# Study plan

## Name of study plan: Geodézie a kartografie

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Geodesy and Cartography
Type of study: Bachelor full-time
Required credits: 180
Elective courses credits: 0
Sum of credits in the plan: 180
Note on the plan: přechod na nový studijní plán, plat pro nástup 2021 a 2022

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Name of the block: Compulsory courses
Minimal number of credits of the block: 165
The role of the block: Z

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Code of the group: BG20190100
Name of the group: Geodézie a kartografie, 1. semestr
Requirement credits in the group: In this group you have to gain at least 29 credits
Requirement courses in the group: In this group you have to complete at least 6 courses
Credits in the group: 29
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 |
|---|---|---|---|---|---|---|
| 101KOGG | **Constructive Geometry** *Hana Lakomá, Petra Vacková, Jozef Bobok, Iva Malechová, Iva Slámová* ***Hana Lakomá*** *Hana Lakomá (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 101MM1G | **Mathematics 1G** *Jozef Bobok, Iva Malechová, Jan Chleboun, Milan Bořík* ***Jan Chleboun*** *Ivana Pultarová (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 102FY_1 | **Physics 1G** *Jiří Novák* ***Jiří Novák*** *Jiří Novák (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 154GED1 | **Geodesy 1** *Rudolf Urban* ***Jaroslav Braun*** *Rudolf Urban (Gar.)* | Z,ZK | 5 | 2P+3C | Z | z |
| 155GEP1 | **Geodetic instruments 1** *Zdeněk Vyskočil* ***Zdeněk Vyskočil*** *Zdeněk Vyskočil (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 155IGS1 | **Interactive Graphical Systems 1** ***Petr Soukup*** *Petr Soukup (Gar.)* | KZ | 4 | 1P+2C | Z | z |

**Characteristics of the courses of this group of Study Plan: Code=BG20190100 Name=Geodézie a kartografie, 1. semestr**

| | | | |
|---|---|---|---|
| 101KOGG | Constructive Geometry | Z,ZK | 5 |
| In the first part the course contains the basics and principles of projections of the space. It applies and practices this knowledge when displaying solids, surfaces, geodetic curves, the reference sphere with meridians and parallels, when using cartographic projections and in the constructive photogrammetry. The 3D program SketchUp is used for visualization and solving geometric problems. In the second part, the course presents the basics of spherical trigonometry and its use in mathematical geography and astronomy. | | | |
| 101MM1G | Mathematics 1G | Z,ZK | 5 |
| https://mat.fsv.cvut.cz/vyuka/bakalari/zs/MA1G/ | | | |
| 102FY_1 | Physics 1G | Z,ZK | 5 |
| This course focuses on basic physical phenomena and applications of classical mechanics, thermodynamics and thermal properties of materials, electricity and magnetism. Individual topics arecomplemented by technical applications with a special focus on surveying and measurement methods. | | | |
| 154GED1 | Geodesy 1 | Z,ZK | 5 |
| Historical development of geodesy, representation of the Earth and reduction of measured quantities. Basic geodetic instruments (theodolites, distance meters) and aids and their parts. Instrument errors and their elimination. Theoretical basics of measuring horizontal and vertical angles and lengths. Centering of measured quantities. Point fields, geodetic reference systems in the Czech Republic. Basic coordinate calculations. Introduction to Error Theory and Balancing Calculus. | | | |
| 155GEP1 | Geodetic instruments 1 | Z,ZK | 5 |
| The subject aims at the principles of optical devices and their functional parts. Simple optical tasks lead to an understanding of the principles of optical measurement. | | | |
| 155IGS1 | Interactive Graphical Systems 1 | KZ | 4 |
| The subject of practical training is the Kokeš system - an interactive graphic editor for working with digital maps. The exercises consist of solving practical tasks in a number of areas of the system's use. Lectures are focused on an introduction to algorithmization of (geodetic) tasks. Flow charts are used to write the algorithms. The functionality of the algorithms is demonstrated using Matlab. A web-based course in the Moodle system is used for teaching. | | | |

Code of the group: BG20190200
Name of the group: Geodézie a kartografie, 2. semestr
Requirement credits in the group: In this group you have to gain at least 28 credits
Requirement courses in the group: In this group you have to complete at least 7 courses
Credits in the group: 28
Note on the group:

| Code | Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 101MM2G | **Mathematics 2G** *Jozef Bobok, Iva Malechová, Jan Chleboun, Milan Bořík* ***Jan Chleboun*** *Jan Chleboun (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 102FY_2 | **Physics 2G** *Jiří Novák, Pavel Novák* ***Jiří Novák*** *Jiří Novák (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 154GED2 | **Geodesy 2** *Rudolf Urban, Martin Štroner* ***Jaroslav Braun*** *Martin Štroner (Gar.)* | Z,ZK | 5 | 2P+3C | L | z |
| 154VY1 | **Fieldwork Training of Geodesy 1,2** ***Michal Seidl*** *Michal Seidl (Gar.)* | KZ | 2 | 4C | L | z |
| 155GEP2 | **Geodetic instruments 2** *Zdeněk Vyskočil* ***Zdeněk Vyskočil*** *Zdeněk Vyskočil (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 155GIT1 | **Informatics 1** *Jan Holešovský, Martin Landa, Jaroslav Šedina* ***Martin Landa*** *Aleš Čepek (Gar.)* | KZ | 5 | 2P+2C | | z |
| 155VGP | **Fieldwork training in geodetic instruments** *Zdeněk Vyskočil* ***Zdeněk Vyskočil*** *Zdeněk Vyskočil (Gar.)* | KZ | 1 | 2C | L | z |

**Characteristics of the courses of this group of Study Plan: Code=BG20190200 Name=Geodézie a kartografie, 2. semestr**

| | | | |
|---|---|---|---|
| 101MM2G | Mathematics 2G | Z,ZK | 5 |
| Core course focused on integral calculus of functions of one variable, differential calculus of functions of several variables, and elements of ordinary differential equations. This course is taught only in Czech. More information on https://mat.fsv.cvut.cz/vyuka/bakalari/ls/MA2G/ | | | |
| 102FY_2 | Physics 2G | Z,ZK | 5 |
| The course introduces students to the basic concepts and applications of electromagnetic waves, optics, optical devices, laser principles, thermal radiation and photodetectors. Individual topics are complemented by technical applications with a special focus on surveying and metrology. | | | |
| 154GED2 | Geodesy 2 | Z,ZK | 5 |
| Determining heights (height point fields, height systems, measurement methods, devices and aids for technical leveling). Geodetic position bases, coordinate systems and map works on the territory of the Czech Republic. Methods of detailed topographic measurement and its numerical and graphical processing. Marking tasks (circular arcs and simple, objects), determination of dimensions. Initial information about the real estate cadastre of the Czech Republic, BIM, GNSS, Laser scanning, photogrammetry. | | | |
| 154VY1 | Fieldwork Training of Geodesy 1,2 | KZ | 2 |
| The course provides practical experience with filed work and ability to apply knowledge from courses Geodesy 1 a Geodesy 2 in several thematic tasks. | | | |
| 155GEP2 | Geodetic instruments 2 | Z,ZK | 5 |
| The subject aims at the principles of operation of electro-optical geodetic instruments (rangefinders, theodolites, laser instruments) and other instruments used in landsurveying - gyrotheodolite, GNSS. From a practical point of view, the subject is oriented towards working with GNSS and the subsequent processing of measurements. | | | |
| 155GIT1 | Informatics 1 | KZ | 5 |
| One of the three introductory courses in bachelor's study program into applied informatics. The course is focused on practical tasks which may be extended in following courses. Algorithm development is stressed together with loops, if-statements and user-defined functions. | | | |
| 155VGP | Fieldwork training in geodetic instruments | KZ | 1 |
| The content of the subject consists of seven tasks, which are solved by students in two- to four-member teams over five days. GNSS, laser scanning, very precise leveling - with the digital leveling device, trigonometric leveling, underground line search and more. Tasks are continuously changed and innovated. | | | |

Code of the group: BG20180300
Name of the group: Geodézie a kartografie, 3. semestr
Requirement credits in the group: In this group you have to gain at least 30 credits
Requirement courses in the group: In this group you have to complete at least 6 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 |
|---|---|---|---|---|---|---|
| 101MA3G | **Mathematics 3G** *Jozef Bobok, Iva Malechová, Jan Chleboun, Milan Bořík* ***Jan Chleboun*** *Zdeněk Skalák (Gar.)* | KZ | 5 | 2P+2C | Z | z |
| 101PMSG | **Probability and Statistics** *Jozef Bobok, Jana Nosková* ***Jana Nosková*** *Jana Nosková (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 154GED3 | **Geodesy 3** *Martin Štroner* ***Martin Štroner*** *Martin Štroner (Gar.)* | Z,ZK | 5 | 2P+3C | Z | z |

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|---|---|---|---|---|---|---|
| 154TCV1 | **Theory of Errors and Adjustment Calculus 1**<br>*Martin Štroner* ***Martin Štroner*** *Martin Štroner (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 155IN2G | **Informatics 2**<br>*Jan Pytel* ***Jan Pytel*** *Jan Pytel (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 155MAPO | **Mapping**<br>*Martin Tauchman* ***Martin Tauchman*** *Martin Tauchman (Gar.)* | Z,ZK | 5 | 2P+3C | Z | z |

**Characteristics of the courses of this group of Study Plan: Code=BG20180300 Name=Geodézie a kartografie, 3. semestr**

| | | | |
|---|---|---|---|
| 101MA3G | Mathematics 3G | KZ | 5 |
| https://mat.fsv.cvut.cz/vyuka/bakalari/zs/MA3G/ | | | |
| 101PMSG | Probability and Statistics | Z,ZK | 5 |
| Fundamental concepts and terminology, random variables, descriptive and inferential statistics. Discrete and continuous random variables, normal distribution, log- normal distribution. Classical and nonparametric methods of estimation and hypotheses testing. Simple and multivariate linear regression. | | | |
| 154GED3 | Geodesy 3 | Z,ZK | 5 |
| Altitude system of the Czech Republic. Methods of stabilization of altitude points. Geometric levelling from the centre, technology of precision and technical levelling including errors and accuracy characteristics. Method of trigonometric determination of height differences. Methods of suppressing the effect of refraction on the measured zenith angle. Centering and mathematical reduction of measured quantities. Detailed altimetry measurements include older and newer technologies of the tachymetric method according to the available instrumentation up to the production of the altimetry plan. | | | |
| 154TCV1 | Theory of Errors and Adjustment Calculus 1 | Z,ZK | 5 |
| Measurement errors and their division, two and multidimensional errors. Measurement properties, characteristics of random variables. Probability distributions. Law of accumulation of real errors, standard deviations. Characteristics of precision. Equalization of measurements. Least squares method (equating measurements of intermediate, conditional, intermediate with conditions). Alignment of bound and free geodetic grids. Regression and correlation analysis - linear regression. Basics of statistical hypothesis testing. | | | |
| 155IN2G | Informatics 2 | Z,ZK | 5 |
| In the course, students are introduced to the relational model, session normalization, integrity constraints, logical and physical database schema, conceptual schema, as well as database model design methodology, E-R diagrams and data flow diagrams. | | | |
| 155MAPO | Mapping | Z,ZK | 5 |
| A set of lectures describing ways of renewing the cadastral documentation, the historical development of cadastral mapping in the Czech Republic and the creation of digital technical maps, including the issue of their updating. | | | |

Code of the group: BG20180400
Name of the group: Geodézie a kartografie, 4. semestr
Requirement credits in the group: In this group you have to gain at least 30 credits
Requirement courses in the group: In this group you have to complete at least 7 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)***<br>*Tutors,* ***authors*** *and guarantors (gar.)* | **Completion** | **Credits** | **Scope** | **Semester** | **Role** |
|---|---|---|---|---|---|---|
| 154GED4 | **Geodesy 4**<br>*Zdeněk Skořepa* ***Zdeněk Skořepa*** *Zdeněk Skořepa (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 154VY3 | **Geodesy 4**<br>***Lenka Línková*** *Zdeněk Skořepa (Gar.)* | KZ | 2 | 4C | L | z |
| 155IN3G | **Informatics 3**<br>*Jan Pytel, Tomáš Bayer* ***Jan Pytel*** *Aleš Čepek (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 155KAR1 | **Cartography 1**<br>*Jiří Cajthaml* ***Jiří Cajthaml*** *Jiří Cajthaml (Gar.)* | Z,ZK | 5 | 2P+2C | | z |
| 155KNEM | **Cadastre of Real Estate**<br>*Martin Tauchman* ***Martin Tauchman*** *Karel Benda (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |
| 155VYMK | **Fieldwork Training in Mapping and Cadastre**<br>*Martin Tauchman* ***Martin Tauchman*** *Karel Benda (Gar.)* | KZ | 3 | 4C | L | z |
| 1551GIS | **GIS 1**<br>*Martin Landa, Lena Halounová* ***Lena Halounová*** *Lena Halounová (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |

**Characteristics of the courses of this group of Study Plan: Code=BG20180400 Name=Geodézie a kartografie, 4. semestr**

| | | | |
|---|---|---|---|
| 154GED4 | Geodesy 4 | Z,ZK | 5 |
| Attention is paid to the problem coordinate transformation in the plane with an redundant number of identical points (Helmert transformation, congruent transformation), coordinate transformation in space, to the calculation of coordinates of free station with least squares adjustment, formulation and solution of the error model of basic intersection problems (covariance matrix of coordinates, mean ellipse errors, isolines for coordinate standard deviation), calculation of the traverse with least squares adjustment and the effect of errors in the centering of an instrument and the target on the measured polar coordinates. | | | |
| 154VY3 | Geodesy 4 | KZ | 2 |
| Surveying and calculation of points of the geodetic network - a flat special-purpose network with measured horizontal directions and lengths, determination of trigonometric height differences from simultaneously and bilaterally measured zenith angles and slope lengths using a total station, determination of the height of one point of the network by geometric levelling from the centre (precise levelling), use of GNSS (RTK measurements in the CZEPOS network of reference stations), calculation according to the method of least squares. Detailed positional and height measurements (tachymetry) of the specified location in the extravilan at a scale of 1 : 500 and preparation of a digital terrain model. Measurement of the actual state of the building for the planned reconstruction and preparation of documentation at a scale of 1 : 50 (plan drawing). | | | |
| 155IN3G | Informatics 3 | Z,ZK | 5 |
| This introductory C++ programming course introduces students to the basic elements of the language, program structure and data types. The course progresses from elementary concepts such as variable declarations, constants, variable initialization, expressions, statements, functions, and pointers. Emphasis is placed on the object-oriented features of the language and the use of selected tools of the standard C++ library, such as vector and map containers, and their use in dynamic memory allocation, which is essential for programming simple geodesic tasks and solving buffer calculus problems, for example. This introductory course does not aim to exhaustively cover all features of C++ (e.g., the issue of templates is only hinted at), but it does aim to introduce students to C++ in sufficient detail so that they can actively program and be prepared for subsequent study of object-oriented programming. | | | |

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|---|---|---|---|
| 155KAR1 | Cartography 1 | Z,ZK | 5 |
| The importance of mathematical cartography. Reference surfaces and coordinate systems. Cartographic distortions. Classification of cartographic representations. Representation of an ellipsoid on a sphere. Simple conic, cylindrical and azimuthal representations. Irregular, polyconic, polyhedral and general representations. An overview of representations used in the Czech Republic and worldwide. Selection, identification and evaluation of displays. Reference coordinate systems in GIS. | | | |
| 155KNEM | Cadastre of Real Estate | Z,ZK | 5 |
| A set of lectures describing the complex issues of the digital real estate cadastre from a technical and legal point of view. While in the subject of mapping the student learns to understand the principle of creating a new cadastral map, in the subject of real estate cadastre the principle of updating it is explained to him. Emphasis is placed on technical activities in cadastre. | | | |
| 155VYMK | Fieldwork Training in Mapping and Cadastre | KZ | 3 |
| At the end of the 2nd year, the teaching of the subjects of mapping and real estate cadastre is appropriately rounded off with field activities. Theoretical knowledge is applied in the creation of a cadastral map, from the construction of a point field to the detailed measurement of the topography. Students learn the possibilities of measuring in cadastre and finding often complex solutions, how to deal with the basic technical tasks of the cadastre, whether it is geometric plan or the marking of a boundary in the terrain. | | | |
| 1551GIS | GIS 1 | Z,ZK | 5 |
| GIS 1 is a set of lectures describing basic terms, principles, models and tools how to use geographic information systems for various applications and purposes. Vector and raster data applications are explained. | | | |

Code of the group: BG20180500
Name of the group: Geodézie a kartografie, 5. semestr
Requirement credits in the group: In this group you have to gain at least 30 credits
Requirement courses in the group: In this group you have to complete at least 6 courses
Credits in the group: 30
Note on the group:

| Code | Name of the course / Name of the group of courses<br>*(in case of groups of courses the list of codes of their members)*<br>*Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 155FTG1 | **Photogrammetry 1**<br>*Karel Pavelka, Jan Pacina* ***Karel Pavelka*** *Karel Pavelka (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 155KAT2 | **Cartography 2**<br>*Jiří Cajthaml, Tomáš Janata* ***Jiří Cajthaml*** *Tomáš Janata (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 155PJIN | **Project - Informatics**<br>*Martin Landa, Jaroslav Šedina, Ondřej Pešek* ***Martin Landa*** *Martin Landa (Gar.)* | KZ | 5 | 3C | Z | z |
| 155PUG | **Land Consolidation**<br>*Josef Vlasák* ***Josef Vlasák*** *Josef Vlasák (Gar.)* | KZ | 5 | 2P+2C | L | z |
| 155TGD1 | **Theoretical geodesy 1**<br>*Jakub Kostelecký* ***Jakub Kostelecký*** *Jakub Kostelecký (Gar.)* | Z,ZK | 5 | 2P+2C | Z | z |
| 1552GIS | **GIS 2**<br>*Martin Landa, Lena Halounová* ***Lena Halounová*** *Lena Halounová (Gar.)* | Z,ZK | 5 | 2P+2C | L | z |

**Characteristics of the courses of this group of Study Plan: Code=BG20180500 Name=Geodézie a kartografie, 5. semestr**

| | | | |
|---|---|---|---|
| 155FTG1 | Photogrammetry 1 | Z,ZK | 5 |
| Introduction to photogrammetry. Analogue, analytic and digital solutions in photogrammetry. Internal and external orientation of photos, elements of orientation. Single image terrestrial photogrammetry, intersection and stereophotogrammetry. Survey metric cameras, methods of interpreting of photos, aerial photogrammetry, aerial and terrestrial laer scanning- an overview. | | | |
| 155KAT2 | Cartography 2 | Z,ZK | 5 |
| The course builds on the basics of mathematical cartography and introduces students to the topographic and thematic parts of cartography. It also includes an excursion into polygraphic techniques, theory of colour, copyright and editorial work. As a part of the course, an excursion to the offices of COSMC is organized. | | | |
| 155PJIN | Project - Informatics | KZ | 5 |
| The course follows up three preceding courses in applied informatics. Students work in groups on selected project. | | | |
| 155PUG | Land Consolidation | KZ | 5 |
| The course provides the basic theoretical and practical background in land consolidation in the Czech Republic and includes the synthesis of sub-issues in a planning documents. The students create a simple land consolidation project within the course in the selected area including designing of new features in common measures plan. | | | |
| 155TGD1 | Theoretical geodesy 1 | Z,ZK | 5 |
| Theoretical geodesy 1 introduces the issue of creating positional, height and gravity geodetic foundations, definition and implementation of geodetic reference systems - worldwide and for the Czech Republic. It provides information about their origin and development, including the necessary theoretical basis of higher geodesy. | | | |
| 1552GIS | GIS 2 | Z,ZK | 5 |
| GIS 2 is focused on a wide range of advanced analyses in the raster GIS using map algebra, on interpolation and extrapolation in 2D and 3D, on statistical data description, geostatistics and graph theory for optimisation tasks of network analysis. | | | |

Code of the group: BG20230600
Name of the group: Geodézie a kartografie, 6. semestr
Requirement credits in the group: In this group you have to gain at least 18 credits
Requirement courses in the group: In this group you have to complete at least 4 courses
Credits in the group: 18
Note on the group:

| Code | Name of the course / Name of the group of courses<br>*(in case of groups of courses the list of codes of their members)*<br>*Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 154INGE | **Engineering Surveying**<br>*Jaroslav Braun* ***Jaroslav Braun*** *Martin Štroner (Gar.)* | Z,ZK | 5 | 2P+2C | L | Z |
| 154TCV2 | **Theory of Errors and Adjustment Calculus 2**<br>*Martin Štroner* ***Martin Štroner*** *Martin Štroner (Gar.)* | Z,ZK | 5 | 2P+2C | L | Z |
| 155GPL1 | **Survey Sketches 1**<br>*Jiří Cajthaml, Zdeněk Valenta* ***Jiří Cajthaml*** *Jiří Cajthaml (Gar.)* | KZ | 3 | 2C | L | Z |
| 155TGD2 | **Theoretical geodesy 2**<br>*Jakub Kostelecký* ***Jakub Kostelecký*** *Leoš Mervart (Gar.)* | Z,ZK | 5 | 2P+2C | L | Z |

**Characteristics of the courses of this group of Study Plan: Code=BG20230600 Name=Geodézie a kartografie, 6. semestr**

| | | | |
|---|---|---|---|
| 154INGE | Engineering Surveying | Z,ZK | 5 |
| History, Terminology and Symbols in Engineering Surveying. Planning for measurement accuracy. Measuring and setting out lengths, angles and verticals and evaluating their accuracy. Positional, height and spatial marking networks, positional and height marking. Solving and setting out arcs. Measurement and evaluation of displacements and deformations of buildings. Application of geodesy in construction. | | | |
| 154TCV2 | Theory of Errors and Adjustment Calculus 2 | Z,ZK | 5 |
| Alignment of intermediaries, repetition of measurement errors and basic procedures. The law of the accumulation of weights. General law of accumulation of standard deviations. Robust methods of compensation. Finding outlying measurements. Special procedures in alignment: Elimination of unknowns. Sequential equalization. Errors in the initial quantities. Approximation of relationships. Regression and correlation analysis. Equating line and plane. Approximation by empirical polynomial. Harmonic analysis. Fourier transform. Equalization of conditionals with unknowns. Statistical hypothesis testing 2. Reliability. Optimization of geodetic measurements. Methods for solving normal equations. Direct solution, inversion, pseudoinversion. | | | |
| 155GPL1 | Survey Sketches 1 | KZ | 3 |
| 155TGD2 | Theoretical geodesy 2 | Z,ZK | 5 |
| Theoretical Geodesy 2 introduces students to the issue of Global Navigation Satellite Systems (GNSS) and their use in practice. It expands students' knowledge from the previous subject (Geodetic instruments) on the issue of satellite movement around the Earth, errors in GNSS measurements and methods of their elimination, methods of processing GNSS measurements and detailed information on current GNSS. | | | |

Name of the block: Povinná tělesná výchova, sportovní kurzy
Minimal number of credits of the block: 0
The role of the block: PT

Code of the group: BTV_POV
Name of the group: Povinná tělesná výchova
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete at least 2 courses
Credits in the group: 0
Note on the group:

| Code | Name of the course / Name of the group of courses<br>*(in case of groups of courses the list of codes of their members)*<br>*Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| TV1 | **Physical Education** | Z | 0 | 0+2 | Z | PT |
| TV2 | **Physical Education** | Z | 0 | 0+2 | L | PT |

**Characteristics of the courses of this group of Study Plan: Code=BTV_POV Name=Povinná tělesná výchova**

| | | | |
|---|---|---|---|
| TV1 | Physical Education | Z | 0 |
| TV2 | Physical Education | Z | 0 |

Name of the block: Jazyky
Minimal number of credits of the block: 3
The role of the block: J

Code of the group: BF20190101_I
Name of the group: Povinně volitelný jazyk, 1. semestr
Requirement credits in the group: In this group you have to gain at least 1 credit
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 1
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 |
|---|---|---|---|---|---|---|
| 104YCA1 | **English 1** *Karolína Synková, Alexandra Steinerová, Elena Dačeva, Jarmila Fučíková, Sandra Giormani, Hana Horká, Petra Martincová, Věra Čermáková, Michaela Németh, .....* ***Svatava Boboková Bartíková*** *Sandra Giormani (Gar.)* | Z | 1 | 2C | Z,L | J |
| 104YCN1 | **German 1** *Svatava Boboková Bartíková* ***Svatava Boboková Bartíková*** *Svatava Boboková Bartíková (Gar.)* | Z | 1 | 2C | Z,L | J |

**Characteristics of the courses of this group of Study Plan: Code=BF20190101_I Name=Povinně volitelný jazyk, 1. semestr**

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|---|---|---|---|
| 104YCA1 | English 1 | Z | 1 |

English 1 Course code: 104Y CA1 Scope: 0 + 2 (practical sessions) Number of credits: 1 Final assessment: credit The aim of the compulsory English course is to enhance the knowledge of lexis and grammar within the scope of the chosen field of study and university studies in general (Academic English); the overall focus is on professional language (i.e., ESP - technical style) and communicative competence within the construction industry. The course also seeks to teach students to read technical literature and to be able to produce essential written discourse and to express themselves in writing on issues in their field of study. The end of course requirements are a credit. Literature: Horká Hana, Giormani Sandra, Martincová Petra, Nivenová Renata : Professional English for Civil Engineering (Units 1 - 5)

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|---|---|---|---|
| 104YCN1 | German 1 | Z | 1 |

The compulsory course - German Language for Civil Engineering is aimed at practising professional vocabulary within the scope of the construction industry, understanding professional texts, and learning the necessary presentation skills in order to present all relevant professional issues. The end-of-course requirement is a credit. Literature: A.Hanáková, J.Dressel: Deutsch im Bauwesen

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Code of the group: BF20190202_I
Name of the group: Povinně volitelný jazyk, 2. semestr
Requirement credits in the group: In this group you have to gain at least 2 credits
Requirement courses in the group: In this group you have to complete at least 1 course
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 |
|---|---|---|---|---|---|---|
| 104YC2A | **English 2** *Karolína Synková, Alexandra Steinerová, Elena Dačeva, Jarmila Fučíková, Sandra Giormani, Hana Horká, Petra Martincová, Věra Čermáková, Michaela Németh, .....* ***Svatava Boboková Bartíková*** *Sandra Giormani (Gar.)* | Z,ZK | 2 | 2C | | J |
| 104YC2N | **German 2** *Svatava Boboková Bartíková* ***Svatava Boboková Bartíková*** *Svatava Boboková Bartíková (Gar.)* | Z,ZK | 2 | 2C | | J |

**Characteristics of the courses of this group of Study Plan: Code=BF20190202_I Name=Povinně volitelný jazyk, 2. semestr**

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|---|---|---|---|
| 104YC2A | English 2 | Z,ZK | 2 |

English 2 Course code: 104YC2A Scope: 0 + 2 (practical sessions) Number of credits: 1 Final assessment: credit and exam The aim of the compulsory English course is to enhance the knowledge of lexis and grammar within the scope of the chosen field of study and university studies in general (Academic English); the overall focus is on professional language (i.e., ESP - technical style) and communicative competence within the construction industry. The course also seeks to teach students to read technical literature and to be able to produce essential written discourse and to express themselves in writing on issues in their field of study. The end of course requirements are a credit and an examination. Literature: Horká Hana, Giormani Sandra, Martincová Petra, Nivenová Renata : Professional English for Civil Engineering (Units 6 10)

| | | | |
|---|---|---|---|
| 104YC2N | German 2 | Z,ZK | 2 |

The compulsory course - German Language for Civil Engineering is aimed at practising professional vocabulary within the scope of the construction industry, understanding professional texts, and learning the necessary presentation skills in order to present all relevant professional issues. The end-of-course requirement is a credit. Literature: A.Hanáková, J.Dressel: Deutsch im Bauwesen

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Name of the block: Povinně volitelné předměty, doporučení S1
Minimal number of credits of the block: 12
The role of the block: S1

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Code of the group: BG20180600_1
Name of the group: Geodézie a kartografie, bakalářská práce
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 1 course
Credits in the group: 12
Note on the group:

| Code | Name of the course / Name of the group of courses<br>*(in case of groups of courses the list of codes of their members)*<br>*Tutors,* ***authors*** *and guarantors (gar.)* | Completion | Credits | Scope | Semester | Role |
|---|---|---|---|---|---|---|
| 154BAPG | **Bachelor project**<br>***Martin Štroner*** *Martin Štroner (Gar.)* | Z | 12 | 10C | L,Z | S1 |
| 155BAPG | **Bachelor Project**<br>*Zdeněk Vyskočil, Jaroslav Šedina, Jan Pytel, Jiří Cajthaml, Jindřich Hodač, Tomáš Janata* ***Jindřich Hodač*** *Jiří Cajthaml (Gar.)* | Z | 12 | 10C | Z,L | S1 |
| 101BAPG | **Bachelor Project**<br>*Milan Bořík, Jana Nosková* ***Jana Nosková*** *Jana Nosková (Gar.)* | Z | 12 | 10C | L,Z | S1 |
| 102BAPG | **Bachelor Project**<br>*Petr Pokorný, Václav Nežerka* ***Jiří Novák*** | Z | 12 | 10C | L,Z | S1 |

**Characteristics of the courses of this group of Study Plan: Code=BG20180600_1 Name=Geodézie a kartografie, bakalářská práce**

| | | | |
|---|---|---|---|
| 154BAPG | Bachelor project | Z | 12 |
| Final thesis, prepared according to the assignment. | | | |
| 155BAPG | Bachelor Project | Z | 12 |
| Processing according to the work assignment | | | |
| 101BAPG | Bachelor Project | Z | 12 |
| Please contact your teacher or guarantor of this subject. | | | |
| 102BAPG | Bachelor Project | Z | 12 |
| in accordance with the thesis proposal | | | |

## List of courses of this pass:

| Code | Name of the course | Completion | Credits |
|---|---|---|---|
| 101BAPG | Bachelor Project | Z | 12 |
| Please contact your teacher or guarantor of this subject. | | | |
| 101KOGG | Constructive Geometry | Z,ZK | 5 |
| In the first part the course contains the basics and principles of projections of the space. It applies and practices this knowledge when displaying solids, surfaces, geodetic curves, the reference sphere with meridians and parallels, when using cartographic projections and in the constructive photogrammetry. The 3D program SketchUp is used for visualization and solving geometric problems. In the second part, the course presents the basics of spherical trigonometry and its use in mathematical geography and astronomy. | | | |
| 101MA3G | Mathematics 3G | KZ | 5 |
| https://mat.fsv.cvut.cz/vyuka/bakalari/zs/MA3G/ | | | |
| 101MM1G | Mathematics 1G | Z,ZK | 5 |
| https://mat.fsv.cvut.cz/vyuka/bakalari/zs/MA1G/ | | | |
| 101MM2G | Mathematics 2G | Z,ZK | 5 |
| Core course focused on integral calculus of functions of one variable, differential calculus of functions of several variables, and elements of ordinary differential equations. This course is taught only in Czech. More information on https://mat.fsv.cvut.cz/vyuka/bakalari/ls/MA2G/ | | | |
| 101PMSG | Probability and Statistics | Z,ZK | 5 |
| Fundamental concepts and terminology, random variables, descriptive and inferential statistics. Discrete and continuous random variables, normal distribution, log- normal distribution. Classical and nonparametric methods of estimation and hypotheses testing. Simple and multivariate linear regression. | | | |
| 102BAPG | Bachelor Project | Z | 12 |
| in accordance with the thesis proposal | | | |
| 102FY_1 | Physics 1G | Z,ZK | 5 |
| This course focuses on basic physical phenomena and applications of classical mechanics, thermodynamics and thermal properties of materials, electricity and magnetism. Individual topics arecomplemented by technical applications with a special focus on surveying and measurement methods. | | | |
| 102FY_2 | Physics 2G | Z,ZK | 5 |
| The course introduces students to the basic concepts and applications of electromagnetic waves, optics, optical devices, laser principles, thermal radiation and photodetectors. Individual topics are complemented by technical applications with a special focus on surveying and metrology. | | | |
| 104YC2A | English 2 | Z,ZK | 2 |
| English 2 Course code: 104YC2A Scope: 0 + 2 (practical sessions) Number of credits: 1 Final assessment: credit and exam The aim of the compulsory English course is to enhance the knowledge of lexis and grammar within the scope of the chosen field of study and university studies in general (Academic English); the overall focus is on professional language (i.e., ESP - technical style) and communicative competence within the construction industry. The course also seeks to teach students to read technical literature and to be able to produce essential written discourse and to express themselves in writing on issues in their field of study. The end of course requirements are a credit and an examination. Literature: Horká Hana, Giormani Sandra, Martincová Petra, Nivenová Renata : Professional English for Civil Engineering (Units 6 10) | | | |
| 104YC2N | German 2 | Z,ZK | 2 |
| The compulsory course - German Language for Civil Engineering is aimed at practising professional vocabulary within the scope of the construction industry, understanding professional texts, and learning the necessary presentation skills in order to present all relevant professional issues. The end-of-course requirement is a credit. Literature: A.Hanáková, J.Dressel: Deutsch im Bauwesen | | | |
| 104YCA1 | English 1 | Z | 1 |
| English 1 Course code: 104Y CA1 Scope: 0 + 2 (practical sessions) Number of credits: 1 Final assessment: credit The aim of the compulsory English course is to enhance the knowledge of lexis and grammar within the scope of the chosen field of study and university studies in general (Academic English); the overall focus is on professional language (i.e., ESP - technical style) and communicative competence within the construction industry. The course also seeks to teach students to read technical literature and to be able to produce essential written discourse and to express themselves in writing on issues in their field of study. The end of course requirements are a credit. Literature: Horká Hana, Giormani Sandra, Martincová Petra, Nivenová Renata : Professional English for Civil Engineering (Units 1 - 5) | | | |

| | | | |
|---|---|---|---|
| 104YCN1 | German 1 | Z | 1 |
| The compulsory course - German Language for Civil Engineering is aimed at practising professional vocabulary within the scope of the construction industry, understanding professional texts, and learning the necessary presentation skills in order to present all relevant professional issues. The end-of-course requirement is a credit. Literature: A.Hanáková, J.Dressel: Deutsch im Bauwesen | | | |
| 154BAPG | Bachelor project | Z | 12 |
| Final thesis, prepared according to the assignment. | | | |
| 154GED1 | Geodesy 1 | Z,ZK | 5 |
| Historical development of geodesy, representation of the Earth and reduction of measured quantities. Basic geodetic instruments (theodolites, distance meters) and aids and their parts. Instrument errors and their elimination. Theoretical basics of measuring horizontal and vertical angles and lengths. Centering of measured quantities. Point fields, geodetic reference systems in the Czech Republic. Basic coordinate calculations. Introduction to Error Theory and Balancing Calculus. | | | |
| 154GED2 | Geodesy 2 | Z,ZK | 5 |
| Determining heights (height point fields, height systems, measurement methods, devices and aids for technical leveling). Geodetic position bases, coordinate systems and map works on the territory of the Czech Republic. Methods of detailed topographic measurement and its numerical and graphical processing. Marking tasks (circular arcs and simple, objects), determination of dimensions. Initial information about the real estate cadastre of the Czech Republic, BIM, GNSS, Laser scanning, photogrammetry. | | | |
| 154GED3 | Geodesy 3 | Z,ZK | 5 |
| Altitude system of the Czech Republic. Methods of stabilization of altitude points. Geometric levelling from the centre, technology of precision and technical levelling including errors and accuracy characteristics. Method of trigonometric determination of height differences. Methods of suppressing the effect of refraction on the measured zenith angle. Centering and mathematical reduction of measured quantities. Detailed altimetry measurements include older and newer technologies of the tachymetric method according to the available instrumentation up to the production of the altimetry plan. | | | |
| 154GED4 | Geodesy 4 | Z,ZK | 5 |
| Attention is paid to the problem coordinate transformation in the plane with an redundant number of identical points (Helmert transformation, congruent transformation), coordinate transformation in space, to the calculation of coordinates of free station with least squares adjustment, formulation and solution of the error model of basic intersection problems (covariance matrix of coordinates, mean ellipse errors, isolines for coordinate standard deviation), calculation of the traverse with least squares adjustment and the effect of errors in the centering of an instrument and the target on the measured polar coordinates. | | | |
| 154INGE | Engineering Surveying | Z,ZK | 5 |
| History, Terminology and Symbols in Engineering Surveying. Planning for measurement accuracy. Measuring and setting out lengths, angles and verticals and evaluating their accuracy. Positional, height and spatial marking networks, positional and height marking. Solving and setting out arcs. Measurement and evaluation of displacements and deformations of buildings. Application of geodesy in construction. | | | |
| 154TCV1 | Theory of Errors and Adjustment Calculus 1 | Z,ZK | 5 |
| Measurement errors and their division, two and multidimensional errors. Measurement properties, characteristics of random variables. Probability distributions. Law of accumulation of real errors, standard deviations. Characteristics of precision. Equalization of measurements. Least squares method (equating measurements of intermediate, conditional, intermediate with conditions). Alignment of bound and free geodetic grids. Regression and correlation analysis - linear regression. Basics of statistical hypothesis testing. | | | |
| 154TCV2 | Theory of Errors and Adjustment Calculus 2 | Z,ZK | 5 |
| Alignment of intermediaries, repetition of measurement errors and basic procedures. The law of the accumulation of weights. General law of accumulation of standard deviations. Robust methods of compensation. Finding outlying measurements. Special procedures in alignment: Elimination of unknowns. Sequential equalization. Errors in the initial quantities. Approximation of relationships. Regression and correlation analysis. Equating line and plane. Approximation by empirical polynomial. Harmonic analysis. Fourier transform. Equalization of conditionals with unknowns. Statistical hypothesis testing 2. Reliability. Optimization of geodetic measurements. Methods for solving normal equations. Direct solution, inversion, pseudoinversion. | | | |
| 154VY1 | Fieldwork Training of Geodesy 1,2 | KZ | 2 |
| The course provides practical experience with filed work and ability to apply knowledge from courses Geodesy 1 a Geodesy 2 in several thematic tasks. | | | |
| 154VY3 | Geodesy 4 | KZ | 2 |
| Surveying and calculation of points of the geodetic network - a flat special-purpose network with measured horizontal directions and lengths, determination of trigonometric height differences from simultaneously and bilaterally measured zenith angles and slope lengths using a total station, determination of the height of one point of the network by geometric levelling from the centre (precise levelling), use of GNSS (RTK measurements in the CZEPOS network of reference stations), calculation according to the method of least squares. Detailed positional and height measurements (tachymetry) of the specified location in the extravilan at a scale of 1 : 500 and preparation of a digital terrain model. Measurement of the actual state of the building for the planned reconstruction and preparation of documentation at a scale of 1 : 50 (plan drawing). | | | |
| 1551GIS | GIS 1 | Z,ZK | 5 |
| GIS 1 is a set of lectures describing basic terms, principles, models and tools how to use geographic information systems for various applications and purposes. Vector and raster data applications are explained. | | | |
| 1552GIS | GIS 2 | Z,ZK | 5 |
| GIS 2 is focused on a wide range of advanced analyses in the raster GIS using map algebra, on interpolation and extrapolation in 2D and 3D, on statistical data description, geostatistics and graph theory for optimisation tasks of network analysis. | | | |
| 155BAPG | Bachelor Project | Z | 12 |
| Processing according to the work assignment | | | |
| 155FTG1 | Photogrammetry 1 | Z,ZK | 5 |
| Introduction to photogrammetry. Analogue, analytic and digital solutions in photogrammetry. Internal and external orientation of photos, elements of orientation. Single image terrestrial photogrammetry, intersection and stereophotogrammetry. Survey metric cameras, methods of interpreting of photos, aerial photogrammetry, aerial and terrestrial laer scanning- an overview. | | | |
| 155GEP1 | Geodetic instruments 1 | Z,ZK | 5 |
| The subject aims at the principles of optical devices and their functional parts. Simple optical tasks lead to an understanding of the principles of optical measurement. | | | |
| 155GEP2 | Geodetic instruments 2 | Z,ZK | 5 |
| The subject aims at the principles of operation of electro-optical geodetic instruments (rangefinders, theodolites, laser instruments) and other instruments used in landsurveying - gyrotheodolite, GNSS. From a practical point of view, the subject is oriented towards working with GNSS and the subsequent processing of measurements. | | | |
| 155GIT1 | Informatics 1 | KZ | 5 |
| One of the three introductory courses in bachelor's study program into applied informatics. The course is focused on practical tasks which may be extended in following courses. Algorithm development is stressed together with loops, if-statements and user-defined functions. | | | |
| 155GPL1 | Survey Sketches 1 | KZ | 3 |
| 155IGS1 | Interactive Graphical Systems 1 | KZ | 4 |
| The subject of practical training is the Kokeš system - an interactive graphic editor for working with digital maps. The exercises consist of solving practical tasks in a number of areas of the system's use. Lectures are focused on an introduction to algorithmization of (geodetic) tasks. Flow charts are used to write the algorithms. The functionality of the algorithms is demonstrated using Matlab. A web-based course in the Moodle system is used for teaching. | | | |

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|---|---|---|---|
| 155IN2G | Informatics 2 | Z,ZK | 5 |
| In the course, students are introduced to the relational model, session normalization, integrity constraints, logical and physical database schema, conceptual schema, as well as database model design methodology, E-R diagrams and data flow diagrams. | | | |
| 155IN3G | Informatics 3 | Z,ZK | 5 |
| This introductory C++ programming course introduces students to the basic elements of the language, program structure and data types. The course progresses from elementary concepts such as variable declarations, constants, variable initialization, expressions, statements, functions, and pointers. Emphasis is placed on the object-oriented features of the language and the use of selected tools of the standard C++ library, such as vector and map containers, and their use in dynamic memory allocation, which is essential for programming simple geodesic tasks and solving buffer calculus problems, for example. This introductory course does not aim to exhaustively cover all features of C++ (e.g., the issue of templates is only hinted at), but it does aim to introduce students to C++ in sufficient detail so that they can actively program and be prepared for subsequent study of object-oriented programming. | | | |
| 155KAR1 | Cartography 1 | Z,ZK | 5 |
| The importance of mathematical cartography. Reference surfaces and coordinate systems. Cartographic distortions. Classification of cartographic representations. Representation of an ellipsoid on a sphere. Simple conic, cylindrical and azimuthal representations. Irregular, polyconic, polyhedral and general representations. An overview of representations used in the Czech Republic and worldwide. Selection, identification and evaluation of displays. Reference coordinate systems in GIS. | | | |
| 155KAT2 | Cartography 2 | Z,ZK | 5 |
| The course builds on the basics of mathematical cartography and introduces students to the topographic and thematic parts of cartography. It also includes an excursion into polygraphic techniques, theory of colour, copyright and editorial work. As a part of the course, an excursion to the offices of COSMC is organized. | | | |
| 155KNEM | Cadastre of Real Estate | Z,ZK | 5 |
| A set of lectures describing the complex issues of the digital real estate cadastre from a technical and legal point of view. While in the subject of mapping the student learns to understand the principle of creating a new cadastral map, in the subject of real estate cadastre the principle of updating it is explained to him. Emphasis is placed on technical activities in cadastre. | | | |
| 155MAPO | Mapping | Z,ZK | 5 |
| A set of lectures describing ways of renewing the cadastral documentation, the historical development of cadastral mapping in the Czech Republic and the creation of digital technical maps, including the issue of their updating. | | | |
| 155PJIN | Project - Informatics | KZ | 5 |
| The course follows up three preceding courses in applied informatics. Students work in groups on selected project. | | | |
| 155PUG | Land Consolidation | KZ | 5 |
| The course provides the basic theoretical and practical background in land consolidation in the Czech Republic and includes the synthesis of sub-issues in a planning documents. The students create a simple land consolidation project within the course in the selected area including designing of new features in common measures plan. | | | |
| 155TGD1 | Theoretical geodesy 1 | Z,ZK | 5 |
| Theoretical geodesy 1 introduces the issue of creating positional, height and gravity geodetic foundations, definition and implementation of geodetic reference systems - worldwide and for the Czech Republic. It provides information about their origin and development, including the necessary theoretical basis of higher geodesy. | | | |
| 155TGD2 | Theoretical geodesy 2 | Z,ZK | 5 |
| Theoretical Geodesy 2 introduces students to the issue of Global Navigation Satellite Systems (GNSS) and their use in practice. It expands students' knowledge from the previous subject (Geodetic instruments) on the issue of satellite movement around the Earth, errors in GNSS measurements and methods of their elimination, methods of processing GNSS measurements and detailed information on current GNSS. | | | |
| 155VGP | Fieldwork training in geodetic instruments | KZ | 1 |
| The content of the subject consists of seven tasks, which are solved by students in two- to four-member teams over five days. GNSS, laser scanning, very precise leveling - with the digital leveling device, trigonometric leveling, underground line search and more. Tasks are continuously changed and innovated. | | | |
| 155VYMK | Fieldwork Training in Mapping and Cadastre | KZ | 3 |
| At the end of the 2nd year, the teaching of the subjects of mapping and real estate cadastre is appropriately rounded off with field activities. Theoretical knowledge is applied in the creation of a cadastral map, from the construction of a point field to the detailed measurement of the topography. Students learn the possibilities of measuring in cadastre and finding often complex solutions, how to deal with the basic technical tasks of the cadastre, whether it is geometric plan or the marking of a boundary in the terrain. | | | |
| TV1 | Physical Education | Z | 0 |
| TV2 | Physical Education | Z | 0 |

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