Study plan

Name of study plan: navaz. mag. PRE program SC 20/21 (pro studenty studující všechny p edm ty 1. a 2.sem. na VUT)

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	4
12XN1C	Thesis 1	Z	4
14XN1C	Thesis 1	Z	4
15XN1C	Thesis 1	Z	4
16XN1C	Thesis 1	Z	4
17XN1C	Thesis 1	Z	4
18XN1C	Thesis 1	Z	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 20/21

Name of the group: 1.s.nav.prez 20/21 - program SC (studium všech p edm t na VUT) Requirement credits in the group: In this group you have to gain 24 credits Requirement courses in the group: In this group you have to complete 4 courses Credits in the group: 24 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
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	Ρ

Characteristics of the courses of this group of Study Plan: Code=1.S.NPSC 20/21 Name=1.s.nav.prez 20/21 - program SC (studium všech p edm t na VUT)

vocon p cum t i			
17SCF	Smart Cities Fundamentals	Z,ZK	6
The main smart city cor	nponents will be described (intelligent transport systems, smart grids, smart buildings, smart lighting, e-governance, etc.) toge	ther with their inte	gration methods
by using existing internation	ational standards to achieve the synergies among different sectors. The quality of life for different city residents is understood	as the main crite	rial function.
17TSC	Technologies for Smart Cities	Z,ZK	6
Each presented techno	logy will be described through performance parameters like safety, reliability, integrity, continuity, etc. New business models o	, f technologies' im	plementation
and operation will be in	troduced to provide advanced deployment decision-making. Legal aspects of technologies' assessment (e.g. GDPR) will be p	presented for sele	cted application
areas.			
20AIMI	Application of ITS in Urban Engineering	Z,ZK	6
The course focuses ma	inly on the issue of the installation of engineering networks in the area, coordination of engineering activities in the area, organi	zation of the publi	c space, concept
of public space solution	s, design of systems for traffic and transport telematics management, coordination of transport modes - automobil, pedestria	in, MHD, cyclo, m	odes 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 specialize	d in problems of work with applications of geographic information systems with special attention to the specialization in the field o	f transport and tel	ecommunication.
It introduces students to	o geographic data management practices and tools, real world modeling, geographic data storage models, data entry and dig	gitization methods	, and a number
of other GIS related tec	hnologies such as problem mapping, webmap, etc.		

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

Name of the group: 2.s.nav.prez 20/21 - program SC (studium všech p edm t na VUT)

Requirement credits in the group: In this group you have to gain 23 credits Requirement courses in the group: In this group you have to complete 6 courses Credits in the group: 23 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
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
14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3	2P+1C	L	Р
17SCAR	Sustainable Cities and Regions	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 20/21 Name=2.s.nav.prez 20/21 - program SC (studium všech p edm t na VUT)

11SMCD	Smart Cities Design	Z,ZK	6
Introduction to smart cit	ies, 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.		
14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3
Status quo and trends i	n telecommunications systems applied in cyber infrastructure, technical, economical and legal aspects of telecommunication	s networks desig	n and services
provisioning, identification	on and quantification of hiererchical telecommunications networks and services performance, telecommunication services dedi	cated for transpor	rt and specifically
Smart Cities solutions.			
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 con-	cept, historical de	velopment of
transportation in cities,	modern transportation systems, logistics as a concept, supply chain, logistics center, city logistics.		
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, teo	hnical properties
evaluaiton, methods of	data collection and processing.		
17PJMG	Project Management	KZ	2
Basic terms of the proje	ct management, project management standards, organizational structures and processess in the project management, life-c	ycle of the project	t, risk analysis,
projects in transport and	d transport infrastructure and their specifics, feasibility study and CBA, project evaluation, PPP projects.		

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:

Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Code Completion Credits Scope Semester Role members) Tutors, authors and guarantors (gar.) Simulation and HMI 16SHMI Z,ZK 3 2P+1C L Р Stanislav Novotný, Tereza Kunclová, Michal Cenkner Application of Operations Research Methods in Logistics 17AMOL Z,ZK 3 2P+1C L Р Alena Rybi ková, Josef Volek Alena Rybi ková (Gar.)

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 grapi	nics 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	alesman 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 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.)	КZ	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 tv z FA

500EKL3	Ecology III - Social Ecology	KZ	2
Social Ecology: The si	bject deals with the relationship of man and the environment in landscape and settlements. It acquaints students with selecte	d methods of soci	o-ecological
research and participa	tion 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 co	oncrete practical
examples, which are p	rocessed by the students and present them during the semester.		
500U3	Urbanism III - Theory	ZK	2
The course introduces	the student to the most important urban theories and ways of thinking about the city from the 19th century to the present. In I	ectures and semir	nars, the student
is led to think critically	in 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 Urbar	Planning I, we teach students on how the cities were planned from ancient times to the present and how discipline itself have	evolved in the co	urse of time. By
using the real example	s, we describe urban planning as a complex process with numerous feedbacks that evolves in time and involves various actors	with different valu	les and interests
and resources. The co	urse presents general principles and concepts of European spatial planning and planning system in the Czech Republic provi	ding students with	practical insight
into relevant planning	locuments, legislation and institutions. Special lectures focus on actual topics: planning of urban ecosystems and participatory p	lanning. At the end	l of the semester
students will be evalua	ted based on the presentation and discussion of their seminar work via TEAMS or in classroom. In their seminar works students	will analyse and c	ritically evaluate
selected case of planr	ing process in one of the following domains: Urban mobility, Housing, Public services, Ecosystems, Economic activities, Cultu	ral heritage.	

List of courses of this pass:

	Name of the course	Completion	Credits
11SMCD	Smart Cities Design	Z,ZK	6
Introduction to smart	cities, systém analysis and design fundamentals, usage of UML for system design, principles of complex systems, modeling using	g multiagent system	is in the SW
	environment AnyLogic, application on a small scale real world problem.		
11XN1C	Thesis 1	Z	4
11XN2C	Thesis 2	Z	4
12XN1C	Thesis 1	Z	4
12XN2C	Thesis 2	Z	4
14CISC	Cyber Infrastructure for Smart Cities	Z,ZK	3
Status quo and trend	ds in telecommunications systems applied in cyber infrastructure, technical, economical and legal aspects of telecommunications	networks design ar	nd services
provisioning, identifica	ation and quantification of hiererchical telecommunications networks and services performance, telecommunication services dedica	ted for transport and	d specificall
	Smart Cities solutions.		
14FCL	Future Cities Laboratory	KZ	3
	Future Cities Laboratory a architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles	1	-
Future cities system		s telco solutions de	dicated for
Future cities system	architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles	s telco solutions de	dicated for
Future cities system	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 55, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a	s telco solutions de	dicated for
Future cities system C-ITS systems (ITS-G	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 35, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing.	s telco solutions de ssessment, technica	dicated for al properties
Future cities system C-ITS systems (ITS-G 14XN1C	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 35, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1	s telco solutions de ssessment, technica	dicated for al properties
Future cities system C-ITS systems (ITS-G 14XN1C 14XN2C	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 35, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1 Thesis 2	s telco solutions de ssessment, technica Z Z	dicated for al propertie 4 4
Future cities system C-ITS systems (ITS-C 14XN1C 14XN2C 15XN1C	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 65, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1 Thesis 2 Thesis 1	z telco solutions de ssessment, technica Z Z Z	dicated for al properties 4 4 4
Future cities system C-ITS systems (ITS-C 14XN1C 14XN2C 15XN1C 15XN2C 16SHMI	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 65, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1 Thesis 2 Thesis 1 Thesis 2	z z z z z z z z z z z z z z z z z	dicated for al properties 4 4 4 4 3
Future cities system C-ITS systems (ITS-C 14XN1C 14XN2C 15XN1C 15XN2C 16SHMI Simulation for the sys	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 55, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1 Thesis 2 Thesis 2 Thesis 2 Simulation and HMI	z z z z z z z z z z z z z z z z z z z	dicated for al properties 4 4 4 4 3 o theory with
Future cities system C-ITS systems (ITS-C 14XN1C 14XN2C 15XN1C 15XN2C 16SHMI Simulation for the sys	n architecture (with focus on C-ITS) and reference projects, functional and technology solutions description and principles, wireles 55, LTE-V, etc.), security architecture, data security and personal data protection, testing of the systems and functional parameters a evaluaiton, methods of data collection and processing. Thesis 1 Thesis 2 Thesis 2 Simulation and HMI tems in transportation and vehicle systems. User interface, HMI (human-machine interaction), virtual reality and computer graphic	z z z z z z z z z z z z z z z z z z z	dicated for al properties 4 4 4 4 3 o theory with

17AMOL	Thesis 2	Z	4
TANIUL	Application of Operations Research Methods in Logistics	Z,ZK	3
Exact, heuristic, m	etaheuristic methods. Static and dynamic shortest path problem. Location analysis, P&R/K&R facilities location. Travelling sales	man problem with	o constraints.
	Assignment problem and matching algorithms. Decision making in urban transport. Design of urban transport lines. Scheduling in publi	c transport.	
17PJMG	Project Management	KZ	2
Basic terms of th	e project management, project management standards, organizational structures and processess in the project management, life-cycle projects in transport and transport infrastructure and their specifics, feasibility study and CBA, project evaluation, PPP project		sk analysis,
17SCAR	Sustainable Cities and Regions	Z,ZK	3
Cities in antiquit	y and in the middle ages, renaissance ideal of a perfect city, 19. and 20. century cities, modern city planning, sustainability as a concer	ot, historical deve	lopment of
	transportation in cities, modern transportation systems, logistics as a concept, supply chain, logistics center, city logistics.		
17SCF	Smart Cities Fundamentals	Z,ZK	6
The main smart ci	y components will be described (intelligent transport systems, smart grids, smart buildings, smart lighting, e-governance, etc.) together	with their integra	tion methods
by using existing	g international standards to achieve the synergies among different sectors. The quality of life for different city residents is understood as	s the main criteria	al function.
17SU	Smart Urbanism	Z,ZK	6
Jrban metabolism	and ecology, urban morphology and land use, urban society: demography, mobility, social transtition, urban space and places, urban f of technology innovations on urban transition.	lows, urban mod	eling, impact
17TSC	Technologies for Smart Cities	Z,ZK	6
•	technology will be described through performance parameters like safety, reliability, integrity, continuity, etc. New business models of technologies assessment (e.g. GDPR) will be presented by areas.		
17XN1C	Thesis 1	Z	4
17XN2C	Thesis 2	Z	4
18XN1C	Thesis 1	Z	4
18XN2C	Thesis 2	Z	4
		Z,ZK	6
20AIMI	Application of ITS in Urban Engineering s mainly on the issue of the installation of engineering networks in the area, coordination of engineering activities in the area, organizatio		-
	solutions, design of systems for traffic and transport telematics management, coordination of transport modes - automobil, pedestrian, I approaches to the development of Smart and green approaches Promoting into Public.		
	approaches to the development of email and grown approaches i remeaning into i abien		
20GINS	Geographical, information, localization and navigation systems	Z,ZK	6
The subject is spe	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of tran	nsport and telecor	nmunication.
The subject is spe	Geographical, information, localization and navigation systems	nsport and telecor	nmunication.
The subject is spe	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize	nsport and telecor	nmunication.
The subject is spe It introduces stud	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc.	nsport and telecon ation methods, ar	mmunication. nd a number
The subject is specific terms of the subject is specific terms of the second se	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1	nsport and telecon ation methods, ar Z	nmunication. nd a number
The subject is specific terms of the subject is specific terms of the second structure study of the second structure	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1 Thesis 2 Thesis 1	nsport and telecon ation methods, ar Z Z	nmunication. nd a number
The subject is spe- It introduces stud 20XN1C 20XN2C 21XN1C 21XN2C	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2	Ansport and telecon tation methods, and Z Z Z Z Z	a number 4 4 4 4 4 4
The subject is spe- It introduces stud 20XN1C 20XN2C 21XN1C 21XN2C 22XN1C	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1 Thesis 2 Thesis 1 Thesis 1 Thesis 2 Thesis 1 Thesis 1	Ansport and telecon ation methods, an Z Z Z Z Z Z Z	nmunication. nd a number 4 4 4 4 4 4 4
The subject is specific terms of the subject is specific terms of the study of the study of the subject is specific terms of t	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 2 Thesis 3 Thesis 4	Asport and telecon ation methods, and Z Z Z Z Z Z Z Z	A number 4 4 4 4 4 4 4 4 4 4
The subject is specific terms of the subject is specific terms of the second structure of the second s	Geographical, information, localization and navigation systems cialized in problems of work with applications of geographic information systems with special attention to the specialization in the field of trar ents to geographic data management practices and tools, real world modeling, geographic data storage models, data entry and digitize of other GIS related technologies such as problem mapping, webmap, etc. Thesis 1 Thesis 2 Thesis 1 Thesis 2 Thesis 3 Thesis 4 Thesis 5 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1 Thesis 1	Z Z Z Z Z Z Z Z Z Z Z Z	A number 4 4 4 4 4 4 4 4 4 4 4 4
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