ZK	3
	s devoted to description of the architecture and interface of the system with the ITS-R concept, the communication interface of the system is the LOTAGE OPTICE of the system of the sys		
inctional and secur	ity features are defined. The principles of ERTMS / ETCS application level 3, UGTMS, CBTC are discussed in detail. Current and future c	communication	technolog
	are described.		
20MZZ	Modern techniques of safety control of moving railway vehicles	Z,ZK	3
	oncepts, ETCS architecture and interface descriptions, ERTMS system level, infrastructure and mobile part of the system, linking to sta	-	
perating and applic	cation modes of the system, infrastructure orientation, interface (DMI), integration of the ETCS mobile part into the driving vehicle, GSN	/I-R functional	specificati
	testing and legislation.		-
20PRZP	Computer aided railway traffic control	Z,ZK	3
	roted to clarifying the reasons and basic principles of automation of the management of railway transport. It explains the structure of rail	-	-
	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of	-	-
ncluding the main p	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies.	the system, w	nich must
ncluding the main p	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering	the system, where the system and the	nich must
ncluding the main p	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of	the system, where the system and the system and the system and the selected type of type of t	hich must
ncluding the main p	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic material to the strategy connection to science-based methodological basics of transport, strategic thinking processes, strategic material to the strategy connection to science based methodological basics of transport, strategic thinking processes, strategic material to the strategy connection to science based methodological basics of transport, strategic thinking processes, strategic material to the strategy connection to science based methodological basics of transport, strategic thinking processes, strategic thinking processes, strategic thinking processes, strategic thinking processes at the strategy connection to science based methodological basics of transport, strategic thinking processes, strategic thinking processes, strategic thinking processes at the strategy connection to science based methodological basics of transport, strategic thinking processes, strategic thinking processes, strategic thinking processes at the strategy connection to science based methodological basics of transport, strategic thinking processes at the strategy connection to science based methodological basics of transport, strategic thinking processes at the strategy connection to science based methodological based bas based based based based based based based based	the system, where the system and the system and the system and the selected type of type of t	hich must
ncluding the main p 20SYIN Enhanced system o engineering tasks, c	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic of of sustainable development.	the system, where the system, where system, where the system of selected type an agement system of selected type an agement system of selected type and sele	hich must 6 s of syste stem, cont
20SYIN Enhanced system of engineering tasks, of 20TSJ	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic ma of sustainable development. Telematic systems and their design	the system, where a system is a system where a system is a system of selected type an agement system of z,ZK	6 bes of syste stem, cont
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr	the system, with z,ZK of selected type anagement system Z,ZK affic managem	hich must
20SYIN Enhanced system of engineering tasks, of 20TSJ Gradual detaile 20TVHD	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, transport Telematics in Public Transport	the system, with z,ZK of selected type anagement system Z,ZK affic managem Z,ZK	hich must
20SYIN Enhanced system of engineering tasks, of 20TSJ Gradual detaile 20TVHD	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering genering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. genering Telematic systems and their design genering d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, transport Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport generation	the system, with z,ZK of selected type anagement system Z,ZK affic managem Z,ZK	hich must
According the main provide the main providet the main provide the main provide the main pro	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of befinition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic ma of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Tra- position monitoring; legislative framework; standardization, certification and interoperability.	the system, with z,ZK of selected type anagement system Z,ZK affic managem Z,ZK ansport prefere	hich must
ACLUDING THE MAIN P 20SYIN Enhanced system of angineering tasks, of 20TSJ Gradual detaile 20TVHD	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering genering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. genering Telematic systems and their design genering d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, transport Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport generation	the system, with a system, with a system, with a system, with a system anagement system anagement system Z,ZK anagement a system a system anagement a system a sy	hich must
According the main provide the main providet the main provide the main provide the main pro	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of befinition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic ma of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Tra- position monitoring; legislative framework; standardization, certification and interoperability.	the system, with a system, with a system, with a system, with a system and a system	hich must
And the main provide the main providet the main provide the main provide the main provide the main provide the main providet the main pr	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic management. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Tra- position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1	the system, with z,ZK of selected type anagement system Z,ZK affic managem Z,ZK ansport prefere Z	hich must 6 ss of syste tem, cont 6 ent, etc. 3 nces; veh
And the main provide the main providet the main provide the main provide the main provide the main providet the main p	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 1	the system, with a system, with a system, with a system, with a system and a system	hich must 6 ss of syste tem, cont 6 eent, etc. 3 nces; veh 4 4
According the main producting the main product of the main product	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic ma of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Tra- position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 1 Thesis 2	the system, with a system, with a system, with a system, with a system and a system	anich must anich must bis of system anich must anich must <t< td=""></t<>
20SYIN 20SYIN Enhanced system of a syst	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Tra- position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1	the system, with a system, with a system, with a system, with a system and a system	hich must 6 is of syste istem, cont 6 ient, etc. 3 nces; veh 4 4 4 4 4 4
20SYIN 20SYIN Enhanced system of a syst	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering generating definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design generation of substems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Tation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 2	the system, with a system, with a system, with a system, with a system and a system a	A A
According the main provide the main providet the main provide the main provide the main pro	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 3	the system, with a system, with a system, with a system, with a system and a system a	A A
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; vehicle weighing, fleet management, transport soft individual experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information and interoperability. Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 3 Thesis 4 Thesis 4	the system, with a system, with a system, with a system, with a system and a system a	A A
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic main of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; vehicle weighing, fleet management, transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 State structures; clearing; Public Transport	the system, where system, where system, where system, where system is a system of the	A B B <t< td=""></t<>
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of a sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tration systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport ation system; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 3 Thesis 4 Thesis 1 Thesis 1 <td>the system, where system, where system, where system, where system is a system of the system of the</td> <td>A B B B B <t< td=""></t<></td>	the system, where system, where system, where system, where system is a system of the	A B B B B <t< td=""></t<>
20SYIN Enhanced system of ingineering tasks, of 20TSJ Gradual detaile 20TVHD icketing and inform 20XN1C 20XN2C 21XN1C 21XN2C 21XN1C 22XN1C 22XN1C 22XN2C 23TBSS The course focuse sens	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of sustainable development. of sustainable development. Telematic systems and their design data structures; clearing; Public Transport data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Technology and Security of Sensor Networks sensor Networks, sensors of electrical and non-electric for connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2	the system, where system, where system, where system, where system is a system of the selected type an agement system and	A B B <t< td=""></t<>
20SYIN Enhanced system of ngineering tasks, of 20TSJ Gradual detailer 20TVHD icketing and inform 20XN1C 20XN2C 21XN1C 21XN2C 21XN1C 22XN1C 22XN1C 22XN2C 23TBSS The course focuse sens 23XN1C	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of a sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tration systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport ation system; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 3 Thesis 4 Thesis 1 Thesis 1 <td>the system, where system, where system, where system, where system is a system of the system of the</td> <td>A A</td>	the system, where system, where system, where system, where system is a system of the	A A
According the main producting the main production of the main product of the main prod	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of sustainable development. of sustainable development. Telematic systems and their design data structures; clearing; Public Transport data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Technology and Security of Sensor Networks sensor Networks, sensors of electrical and non-electric for connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2	the system, where system, where system, where system, where system is a system of selected type an agement system and sys	A A <t< td=""></t<>
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of sustainable development. of sustainable development. Telematic systems and their design Idenatics systems in modes of transport, strategic thinking processes, strategic margement, transports, store in the systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Italian systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Technology and Security of Sensor Networks sensor networks, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2 Thesis 1 Thesis 1 Thesis 1 Technology and Security of Sensor Networks and non-electric for connection, communication technology for sensor networks. Principles of sensor networks, sensors of electrical and non-electric for connection, communication technology for sensor networks, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2 Thesis 1 Thesis 1	the system, where system, where system, where system, where system is a system of selected type an agement system an agement system an agement system and system an agement sy	A B Colorization
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement of sustainable development. definition of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic ma of sustainable development. Telematic systems and their design danalysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, transport reprint experiences; vehicle technology, dispatching systems; Information Systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology, dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Set on the safety of data collection in new areas of sensor networks. SigFox, LoRa, NB-IoT, IoT technology and Sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 <td>the system, where system, where system, where system, where system is a system of selected type an agement system an agement system an agement system and system an agement sy</td> <td>A B Colorization</td>	the system, where system, where system, where system, where system is a system of selected type an agement system an agement system an agement system and system an agement sy	A B Colorization
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of sustainable development. Telematic systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; information Systems; data structures; clearing; Public Tresposition monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 1 Thesis 1 <td>the system, where system, where system, where system, where system is a system of selected type an agement system an agement system an agement system and system an agement sy</td> <td>A B Colorization</td>	the system, where system, where system, where system, where system is a system of selected type an agement system an agement system an agement system and system an agement sy	A B Colorization
Acceleration of the main producting the main product of the main p	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of system strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic methodological basics of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, trafeore systems; foreinght experiences; vehicle technology; dispatching system; Information Systems; data structures; clearing; Public Trapport position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Technology and Security of Sensor Networks sensor of electrical and non-electric for connection, communication technology for sensor networks, SigFox, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2 Ecology III - Social Ecology e subject deals with the relationship of man and the environment, the city and its socio-spatial structure. The theoretical part of the subject de termino of the rural environment, the city and its socio-spatial structure. The theoretical part of the subject de termino method sensor processed by the students and present them during the semester.	the system, where system, where system, where system, where system is a system of selected type an agement system an age	A B Colorized Colorized Colorized Colorized A A A A A A B Colorized Colorized Colorized A A
And the main provide the main providet the main provide the main provide the main provide t	brinciples applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering	the system, where system, where system, where system, where system is a system of the system of the system of the system, where shares are system of the system, where shares are system of the system, where system	A B Colorization Colorization <t< td=""></t<>
And the main provide th	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of systems strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic main of systems strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic main of systems and their design d analysis of individual existing telematics systems in modes of transport atton systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 3 Thesis 2 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 3 Thesis 1 Thesis 2 Thesis 2 Thesis 2	the system, where system, where system, where system, where system is a system of the system of the system of the system, where shares are system of the system, where shares are system of the system, where system	A A B A Constant C
And the main provide th	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of sustainable development. Telematics systems and their design d analysis of individual existing telematics systems in modes of transport, such as toll systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Technology and Security of Sensor Networks, sensors of electrical and non-electric or connection, communication technology for sensor networks, Sifex, LoRa, NB-IoT, IoT technology and SmartCity. Trends in IoT and Thesis 2 Thesis 2 Ecology III - Social Ecology e subject deals with the relationship of man and the environment, in andscape and settlements. It acquaints students with selected me pation of citizens in the formation of the invalue of the individual component in and the environment, the city and its socio-spatial structure. The theoretical part of the subject is examples, which are processed by the students and present them during the semester. Urbanism III - Theory Planning 1 - Urban Planning	the system, where system, where system, where system, where system is a system of the	A B A B <t< td=""></t<>
20SYIN Enhanced system of ngineering tasks, or 20TSJ Gradual detaile 20TVHD icketing and inform 20XN1C 20XN1C 20XN1C 21XN1C 21XN1C 23TBSS The course focuse sens 23XN1C 23XN1C 500EKL3 Social Ecology: Trasearch and partici 500U3 he course introduction is led to thin 555UP1 n the course of Urb	principles applied in the management of railway traffic. The main part is devoted to detailed description of the individual components of included in the systems for automation of railway traffic control using computer technologies. System Engineering definition in engineering tasks, specification of selected system types against related tools of system analysis and design, refinement or of systems strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic main of systems strategy, connection to science-based methodological basics of transport, strategic thinking processes, strategic main of systems and their design d analysis of individual existing telematics systems in modes of transport atton systems, vehicle weighing, fleet management, tr Telematics in Public Transport ation systems; foreinght experiences; vehicle technology; dispatching systems; Information Systems; data structures; clearing; Public Transport position monitoring; legislative framework; standardization, certification and interoperability. Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 3 Thesis 2 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 2 Thesis 3 Thesis 1 Thesis 2 Thesis 2 Thesis 2	the system, where system, where system, where system, where system is a system of the	A B B B B B B B B B B B <td< td=""></td<>

students will be evaluated based on the presentation and discussion of their seminar work via TEAMS or in classroom. In their seminar works students will analyse and critically evaluate selected case of planning process in one of the following domains: Urban mobility, Housing, Public services, Ecosystems, Economic activities, Cultural heritage.

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2024-05-21, time 14:14.