Study plan

Name of study plan: obor Geomatika

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Geomatics
Garantor of the study branch:
Program of study: Geodesy and Cartography
Type of study: Follow-up master full-time
Required credits: 120
Elective courses credits: 0
Sum of credits in the plan: 120
Note on the plan: tento studijní plán platí od nástupu 2015-16

Name of the block: Compulsory courses
Minimal number of credits of the block: 77
The role of the block: Z

Code of the group: NH20150100
Name of the group: obor Geomatika, 1. semestr
Requirement credits in the group: In this group you have to gain 30 credits
Requirement courses in the group: In this group you have to complete at least 5 courses
Credits in the group: 30
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
101NMG	**Numerical Analysis**	Z,ZK	6	2P+2C	L	z
101STG	**Statistics** ***Jana Nosková***	Z,ZK	6	2P+2C	Z	z
155KANE	**Cadastre of Real Estate** ***Karel Benda***	Z,ZK	6	3P+2C		z
155OBJ	**Object Oriented Programming**	ZK	6	3P	Z	z
155TG3	**Theoretical geodesy 3** ***Jan Holešovský***	Z,ZK	6	3P+2C	Z	z

Characteristics of the courses of this group of Study Plan: Code=NH20150100 Name=obor Geomatika, 1. semestr

101NMG	Numerical Analysis	Z,ZK	6
101STG	Statistics	Z,ZK	6
155KANE	Cadastre of Real Estate	Z,ZK	6
History of land registration in the CR. Stable and land cadastre. Land registration and development of title registration. Subject and content of cadastre of real estates. Cadastral information system ISKN. Organisation of surveying agency. Administration and maintenance of cadastre - measurements, calculations, visualisation and documentation. Geometric plan. Setting-out of property boundaries. Legal relations to real estates, cadastral registration.			
155OBJ	Object Oriented Programming	ZK	6
155TG3	Theoretical geodesy 3	Z,ZK	6

Code of the group: NH20150200
Name of the group: obor Geomatika, 2. semestr
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 at least 5 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
101PJS	**Project - Statistics** *Jana Nosková* ***Jana Nosková*** *Jana Nosková (Gar.)*	KZ	5	3C	L	z
128TGS	**Graph Theory** ***Jiří Demel***	Z,ZK	5	2P+2C	Z	z
155DPZE	**Remote Sensing** ***Karel Pavelka***	Z,ZK	4	2P+2C	L	z
155FTG2	**Photogrammetry 2** *Karel Pavelka, Jan Pacina* ***Karel Pavelka*** *Karel Pavelka (Gar.)*	Z,ZK	5	2P+2C	L	z
155TG4	**Theoretical geodesy 4** *Jakub Kostelecký* ***Jakub Kostelecký*** *Jakub Kostelecký (Gar.)*	Z,ZK	5	2P+2C		z

Characteristics of the courses of this group of Study Plan: Code=NH20150200 Name=obor Geomatika, 2. semestr

101PJS	Project - Statistics	KZ	5
128TGS	Graph Theory	Z,ZK	5
Graph theory - basic elements, graph tasks formulations, basic algorithms with recognition of calculation efficiency. Connectivity, strong connectivity, trees, spanning trees, flows in networks, matchings, eulerian trails, hamiltonian paths, independent sets, cliques, coloring, plannar graphs.			
155DPZE	Remote Sensing	Z,ZK	4
Contactless method of earth surface data collection, its physical basis, their understanding, analysis and applications for various purposes			
155FTG2	Photogrammetry 2	Z,ZK	5
* 1. Evaluation with known external orientation parameters * 2. Requirement of complanarity, requirement of zero vertical parallax, numerical determination of external orientation elements - overview * 3. Relative orientation (RO), RO of independent stereo-pairs, RO by image attachment, absolute orientation * 4. Complex solution, etape-solution, bundle adjustment * 5. Image triangulation, use, types * 6. Digital photogrammetry, digital image, principle, scanners, scanning, DPI, accuracy, data quantity * 7. Correlation technique, principle, utilization, automatic searching in raster image * 8. Digital orthophoto, types, interpolation, principle, algorithm, usage, problems * 9. Subpixel transformation * 10. Digital workstations, devices and processing systems * 11. Image transformations, Direct and Indirect methods, reasons to use * 12. Aerial laser scanning, utilization and products in the Czech Republic *13. RPAS methods (drones)			
155TG4	Theoretical geodesy 4	Z,ZK	5
Astronomical coordinate systems. Kepler's and disturbed motion of the satellites. Time learning. Precessions and nutation. Phenomena of the aberration type. Observation methods of cosmic geodesy. Geodetic satellites. Dynamic method of space geodesy. Space coordinate systems. Application to determine the Earth's gravity field parameters. Satellite Earth Observation Missions (CHAMP, GRACE, GOCE).			

Code of the group: NH20150300
Name of the group: obor Geomatika, 3. semestr
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 5 courses
Credits in the group: 23
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
155ADKG	**Algorithms in Digital Cartography and GIS** *Aleš Čepek, Jiří Cajthaml, Tomáš Bayer* ***Tomáš Bayer*** *Tomáš Bayer (Gar.)*	Z,ZK	4	2P+1C	Z	z
155GIT4	**Informatics 4** *Jan Pytel* ***Jan Pytel*** *Jan Pytel (Gar.)*	ZK	5	3P	Z	z
155PRGE	**Project - Theoretical Ggeodesy**	KZ	5	3C	L	z
155UZPD	**Introduction to Image Data Processing** *Martin Landa* ***Martin Landa*** *Martin Landa (Gar.)*	Z,ZK	4	2P+1C	Z	z
155VFG	**Photogrammetry -Project** *Karel Pavelka, Jindřich Hodač* ***Jindřich Hodač*** *Karel Pavelka (Gar.)*	KZ	5	3C	Z	z

Characteristics of the courses of this group of Study Plan: Code=NH20150300 Name=obor Geomatika, 3. semestr

155ADKG	Algorithms in Digital Cartography and GIS	Z,ZK	4
155GIT4	Informatics 4	ZK	5
155PRGE	Project - Theoretical Ggeodesy	KZ	5
155UZPD	Introduction to Image Data Processing	Z,ZK	4
1. Introduction to the problem, specification of OpeGIS Simple Features 2. Spatial relations, 9-crossection model (DE-9IM) 3. Object-relational database model, introduction to PostGIS geodatabase 4. Spatial SQL, data types, indices, functions 5. Advanced technics of spatial SQL 6. Topology of vector data, data models 7, Raster data in object-relational databases and their processing 8. GIS network analyses in object-relational databases 9. Data access, web services, map servers 10.Data publicising, creation of application using data warehouses 11. Set geodatabases, practical applications 12. Distributed, document oriented (NoSQL) databases and their application in geoinformatics 13. Introduction to the problem of BigData processing 13. Úvod do problematiky zpracování velkých dat (BigData)			
155VFG	Photogrammetry -Project	KZ	5
practical documentation of historical objects, technology of documentation and data processing by modern methods			

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 13
The role of the block: S

Code of the group: NH20150200_1
Name of the group: obor Geomatika, povinně volitelné předměty
Requirement credits in the group: In this group you have to gain at least 13 credits
Requirement courses in the group: In this group you have to complete at least 3 courses
Credits in the group: 13
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
128POS	**Computer Networks** ***Jiří Demel***	Z,ZK	4	2P+1C	Z,L	s
128YNAP	**Design and Analysis of Algorithms** ***Jiří Demel***	ZK	3	2P	L	s
155ISZK	**Information System of Surveying and Cadastre in the CR**	Z	2	2P	L	s
155RAIN	**Radio Interferometry**	Z	2	2C	L	s
155YFD	**Photogrammetric Documentation of Historical Buildings and Sites** *Jindřich Hodač* ***Jindřich Hodač***	KZ	4	3C	L	s
155YFSG	**Free Software GIS** ***Martin Landa***	Z,ZK	4	2P+2C	L	s
155YVDD	**Visualization and Distribution of Spatial Data** ***Petr Soukup***	Z,ZK	4	2P+2C	L	s
155YSS1	**Software Seminar 1**	Z	3	2C	L,Z	s
101YAGM	**Applied Geometry** *Hana Lakomá* ***Hana Lakomá*** *Hana Lakomá (Gar.)*	ZK	5	3P+2C	Z	s
102FY2H	**Physics 2** *Antonín Mikš, Jiří Novák* ***Jiří Novák*** *Antonín Mikš (Gar.)*	Z,ZK	4	3P+2C	Z	s
102YLMF	**Lasers and Modern Physics** *Pavel Novák* ***Pavel Novák*** *Pavel Novák (Gar.)*	Z,ZK	3	2P+1C	Z	s
128YKOP	**Combinatorial optimization** *Jiří Demel* ***Jiří Demel*** *Jiří Demel (Gar.)*	ZK	3	2P	Z	s
143YGKH	**GIS in Landscape Engineering** *Josef Krása, Miroslav Bauer* ***Josef Krása*** *Josef Krása (Gar.)*	KZ	3	3C	Z	s
155FTG3	**Photogrammetry 3** *Karel Pavelka, Jindřich Hodač* ***Karel Pavelka*** *Karel Pavelka (Gar.)*	Z,ZK	4	2P+2C	Z	s
155PIN2	**Project - Informatics 2**	KZ	5	3C	Z	s
155YJJ	**Programming Language Java** *Jan Pytel* ***Jan Pytel***	Z,ZK	6	2P+2C	Z	s
155YSS2	**Software Seminar 2**	Z	3	2C	L,Z	s
155ZDDP	**Processing of Remote Sensing Dat** *Martin Landa, Lena Halounová* ***Martin Landa***	Z,ZK	4	2P+2C	Z	s
155KAR3	**Cartography 3** *Jiří Cajthaml, Tomáš Janata* ***Jiří Cajthaml***	Z,ZK	4	2P+2C		s

Characteristics of the courses of this group of Study Plan: Code=NH20150200_1 Name=obor Geomatika, povinně volitelné předměty

128POS	Computer Networks	Z,ZK	4
Computer network architecture. Transmission medium, transmission data encoding. Local area network, medium access management, network interconnections on 2nd and 3rd layers. Protocols IPv4, IPv6, TCP, UDP, ICMP, DNS, http, smtp, pop3. Computer network security, risks, precautions. Authentization, access management, encryption, electronic signature, SSL/TLS.			
128YNAP	Design and Analysis of Algorithms	ZK	3
specification, proof of correctness, time and space complexity. Basic data structures, sorting, selected graph algorithms. P and NP problems.			
155ISZK	Information System of Surveying and Cadastre in the CR	Z	2
155RAIN	Radio Interferometry	Z	2
155YFD	Photogrammetric Documentation of Historical Buildings and Sites	KZ	4
155YFSG	Free Software GIS	Z,ZK	4
Free software in geoinformatics in general. In practical applications is used mainly GRASS GIS. Besides GRASS GIS, also QGIS, uDig, OpenJump, gvSig, libraries GDAL/OGR, Proj.4 or GeoTools are demonstrated during lessons. Geostatistical analysis in GRASS/R, creation of hard-copy output maps using GMT. Storing geodata in relational database management systems - PostGIS. Geodata published on Internet - UMN MapServer, GeoServer, OpenLayers, PyWPS. OGC standards and their implementation. Freely accessible geodata, community project OpenStreetMap.			
155YVDD	Visualization and Distribution of Spatial Data	Z,ZK	4
155YSS1	Software Seminar 1	Z	3
101YAGM	Applied Geometry	ZK	5
102FY2H	Physics 2	Z,ZK	4
Basics of thermodynamics. Electricity and magnetism. Electrostatic field. Magnetic field. Electromagnetic waves.			
102YLMF	Lasers and Modern Physics	Z,ZK	3
Introduction to modern physics. Electromagnetic waves. Diffraction. Interference. Interaction of photons with matter. Sources and detectors of optical radiation. Modern optolelectronic elements (deformable mirrors, active tunable-focus lenses, LC spatial light modulators etc.). Lasers. Applications of lasers.			

128YKOP	Combinatorial optimization	ZK	3
Effective algorithms for solving combinatorial optimization problems. Classification of problems and methods, NP-hard problems, advanced polynomial algorithms, branch and bound method, dynamic programming, heuristics, approximation algorithms, approximation schemes, local search, randomized algorithms, genetic algorithms.			
143YGKH	GIS in Landscape Engineering	KZ	3
Geographical information systems and their use in landscape engineering - basic software components, data management, vector and raster formats. Principles of modeling erosion and transport processes, rainfall runoff processes, landscape management. Influence on landscape stability and quality of natural resources. Preparation of input layers (digital elevation model, map of land use, soils, etc.), data sources management. Remote sensing data application. Seminars will be focused on practical use of GIS Idrisi 32 and ArcGIS.			
155FTG3	Photogrammetry 3	Z,ZK	4
155PIN2	Project - Informatics 2	KZ	5
155YJJ	Programming Language Java	Z,ZK	6
Introduction into basic knowledge of Java language. In the course are also covered topics like servlet technology, design pattern inversion of control and framework Spring.			
155YSS2	Software Seminar 2	Z	3
155ZDDP	Processing of Remote Sensing Dat	Z,ZK	4
155KAR3	Cartography 3	Z,ZK	4

Name of the block: Povinně volitelné předměty, doporučení S1
Minimal number of credits of the block: 30
The role of the block: S1

Code of the group: NH20150400_1
Name of the group: obor Geomatika, diplomová práce
Requirement credits in the group: In this group you have to gain 30 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 30
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
101DPM	**Diploma Thesis** *Jana Nosková, Daniela Jarušková, Michal Beneš, Milan Bořík, Jakub Šolc* ***Iva Malechová*** *Daniela Jarušková (Gar.)*	Z	30	24C	Z	S1
102DPM	**Diploma Thesis** *Pavel Novák, Petr Pokorný, Alexey Sveshnikov* ***Jiří Novák***	Z	30	24C	Z	S1
143DPM	**Diploma Thesis** *Martina Sobotková, David Zumr* ***Petr Koudelka***	Z	30	24C	Z	S1
154DPM	**Diploma Thesis** ***Martin Štroner***	Z	30	24C	Z,L	S1
155DPM	**Diploma Thesis** *Jindřich Hodač, Jan Holešovský, Aleš Čepek, Jiří Cajthaml, Jan Pytel, Zdeněk Vyskočil, Lena Halounová, Tomáš Janata, Petr Souček, ...* ***Jiří Cajthaml***	Z	30	24C	Z,L	S1

Characteristics of the courses of this group of Study Plan: Code=NH20150400_1 Name=obor Geomatika, diplomová práce

101DPM	Diploma Thesis	Z	30
102DPM	Diploma Thesis	Z	30
in accordance with the thesis proposal			
143DPM	Diploma Thesis	Z	30
in accordance with the thesis proposal			
154DPM	Diploma Thesis	Z	30
in accordance with the thesis proposal			
155DPM	Diploma Thesis	Z	30
in accordance with the thesis proposal			

List of courses of this pass:

Code	Name of the course	Completion	Credits
101DPM	Diploma Thesis	Z	30
101NMG	Numerical Analysis	Z,ZK	6
101PJS	Project - Statistics	KZ	5
101STG	Statistics	Z,ZK	6
101YAGM	Applied Geometry	ZK	5

102DPM	Diploma Thesis	Z	30
	in accordance with the thesis proposal		
102FY2H	Physics 2	Z,ZK	4
	Basics of thermodynamics. Electricity and magnetism. Electrostatic field. Magnetic field. Electromagnetic waves.		
102YLMF	Lasers and Modern Physics	Z,ZK	3
	Introduction to modern physics. Electromagnetic waves. Diffraction. Interference. Interaction of photons with matter. Sources and detectors of optical radiation. Modern optolelectronic elements (deformable mirrors, active tunable-focus lenses, LC spatial light modulators etc.). Lasers. Applications of lasers.		
128POS	Computer Networks	Z,ZK	4
	Computer network architecture. Transmission medium, transmission data encoding. Local area network, medium access management, network interconnections on 2nd and 3rd layers. Protocols IPv4, IPv6, TCP, UDP, ICMP, DNS, http, smtp, pop3. Computer network security, risks, precautions. Authentization, access management, encryption, electronic signature, SSL/TLS.		
128TGS	Graph Theory	Z,ZK	5
	Graph theory - basic elements, graph tasks formulations, basic algorithms with recognition of calculation efficiency. Connectivity, strong connectivity, trees, spanning trees, flows in networks, matchings, eulerian trails, hamiltonian paths, independent sets, cliques, coloring, plannar graphs.		
128YKOP	Combinatorial optimization	ZK	3
	Effective algorithms for solving combinatorial optimization problems. Classification of problems and methods, NP-hard problems, advanced polynomial algorithms, branch and bound method, dynamic programming, heuristics, approximation algorithms, approximation schemes, local search, randomized algorithms, genetic algorithms.		
128YNAP	Design and Analysis of Algorithms	ZK	3
	specification, proof of correctness, time and space complexity. Basic data structures, sorting, selected graph algorithms. P and NP problems.		
143DPM	Diploma Thesis	Z	30
	in accordance with the thesis proposal		
143YGKH	GIS in Landscape Engineering	KZ	3
	Geographical information systems and their use in landscape engineering - basic software components, data management, vector and raster formats. Principles of modeling erosion and transport processes, rainfall runoff processes, landscape management. Influence on landscape stability and quality of natural resources. Preparation of input layers (digital elevation model, map of land use, soils, etc.), data sources management. Remote sensing data application. Seminars will be focused on practical use of GIS Idrisi 32 and ArcGIS.		
154DPM	Diploma Thesis	Z	30
	in accordance with the thesis proposal		
155ADKG	Algorithms in Digital Cartography and GIS	Z,ZK	4
155DPM	Diploma Thesis	Z	30
	in accordance with the thesis proposal		
155DPZE	Remote Sensing	Z,ZK	4
	Contactless method of earth surface data collection, its physical basis, their understanding, analysis and applications for various purposes		
155FTG2	Photogrammetry 2	Z,ZK	5
	* 1. Evaluation with known external orientation parameters * 2. Requirement of complanarity, requirement of zero vertical parallax, numerical determination of external orientation elements - overview * 3. Relative orientation (RO), RO of independent stereo-pairs, RO by image attachment, absolute orientation * 4. Complex solution, etape-solution, bundle adjustment * 5. Image triangulation, use, types * 6. Digital photogrammetry, digital image, principle, scanners, scanning, DPI, accuracy, data quantity * 7. Correlation technique, principle, utilization, automatic searching in raster image * 8. Digital orthophoto, types, interpolation, principle, algorithm, usage, problems * 9. Subpixel transformation * 10. Digital workstations, devices and processing systems * 11. Image transformations, Direct and Indirect methods, reasons to use * 12. Aerial laser scanning, utilization and products in the Czech Republic *13. RPAS methods (drones)		
155FTG3	Photogrammetry 3	Z,ZK	4
155GIT4	Informatics 4	ZK	5
155ISZK	Information System of Surveying and Cadastre in the CR	Z	2
155KANE	Cadastre of Real Estate	Z,ZK	6
	History of land registration in the CR. Stable and land cadastre. Land registration and development of title registration. Subject and content of cadastre of real estates. Cadastral information system ISKN. Organisation of surveying agency. Administration and maintenance of cadastre - measurements, calculations, visualisation and documentation. Geometric plan. Setting-out of property boundaries. Legal relations to real estates, cadastral registration.		
155KAR3	Cartography 3	Z,ZK	4
155OBJ	Object Oriented Programming	ZK	6
155PIN2	Project - Informatics 2	KZ	5
155PRGE	Project - Theoretical Ggeodesy	KZ	5
155RAIN	Radio Interferometry	Z	2
155TG3	Theoretical geodesy 3	Z,ZK	6
155TG4	Theoretical geodesy 4	Z,ZK	5
	Astronomical coordinate systems. Kepler's and disturbed motion of the satellites. Time learning. Precessions and nutation. Phenomena of the aberration type. Observation methods of cosmic geodesy. Geodetic satellites. Dynamic method of space geodesy. Space coordinate systems. Application to determine the Earth's gravity field parameters. Satellite Earth Observation Missions (CHAMP, GRACE, GOCE).		
155UZPD	Introduction to Image Data Processing	Z,ZK	4
	1. Introduction to the problem, specification of OpeGIS Simple Features 2. Spatial relations, 9-crossection model (DE-9IM) 3. Object-relational database model, introduction to PostGIS geodatabase 4. Spatial SQL, data types, indices, functions 5. Advanced technics of spatial SQL 6. Topology of vector data, data models 7, Raster data in object-relational databases and their processing 8. GIS network analyses in object-relational databases 9. Data access, web services, map servers 10.Data publicising, creation of application using data warehouses 11. Set geodatabases, practical applications 12. Distributed, document oriented (NoSQL) databases and their application in geoinformatics 13. Introduction to the problem of BigData processing 13. Úvod do problematiky zpracování velkých dat (BigData)		
155VFG	Photogrammetry -Project	KZ	5
	practical documentation of historical objects, technology of documentation and data processing by modern methods		
155YFD	Photogrammetric Documentation of Historical Buildings and Sites	KZ	4
155YFSG	Free Software GIS	Z,ZK	4
	Free software in geoinformatics in general. In practical applications is used mainly GRASS GIS. Besides GRASS GIS, also QGIS, uDig, OpenJump, gvSig, libraries GDAL/OGR, Proj.4 or GeoTools are demonstrated during lessons. Geostatistical analysis in GRASS/R, creation of hard-copy output maps using GMT. Storing geodata in relational database management systems - PostGIS. Geodata published on Internet - UMN MapServer, GeoServer, OpenLayers, PyWPS. OGC standards and their implementation. Freely accessible geodata, community project OpenStreetMap.		

155YJJ	Programming Language Java	Z,ZK	6
Introduction into basic knowledge of Java language. In the course are also covered topics like servlet technology, design pattern inversion of control and framework Spring.			
155YSS1	Software Seminar 1	Z	3
155YSS2	Software Seminar 2	Z	3
155YVDD	Visualization and Distribution of Spatial Data	Z,ZK	4
155ZDDP	Processing of Remote Sensing Dat	Z,ZK	4

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