Study plan

Name of study plan: obor Konstrukce a dopravní stavby, zaměření Dopravní stavby

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Civil Engineering
Type of study: Follow-up master full-time
Required credits: 90
Elective courses credits: 0
Sum of credits in the plan: 90
Note on the plan: tento studijní plán platí do nástupu 2022/23

Name of the block: Compulsory courses
Minimal number of credits of the block: 18
The role of the block: Z

Code of the group: NK20160100
Name of the group: obor Konstrukce a dopravní stavby, 1. semestr
Requirement credits in the group: In this group you have to gain at least 15 credits
Requirement courses in the group: In this group you have to complete at least 3 courses
Credits in the group: 15
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
101MA04	**Mathematics PS** *Michal Beneš, Ivana Pultarová, Jan Chleboun, Petr Mayer, Jan Lamač, Ondřej Zindulka, Iva Malechová **Jan Chleboun** Jan Chleboun (Gar.)*	Z,ZK	5	2P+2C	Z	z
132NAK	**Numerical Analysis of Structures** *Bořek Patzák, Jan Vořišek, Tomáš Krejčí **Bořek Patzák** Bořek Patzák (Gar.)*	Z,ZK	5	2P+2C	Z	z
135GET	**Geotechnics** *Jan Pruška, Jan Kos, Matouš Hilar, Jan Valenta, Jan Salák, Alexandr Butovič, Jan Masopust **Jan Valenta** Jan Pruška (Gar.)*	Z,ZK	5	2P+2C	Z	z

Characteristics of the courses of this group of Study Plan: Code=NK20160100 Name=obor Konstrukce a dopravní stavby, 1. semestr

101MA04	Mathematics PS	Z,ZK	5
After elementary tools of linear algebra (matrix, determinant, Gaussian elimination) are recalled, iterative methods for solving systems of linear algebraic equations are in the focus. Then, the finite difference method and the finite element method are presented and their applications to problems based on differential equations are shown.			
132NAK	Numerical Analysis of Structures	Z,ZK	5
Variational principles of mechanics. Method of weighted residuals, conditions of convergence (continuity, integrity). Principles of FEM. Isoparametric elements, area coordinates, numerical integration. Application of method to selected 1D and 2D problems (Elasticity, heat transfer, consolidation). Algorithmic aspects of the method.			
135GET	Geotechnics	Z,ZK	5
Familiarization with specific issues of building foundation, mastering the basic methods of technology of implementation of individual elements and structures and the use of methods of their static assessment.			

Code of the group: NK20160200
Name of the group: obor Konstrukce a dopravní stavby, 2. semestr
Requirement credits in the group: In this group you have to gain at least 3 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 3
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
132EADK	**Experimental Analysis and Diagnostics K** *Michal Polák, Tomáš Plachý **Michal Polák** Michal Polák (Gar.)*	KZ	3	1P+2C	L	z

Characteristics of the courses of this group of Study Plan: Code=NK20160200 Name=obor Konstrukce a dopravní stavby, 2. semestr

132EADK	Experimental Analysis and Diagnostics K	KZ	3

Experiments focused on monitoring of the amount of climatic loads on building and engineering structures (wind, snow, temperature loads), diagnostics of building and engineering structures, tests carried out on physical models of building and engineering structures (model similarity laws, seismic simulations on shake tables, wind tunnel simulations of wind effects, static load tests on physical models), monitoring of building and engineering structures, static load tests (building structures, engineering structures, bridges), dynamic load tests and experimental modal analysis (building structures, engineering structures, bridges, footbridges), effects of technical seismicity, evaluation of adverse effects of vibration on the human body, assessment of the influence of building vibrations on installed machines and devices).

Name of the block: Povinné předměty zaměření
Minimal number of credits of the block: 32
The role of the block: PZ

Code of the group: NK20160102
Name of the group: obor Konstrukce a dopravní stavby, zaměření Dopravní stavby, 1. semestr
Requirement credits in the group: In this group you have to gain at least 14 credits
Requirement courses in the group: In this group you have to complete at least 3 courses
Credits in the group: 14
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
135DYGK	**Dynamics of geotechnical structures** *Jan Pruška* ***Jan Pruška*** *Jan Pruška (Gar.)*	Z,ZK	4	2P+1C	Z	PZ
136S03D	**Road construction 3D** *Michal Uhlík* ***Michal Uhlík*** *Michal Uhlík (Gar.)*	Z,ZK	5	2P+2C	Z	PZ
137Z02D	**Railway structures 2D** *Leoš Horníček, Hana Krejčiříková* ***Leoš Horníček*** *Leoš Horníček (Gar.)*	Z,ZK	5	2P+2C	Z	PZ

Characteristics of the courses of this group of Study Plan: Code=NK20160102 Name=obor Konstrukce a dopravní stavby, zaměření Dopravní stavby, 1. semestr

135DYGK	Dynamics of geotechnical structures	Z,ZK	4

The course builds on the knowledge acquired by students of the Dynamics of Building Structures course. The student will get acquainted with the determination of the loading of geotechnical structures from natural and technical seismicity, will get an overview of the properties of dynamically loaded soils and rocks, including the procedures for determining these properties. In addition, the student will learn the basic procedures for assessing the effects of technical seismicity and earthquakes on selected geotechnical structures (slab foundations, frame and retaining walls, embankments, slopes, tunnels).

136S03D	Road construction 3D	Z,ZK	5

Introduction to urban engineering, solutions in built-up areas - reconstruction. Parking - solution methods, technical parameters and requirements, garages. Bus stations and bus stops. Public mass transport and its preferences. Pedestrian and bicycle traffic. Traffic signs. Adaptations for the blind and partially sighted, barrier-free adaptations. Utilities.

137Z02D	Railway structures 2D	Z,ZK	5

Track design of individual types of railway stations, structural elements of railway stations, equipment for passenger and freight transport, connection to the European railway network, modernisation and optimisation of railway lines, design of tram and metro lines, ecological impacts of rail transport.

Code of the group: NK20160202
Name of the group: obor Konstrukce a dopravní stavby, zaměření Dopravní stavby, 2. 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 *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
133B03D	**Concrete Structures 3D** *Jan Janoušek, Roman Lenner* ***Roman Lenner*** *Roman Lenner (Gar.)*	Z,ZK	5	2P+2C	L	PZ
134O02D	**Steel Structures 2D** *Martina Eliášová* ***Martina Eliášová*** *Martina Eliášová (Gar.)*	Z,ZK	5	2P+2C	L	PZ
136S04D	**Road construction 4D** *Jan Valentin* ***Jan Valentin*** *Jan Valentin (Gar.)*	Z,ZK	4	2P+1C	L	PZ
137Z03D	**Railway Structures 3D** *Vít Lojda, Leoš Horníček* ***Vít Lojda*** *Vít Lojda (Gar.)*	Z,ZK	4	2P+1C	L	PZ

Characteristics of the courses of this group of Study Plan: Code=NK20160202 Name=obor Konstrukce a dopravní stavby, zaměření Dopravní stavby, 2. semestr

133B03D	Concrete Structures 3D	Z,ZK	5

Concrete structures with a focus on infrastructure

134O02D	Steel Structures 2D	Z,ZK	5
Deepening of knowledge received from courses 133NNK and 134OK01. Amplifying of theoretical knowledge in the field of steel grade selection, toughness, global analysis of structures, buckling of structural systems, joint classification, and high strength steel and demanding composite steel and concrete structures. Complementation of knowledge from fire resistance of steel and composite structures and detailed design of industrial buildings and crane girders. Design of masts, towers, chimneys, tanks, silos and pipelines, technological structures, pre-stressed steel structures and basis of design from aluminium alloys and stainless steel, and cable and membrane structures.			
136S04D	Road construction 4D	Z,ZK	4
Course 13604D is the final professional course for students who have chosen to specialization in road construction. The course deepens the knowledge previously acquired in the field of technologies and technical solutions of road structures including pavements and extends it to other special or otherwise specific technologies. The student will be introduced to key technologies for asphalt pavements, concrete pavements, stone paved pavements and bridge pavements.			
137Z03D	Railway Structures 3D	Z,ZK	4
The subject is aimed at a detailed introduction to the construction and maintenance of railway lines. Students are introduced to working procedures and mechanization tools that are used for the construction of the railway bottom and top and for the establishment and maintenance of the geometrical position of the track.			

Name of the block: Elective courses
Minimal number of credits of the block: 0
The role of the block: V

Code of the group: NF20150100
Name of the group: volitelná výběrová matematika
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
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
101YMAV	**Mathematics 4 - Selective Course** *Aleš Nekvinda **Aleš Nekvinda** Aleš Nekvinda (Gar.)*	Z,ZK	5	2P+2C	Z	V

Characteristics of the courses of this group of Study Plan: Code=NF20150100 Name=volitelná výběrová matematika

101YMAV	Mathematics 4 - Selective Course	Z,ZK	5
To be added.			

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 6
The role of the block: S

Code of the group: NK20160100_1
Name of the group: obor Konstrukce a dopravní stavby, povinně volitelné předměty, zimní 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
102YFPL	**Solid State Physics in Civil Engineering** *Jiří Konfršt **Jiří Konfršt** Jiří Konfršt (Gar.)*	Z	2	1P+1C	Z	S
132YDDS	**Dynamics of Transport Structures** *Michal Polák **Michal Polák** Michal Polák (Gar.)*	Z	2	1P+1C	Z	S
132YMMO	**Modern Methods of Optimization** *Matěj Lepš, Jan Zeman **Matěj Lepš** Matěj Lepš (Gar.)*	Z	2	1P+1C	Z	S
132YSEI	**Seismic Engineeering** *Jiří Máca **Jiří Máca** Jiří Máca (Gar.)*	Z	2	1P+1C	Z	S
132YSSK	**Reliability of Structures** *Jaroslav Kruis **Jaroslav Kruis** Jaroslav Kruis (Gar.)*	Z	2	1P+1C	Z	S
133YBEX	**Concrete under Extreme Conditions** *Radek Štefan, Petr Štemberk, Marek Foglar **Radek Štefan** Radek Štefan (Gar.)*	Z	2	1P+1C	Z	S
133YBM2	**Concrete Bridges 2** *Michal Drahorád, Jan Vítek **Jan Vítek** Jan Vítek (Gar.)*	Z	2	1P+1C	Z	S
133YPRK	**Failures and Rehabilitation of Concrete Structures** *Petr Štemberk, Yuliia Khmurovska, Jakub Žák **Petr Štemberk** Petr Štemberk (Gar.)*	Z	2	1P+1C	Z	S

134YDKM	**Timber structures and bridges** *Anna Kuklíková* ***Anna Kuklíková*** *Anna Kuklíková (Gar.)*	Z	2	1P+1C	Z	S
134YROK	**Extending the Life of Steel and Timber Structures** *Karel Mikeš* ***Karel Mikeš*** *Karel Mikeš (Gar.)*	Z	2	1P+1C	Z	S
134YSMK	**Stability and modelling of steel structures** *Josef Macháček, Michal Jandera* ***Michal Jandera*** *Josef Macháček (Gar.)*	Z	2	1P+1C	Z	S
135YGSM	**Geotechnical Software for Numerical modelling** *Jan Pruška, Jan Ježek, Daniel Turanský* ***Alena Zemanová*** *Jan Pruška (Gar.)*	Z	2	1P+1C	Z	S
135YZAL	**Basics of mining** *Jiří Barták* ***Jiří Barták***	Z	2	1P+1C	Z	S
136YEES	**Environmental Aspects and Esthetics of Road Structures** *Karel Horníček* ***Michal Uhlík*** *Karel Horníček (Gar.)*	Z	2	1P+1C		S
136YLET	**Airports** *Petr Pánek* ***Petr Pánek*** *Petr Pánek (Gar.)*	Z	2	1P+1C	Z	S
137YDKP	**Diagnostics of rail transport construction** *Hana Krejčiříková* ***Lenka Lomoz*** *Hana Krejčiříková (Gar.)*	Z	2	1P+1C	Z	S
220YLPG	**Geotechnical laboratory** *Jiří Svoboda, Jiří Šťástka, Radek Vašíček* ***Radek Vašíček*** *Jiří Svoboda (Gar.)*	Z	2	2C	Z	S

Characteristics of the courses of this group of Study Plan: Code=NK20160100_1 Name=obor Konstrukce a dopravní stavby, povinně volitelné předměty, zimní semestr

102YFPL	Solid State Physics in Civil Engineering	Z	2

Solids, crystal structure, atomic shell theory, valence layer chemical bonds, dislocation disturbances, critical crack energy,vibration of masses, systems natural frequency of vibration and damped vibration, basics concepts of fracture mechanics, types of fracture, electron microscopes, scanning tunneling microscope, atomic force microscope, diffraction, diffraction methods, semiconductors, p-n junction, photovoltaic effect, solar cells, heat and moisture transport.

132YDDS	Dynamics of Transport Structures	Z	2

Understanding of the problems of the Dynamics of transport structures (especially of road bridges, railway bridges and footbridges), explanation of experimental and theoretical analysis procedures - the arrangement of an experiment "in situ?, monitored parameters, measuring line, modal analysis, the monitoring systems for observation of building structure dynamics behaviour and of traffic flow characteristics, numerical methods for solving dynamical interaction between building structure and moving load, modelling of structures, traffic flow and pedestrians, dynamical wind effects, practical examples.

132YMMO	Modern Methods of Optimization	Z	2

The course is aimed at an overview of numerical optimization methods applicable not only in the Civil Engineering area. The emphasis is put more on the introduction of driving principles, however, practical applications in MATLAB environment are also conducted during exercises.

132YSEI	Seismic Engineeering	Z	2

Basic principles of design of earthquake resistant structures. Methods of calculating the response of structures to earthquake loads according to Eurocode 8.

132YSSK	Reliability of Structures	Z	2

The course is devoted to the reliability of elements and systems. Element reliability is time dependent while the reliability of systems is of type strength-load. Complicated cases are solved by the FORM method. Two simulation methods are introduced: Monte Carlo and LHS.

133YBEX	Concrete under Extreme Conditions	Z	2

The course is focused on concrete and concrete structures under extreme conditions.

133YBM2	Concrete Bridges 2	Z	2

Extension of the field of concrete bridges. The technologies of bridge construction represent main part of the study. Specifications of individual structural systems.

133YPRK	Failures and Rehabilitation of Concrete Structures	Z	2

The course focuses on the description of failures of concrete structures, explanation of the causes of these failures and the design of remedial measures. Methods of strengthening existing concrete structures are also discussed. Surface repairs, strengthening of contactors, strengthening of structural elements to the effects of bending moment and shear, and foundation structures are discussed. The course appropriately combines theoretical approaches with common practice.

134YDKM	Timber structures and bridges	Z	2

Timber structures focused to national strategy of sustainable development. New timber-based materials. Structural systeme of houses and bridges. Repairing and strengthtening. Fire design. Production, protection, erection and maintenance. Design and evaluation of bridges, roofs structures in normal temperature and in fire.

134YROK	Extending the Life of Steel and Timber Structures	Z	2

Materials used for bearing structures. Developments in the area of regulations and standardization. Causes of defects, malfunctions, survey of objects, static assumptions of reconstruction. Possibilities of strengthening, strengthening of steel and timber structures and strengthening of connections. Using of computers in reconstructions and development of numerical models.

134YSMK	Stability and modelling of steel structures	Z	2

Subject YSMK covers two parts. The first one deals with stability and strength of steel plates, the second one with stability and strengths of steel frame structures. In the first part the historic collapses of steel structures are analysed including the importance of imperfections for a design of thin plated structures. Presented are principles of theory of buckling, linear and nonlinear theory of buckling of thin plates. The results are applied to the 4th class cross sections in harmony with Eurocode. Buckling due to normal, shear and local loadings including their combination is analysed in a detail. In the end the application of the results is shown together with design of necessary stiffeners. The second part is focused on member and structure stability. Possible global analysis methods are presented together with methods for compression and bending interaction for slender members. In detail, specific cases of lateral torsional buckling are explained including also tapered members.

135YGSM	Geotechnical Software for Numerical modelling	Z	2

Students get acquainted with the Finite Element Method, the currently dominant tool for numerical modeling in Geotechnics. Emphasis is placed on introducing the basic principles of the Finite Element Method and their subsequent application to selected problems of Geotechnical Engineering. The course summarises the types of finite elements used in geotechnical applications, material models suitable for the description of soil deformation, and selected specifics associated with numerical modeling in geotechnics. This knowledge is further applied in the modeling of foundation, embedded walls, and stability problems.

135YZAL	Basics of mining	Z	2

The Fundamentals of Quarrying course introduces students to all the essential aspects of aggregate mining, an important part of the national economy, in a concise and understandable way. Aggregates extracted and processed in various ways are essential raw materials for most construction industries.

136YEES	Environmental Aspects and Esthetics of Road Structures	Z	2

Terminology of evironmental terms, Laws 114/1991 and 100/2000, Detailed description of the EIA process from the point of view of the investor, the designer and the public, physical principles of acoustics, noise from traffic and anti-noise measures, emissions and immissions from traffic, historical development of emitted pollutants on characteristic roads in the relationship between increasing traffic intensity and decreasing emissions from better-quality vehicles, animal migration and its reasons, ways of financing road construction and maintenance according to categories and owners, functioning of municipal and city authorities, competence of mayors, councils, councils and officials of the Department of Transport and Construction, advantages and risks transition to electric cars, technical, economic and environmental aspects and risks, issues of transition to hydrogen cells, history of highway construction in the Czech Republic, basics of automobile traffic modeling, aesthetics of off-road road design, landscape profile considerations, relationships between directional and height profile, most common mistakes in proposals, risks of ill-advised acceptance of data from CRMV for transport ex numbers, the principle of determining the dynamic composition of the vehicle fleet, the differences between static and dynamic composition in the data.

136YLET	Airports	Z	2

Types of airports, organization, data about airports, legislature, choice notions, movement of aeroplanes, flight and touch - down, assesment longitude RWY,aerodrome code, geometric characteristics , ACN / PCN, protective zone, visual aids, traffic processes at the airport, structureof terminals and aprons, proposal airport.

137YDKP	Diagnostics of rail transport construction	Z	2

Diagnostics of the railway track - Czech regulation 177/1995 as amended, regulations for assessing the operability of the lines, means of diagnostics of the railway superstructure and switches, railway substructure - ballast bed. Measurement of other track parameters. Examples of defects and shortcomings of the railway track.

220YLPG	Geotechnical laboratory	Z	2

A course dealing with practical exercise on geotechnical tests in laboratory and in-situ activities (The Josef underground laboratory, http://ceg.fsv.cvut.cz). It focuses on laboratory determination of soil and rock parametres neccessary for geotechnical calculations and design - basic physical and hydrophysical properties, strength and deformation parametres.

Code of the group: NK20170200_1
Name of the group: obor Konstrukce a dopravní stavby, povinně volitelné předměty, letní semestr
Requirement credits in the group: In this group you have to gain at least 4 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 4
Note on the group: volitelný předmět

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
101YMCD	**Methods of Time Discretization** *Petr Mayer* ***František Bubeník*** *František Bubeník (Gar.)*	Z	2	1P+1C	L	S
101YMST	**Mathematical statistics for technicians** *Daniela Jarušková* ***Jana Nosková*** *Daniela Jarušková (Gar.)*	Z	2	1P+1C	L	S
101YNUM	**Numerical Methods** *Ivana Pultarová, Martin Ladecký, Liya Gaynutdinova* ***Ivana Pultarová*** *Ivana Pultarová (Gar.)*	Z	2	1P+1C	L	S
126YBIM	**Building Information Modelling - Fundamentals** *Petr Matějka, Robert Bouška* ***Robert Bouška*** *Petr Matějka (Gar.)*	Z	2	2C	L	S
132KMAT	**Composite materials** *Michal Šejnoha* ***Michal Šejnoha*** *Michal Šejnoha (Gar.)*	Z,ZK	5	2P+2C		S
132YDSK	**Diagnostics of Building Structures** *Michal Polák* ***Michal Polák*** *Michal Polák (Gar.)*	Z	2	1P+1C	L	S
132YMCK	**Micromechanics of Cement-Based Composites** *Vít Šmilauer* ***Vít Šmilauer*** *Vít Šmilauer (Gar.)*	Z	2	1P+1C	L	S
132YNAK	**Nonlinear Analysis of Materials and Structures** *Bořek Patzák, Petr Kabele, Daniel Rypl* ***Daniel Rypl*** *Daniel Rypl (Gar.)*	Z	2	1P+1C	L	S
132YNA2	**Numerical Analysis of Structures 2** *Bořek Patzák* ***Bořek Patzák*** *Bořek Patzák (Gar.)*	Z,ZK	4	2P+1C	L	S
132YUPM	**General Principles of Mechanics** *Milan Jirásek* ***Milan Jirásek*** *Milan Jirásek (Gar.)*	Z,ZK	4	2P+1C	L	S
133YATK	**Applied Theory of Structures** *Radek Hájek, Lukáš Vráblík* ***Lukáš Vráblík*** *Lukáš Vráblík (Gar.)*	Z,ZK	4	2P+1C	L	S
133YPNB	**Fire desgn og concrete and mnsory structures** *Radek Štefan, Martin Benýšek* ***Radek Štefan*** *Radek Štefan (Gar.)*	Z	2	1P+1C	L	S
133YRZM	**Reconstruction and strengthening of bridges** *Michal Drahorád* ***Michal Drahorád*** *Michal Drahorád (Gar.)*	Z	2	1P+1C	L	S
133YVHB	**Ultrahigh Performance Concretes** *Josef Fládr* ***Josef Fládr*** *Josef Fládr (Gar.)*	Z	2	1P+1C	L	S
134YHNK	**Stainless steel and aluminium structures** *Josef Macháček, František Wald* ***František Wald*** *Josef Macháček (Gar.)*	Z	2	1P+1C	L	S
134YNDK	**Load-bearing timber roof constructions** *Karel Mikeš* ***Karel Mikeš*** *Karel Mikeš (Gar.)*	Z	2	1P+1C	L	S
134YPOD	**Fire Resistance of Steel and Timber Structures** *Zdeněk Sokol* ***Zdeněk Sokol*** *Zdeněk Sokol (Gar.)*	Z	2	1P+1C	L	S
134YSDO	**Connections of steel and timber structures** *František Wald, Robert Jára* ***Robert Jára*** *František Wald (Gar.)*	Z,ZK	4	2P+1C	L	S
134YSKO	**Special steel structures** *Jakub Dolejš* ***Jakub Dolejš*** *Jakub Dolejš (Gar.)*	Z,ZK	4	2P+1C	L	S
135YGEM	**Geotechnical monitoring** *Jan Záleský* ***Jan Záleský*** *Jan Záleský (Gar.)*	Z	2	1P+1C	L	S
135YGZP	**Environmental Geotechnics** *Ivan Vaníček* ***Kateřina Kovářová*** *Ivan Vaníček (Gar.)*	Z	2	1P+1C		S

135YMPK	**Mechanics of underground structures** *Jan Pruška, Alexandr Butovič, Jiří Barták* ***Alexandr Butovič*** *Jan Pruška (Gar.)*	Z	2	1P+1C	L	S
135YZKS	**Soil structures** *Ivan Vaníček, Martin Vaníček* ***Ivan Vaníček*** *Ivan Vaníček (Gar.)*	Z	2	1P+1C	L	S
136YMVZ	**Pavement mechanics** *Ludvík Vébr* ***Ludvík Vébr*** *Ludvík Vébr (Gar.)*	Z	2	1P+1C	L	S
136YPPK	**Intersection Highway Design** *Jaromíra Ježková* ***Jaromíra Ježková*** *Jaromíra Ježková (Gar.)*	KZ	2	2C	L	S
137YEAD	**Ecological Aspects of Transport** *Petra Váňová, Lenka Lomoz* ***Lenka Lomoz*** *Lenka Lomoz (Gar.)*	Z	2	1P+1C	L	S
137YAZS	**Project - Progressive application of substructure** *Vít Lojda* ***Vít Lojda*** *Vít Lojda (Gar.)*	KZ	2	2C	L	S

Characteristics of the courses of this group of Study Plan: Code=NK20170200_1 Name=obor Konstrukce a dopravní stavby, povinně volitelné předměty, letní semestr

101YMCD	Methods of Time Discretization	Z	2

The course is devoted to a universal and very effective method for solving problems involving time, the so-called evolutionary problems, especially for partial differential equations with a time variable. This method represents a modern approach to modeling and solving engineering tasks. These problems, both linear and non-linear, model events in many engineering fields, such as heat conduction, oscillations, also in rheology and other parts.

101YMST	Mathematical statistics for technicians	Z	2

Inferential statistics. Theory of probability. Random variables and its characteristics. Basic methods of mathematical statistics.

101YNUM	Numerical Methods	Z	2

Numerical computing in applied mathematics: course for beginners.

126YBIM	Building Information Modelling - Fundamentals	Z	2

Subject deals with Building Information Modeling (BIM) topic as with the modern tool for management and operation of construction projects. It is oriented to handling basic relevant software (Autodesk Revit, Autodesk Navisworks) and especially to understanding meaning of BIM in current construction business and its future and importance in specific phases of construction projects.

132KMAT	Composite materials	Z,ZK	5

The course introduces the theory of homogenization which allows prediction of effective properties of heterogeneous materials by exploiting both classical micromechanics and numerical modeling of periodic structures. Grounding on the theory of elasticity the students will become familiar with the behavior of general anisotropic materials. Application of theoretical formulations is illustrated on several examples of heterogeneous structures encountered in civil as well as mechanical engineering. Such structures include wood, masonry, asphalt mixtures, fibrous composites, metal foams, etc. Determination of effective elastic (Hooke's law) will be accompanied by homogenization of parameters governing various mass transport processes assuming steady state heat flow (Fourier's law, coefficient of thermal conduction) and moisture (Fick's law, coefficient of diffusion). These basic concepts will be eventually presented in the framework of multi-scale homogenization. The students will also become familiar with the CELP software intended for a quick estimate of properties of mutli-phase material systems.

132YDSK	Diagnostics of Building Structures	Z	2
132YMCK	Micromechanics of Cement-Based Composites	Z	2

Cement composites form the basis of today's civilization and construction industry; traditional concrete is now the most produced material in the world with an average consumption of over 1 m3 / person / year. The properties of these composites can be changed in a wide range according to needs - compressive strength up to 800 MPa, creep, shrinkage, resistance to environmental influences or the formation of cracks. The subject presents a multi-scale description of these cement composites, from the atomic level to the building structure level. It includes an overview of experimental methods used to identify properties, analytical and numerical methods for modeling hydration, heat transfer, elasticity, creep and strength across different levels of resolution. The subject is supplemented by a whole range of engineering applications on which these methods have been successfully used - designs and optimization of massive concrete structures (arches with cooling, foundation blocks, guide faces of dams), cement concrete highway covers with extended durability, sprayed concrete with replacement of Portland cement with calcium sulphide binders, innovative crack-resistant materials, alkali-activated fly ash. Most of the used numerical models have been implemented in the open-source software OOFEM, which you can freely use, for example, for your prediction of temperatures during hydration, stress and crack analysis including the influence of reinforcement and boundary conditions.

132YNAK	Nonlinear Analysis of Materials and Structures	Z	2

Students become acquainted with the concepts of linear stability and calculation of elastoplastic load capacity. Linear stability - evaluation of the critical load and buckling shape. Analysis of structures according to the 2nd order theory - equilibrium conditions on a deformed structure, initial stress matrix. Elastoplastic analysis of structures - evaluation of the limit load capacity, distribution of internal forces at the limit state - static incremental method, kinematic method. Solving stability and elastoplasticity problems by means of a general-purpose finite element program.

132YNA2	Numerical Analysis of Structures 2	Z,ZK	4

Advanced course on finite element method. Formulation of plate elements suitable for thin and thick plates, plates on elastic foundation. Introduction to nonlinear problems: geometrical and material nonlinearity, solution methods, implementation aspects.

132YUPM	General Principles of Mechanics	Z,ZK	4

Tensors, differential operators and their application in mechanics, Gauss and Green theorems. General structure of the basic equations of linear and nonlinear statics, energy and duality. Principle of virtual work (power), variational principles (Lagrange, Castigliano, Hellinger-Reissner, Hu-Washizu) and their application to continuous and discrete models of beams, frames, plates, walls and three-dimensional bodies.

133YATK	Applied Theory of Structures	Z,ZK	4

Detailed introduction to theoretical approaches to the effects of creep and shrinkage on structures. Principles of time-dependent analysis. Methods for the analysis of thin-walled concrete structures, stability theory.

133YPNB	Fire desgn og concrete and mnsory structures	Z	2

The course is focused on fire resistance of concrete and masonry structures: concrete and concrete structures exposed to fire, design rules, thermal analysis, loads, design principles, design methods, material properties of concrete and steel reinforcement at high temperatures, fire design of masonry structures.

133YRZM	Reconstruction and strengthening of bridges	Z	2

The course focuses on the assessment of existing concrete and masonry bridges, determination of carrying capacity, design of rehabilitation and strengthening.

133YVHB	Ultrahigh Performance Concretes	Z	2

The aim of the course is to present a special type of concrete that achieves great strength and high durability, which enables the realization of very thin structures. The components of high performance concrete are presented and the main differences in composition of ordinary concrete and HPC. A large part of the lectures is devoted to the components of high performance concrete, the composition and the method of manufacturing, which are subsequently accompanied by laboratory exercises, where the students can experience the theoretical knowledge in practical use.

134YHNK	Stainless steel and aluminium structures	Z	2
Subject YHNK covers two parts: the first concerns design of structures from aluminium alloys, the second deals with stainless steel structures. Structures of aluminium alloys: Introduction and practice in designing of aluminium structures. Structures of stainless steel: Evolution of stainless steel materials/structures and examples of realized structures. Stainless steels suitable for structures are described in a detail, including their properties. Dissimilarities in assessments of members under common loadings with respect to low-carbon steels is described for both ultimate and serviceability limit states. In the end the possibilities concerning connections of stainless steel members, erection and installation of stainless steel members are described.			
134YNDK	Load-bearing timber roof constructions	Z	2
System of roofs structures. Creation of numerical models for assessment of internal forces and deformations for main different roof systems and structures. Analysis of the static function and behaviour of main individual elements and their design. Historic structures and their reconstruction. Designing typical structural details based on carpentry joints. We will discuss also using modern methods of joining elements of timber structures.			
134YPOD	Fire Resistance of Steel and Timber Structures	Z	2
The class gives introduction to fire modeling, fire safety and fire resistance of steel, steel-concrete composite and timber structural elements.			
134YSDO	Connections of steel and timber structures	Z,ZK	4
The subject allows insight and ability to apply the knowledge related to structural connections and its application by software.			
134YSKO	Special steel structures	Z,ZK	4
The course follows the basic education in the field of steel structures. It focuses on a design of some special construction types, includes parts: High-strength steel construction, Crane supporting structures, Silos and Rope structures.			
135YGEM	Geotechnical monitoring	Z	2
Monitoring of structures and subsoil as a tool for confirmation of assumptions made at the design stage, selection of input data and reliability assurance. Relation between application of sensors and gathered data for back analyses and modelling of field performance.			
135YGZP	Environmental Geotechnics	Z	2
Environment. Natural factors of mass movements. Mass movements caused by human activities - landfills, tailings, dumps, underground storage sites including radioactive waste. Environmental changes during construction. Protection of historic towns and monuments. Aspects of site selection, information sources, conflicts of interest. The perspective of the engineer and the naturalist is presented.			
135YMPK	Mechanics of underground structures	Z	2
The course is a continuation of the course Underground structures and rock mechanics, which is part of the Bachelor's degree programme. The course deepens the knowledge in the field of underground construction and provides practical experience in the design and implementation of underground structures. The student tries out the application of the knowledge gained on a simple tunnel project. An integral part of the course is also an excursion to a completed underground construction in Prague.			
135YZKS	Soil structures	Z	2
Principles of soil structures design			
136YMVZ	Pavement mechanics	Z	2
Rise and development of road pavement mechanics, fundamental data for designing, characteristics of traffic load, thermic and water relation of subbase,load-bearing capacity of subgrade, road pavement materials, pavement design methods - partition, development and possibilities. Stress and transformation analysis on road pavement construction and subgrade, pavement design specificity for different constructional types, road pavements with special loads.			
136YPPK	Intersection Highway Design	KZ	2
Design of interchange. Based on capacity assessment, evaluation of the most suitable form of interchange and its design processing. Roundabout design.			
137YEAD	Ecological Aspects of Transport	Z	2
Negative impacts of noise and vibration on human. Assessment of varied transport noise Acoustic levels. Noise maps. Noise study. Traffic noise characteristics of different transport means. Propagation of noise. Ways of environment protection before adverse impacts of transport noise (urban, architectural, traffic-organizing, technical).			
137YAZS	Project - Progressive application of substructure	KZ	2
The content of the subject is focused on the presentation of the latest knowledge and results of research and development in the field of railway undercarriage, which have not yet entered into common practice or the regulatory base in the Czech Republic. It complements and expands students' knowledge from basic subjects Z01, Z02 and Z03.			

Name of the block: Povinně volitelné předměty, doporučení S1
Minimal number of credits of the block: 34
The role of the block: S1

Code of the group: NK20160200_2
Name of the group: obor Kostrukce a dopravní stavby, volitelný diplomový seminář
Requirement credits in the group: In this group you have to gain 4 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 4
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
101DISE	**Diploma Seminar** *Aleš Nekvinda, Jozef Bobok* ***Jozef Bobok*** *Jozef Bobok (Gar.)*	Z	4	4C	L	S1
132DISE	**Diploma Seminar** *Michal Polák, Tomáš Plachý, Matěj Lepš, Jan Zeman, Jiří Máca, Michal Šejnoha, Milan Jirásek, Martin Doškář, Jan Vorel, ...* ***Aleš Jíra***	Z	4	4C	L	S1
133DISE	**Diploma Seminar** ***Lukáš Vráblík*** *Lukáš Vráblík (Gar.)*	Z	4	4C	L	S1
134DISE	**Diploma Seminar** ***Michal Jandera*** *Pavel Ryjáček (Gar.)*	Z	4	4C		S1
135DISE	**Diploma Seminar** ***Jan Pruška***	Z	4	4C	L	S1

136DISE	**Diploma Seminar** *Petr Mondschein, Michal Uhlík, Jan Valentin, Petr Pánek, Ludvík Vébr, Jaromíra Ježková, Karel Fazekas, Jan Hradil, Tomáš Havlíček* ***Petr Mondschein*** *Jaromíra Ježková (Gar.)*	Z	4	4C		S1
137DISE	**Diploma Seminar** *Vít Lojda, Leoš Horníček, Hana Krejčiříková, Ondřej Bret, Lenka Lomoz, Martin Lidmila* ***Lenka Lomoz*** *Leoš Horníček (Gar.)*	Z	4	4C	L	S1
220DISE	**Diploma Seminar** *Jiří Svoboda, Radek Vašíček, Jaroslav Pacovský* ***Radek Vašíček*** *Jaroslav Pacovský (Gar.)*	Z	4	4C		S1

Characteristics of the courses of this group of Study Plan: Code=NK20160200_2 Name=obor Kostrukce a dopravní stavby, volitelný diplomový seminář

101DISE	Diploma Seminar	Z	4
Please contact your teacher or guarantor of this subject.			
132DISE	Diploma Seminar	Z	4
The course precedes the thesis and prepares students for writing their future thesis. The assignment of the final thesis is always individual based on the agreement of the teacher and the student. The vast majority of assignments are connected with the scientific and research activities of the respective employee. The output of the solution may be a brief research study of the given problem, experimental activity, programming and others according to the respective assignment.			
133DISE	Diploma Seminar	Z	4
The topic of the assignment is individual, mostly related to the expected topic of the Diploma Thesis.			
134DISE	Diploma Seminar	Z	4
Semestral project of master study.			
135DISE	Diploma Seminar	Z	4
Deepening of knowledge in the field according to the choice of the assignment as preparation for the Diploma Thesis, study of specialized literature and knowledge from implementations, preparation of theoretical research and variant solutions , or preparation for the implementation of an experimental program.			
136DISE	Diploma Seminar	Z	4
Preparation of the basic documents for the assignment of a master thesis and their processing. Lectures by experts from the practice (road design, construction technology, information about new procedures and software)			
137DISE	Diploma Seminar	Z	4
After agreement with the teacher, a preliminary thesis topic is determined. The student should responsibly prepare for the creation of the work itself by studying the documents, creating research, and obtaining background materials (e.g. maps). Furthermore, he should determine the outline of the work and master the work with any measuring technique, etc.			
220DISE	Diploma Seminar	Z	4
Preparatory works on diploma thesis elaboration. Literature review, study on problematics to be solved - practical cases in geotechnical laboratory and the Josef underground laboratory (http://ceg.fsv.cvut.cz).			

Code of the group: NK20160300_1
Name of the group: obor Konstrukce a dopravní stavby, 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** *Michal Beneš, Daniela Jarušková, Milan Bořík, Jakub Šolc, Jana Nosková* ***Michal Beneš*** *Daniela Jarušková (Gar.)*	Z	30	24C	Z	S1
132DPM	**Diploma Thesis** *Bořek Patzák, Michal Polák, Tomáš Plachý, Matěj Lepš, Jan Zeman, Jiří Máca, Michal Šejnoha, Petr Kabele, Milan Jirásek, ...* ***Aleš Jíra***	Z	30	24C	Z	S1
133DPM	**Diploma Thesis** ***Martin Tipka***	Z	30	24C	Z	S1
134DPM	**Diploma Thesis** *Jakub Dolejš* ***Jakub Dolejš*** *Jakub Dolejš (Gar.)*	Z	30	24C	Z	S1
135DPM	**Diploma Thesis** *Jan Pruška, Jan Masopust* ***Jan Pruška*** *Jan Pruška (Gar.)*	Z	30	24C	Z	S1
136DPM	**Diploma Thesis** ***Petr Mondschein*** *Ludvík Vébr (Gar.)*	Z	30	24C	Z	S1
137DPM	**Diploma Thesis** *Leoš Horníček, Hana Krejčiříková* ***Lenka Lomoz*** *Leoš Horníček (Gar.)*	Z	30	24C	Z	S1
220DPM	**Diploma Thesis** *Jiří Svoboda, Radek Vašíček, Jaroslav Pacovský* ***Jiří Svoboda*** *Jiří Svoboda (Gar.)*	Z	30	24C	Z	S1

Characteristics of the courses of this group of Study Plan: Code=NK20160300_1 Name=obor Konstrukce a dopravní stavby, diplomová práce

101DPM	Diploma Thesis	Z	30
Please contact your teacher or guarantor of this subject.			
132DPM	Diploma Thesis	Z	30
In accordance with the thesis proposal.			

133DPM	Diploma Thesis	Z	30
In accordance with a thesis proposal.			
134DPM	Diploma Thesis	Z	30
Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. A study focused on research of load bearing structures may be also the topic of the the project. The project is assigned by a final project superisor individually.			
135DPM	Diploma Thesis	Z	30
In the diploma thesis, the student deals with a topic chosen by the department from those regularly announced by the department. It addresses, for example, problems related to the design and construction of geotechnical structures, civil engineering structures, special foundations for industrial, transport, housing and water management structures, earth and rock structures in complex cases and waste disposal structures. The thesis builds on and develops the findings of the thesis project.			
136DPM	Diploma Thesis	Z	30
The assigned topic of diploma theses can be a project, traffic surveys, research of selected issues with application in practice for various technical solutions of road structures, laboratory tests to verify the functionality of various materials for pavements, etc. In terms of design, the most common topics of theses are, for example, the design of a new construction or reconstruction of a selected section of a road (bypass, flyover), the design of a road network in a selected area of the city, the design of a new construction or reconstruction of intersections, the design of an airport, heliport, etc. In terms of pavement structures and road construction technologies, the most frequent topics of work are, for example, comparison of different material solutions for asphalt or concrete pavements, including the relevant composite materials or input components (binders, aggregates, etc.), assessment of the behaviour of a particular material or type of structure by laboratory methods, or carrying out simulations, etc.			
137DPM	Diploma Thesis	Z	30
The diploma thesis is the final complex work prepared by students at the end of their university studies. The diploma thesis describes the given issue in a broader context, in which the student demonstrates the ability to work independently and an engineering approach. The diploma thesis takes the form of either a project (reconstruction of a section of a railway line, study of new railway lines), a research (processing of an overview in a certain area) or a laboratory (including the execution and evaluation of specified laboratory tests), or a combined one.			
220DPM	Diploma Thesis	Z	30
Diploma thesis elaboration with possible use of geotechnical laboratory and underground facility the Josef underground laboratory (http://ceg.fsv.cvut.cz).			

List of courses of this pass:

Code	Name of the course	Completion	Credits
101DISE	Diploma Seminar	Z	4
Please contact your teacher or guarantor of this subject.			
101DPM	Diploma Thesis	Z	30
Please contact your teacher or guarantor of this subject.			
101MA04	Mathematics PS	Z,ZK	5
After elementary tools of linear algebra (matrix, determinant, Gaussian elimination) are recalled, iterative methods for solving systems of linear algebraic equations are in the focus. Then, the finite difference method and the finite element method are presented and their applications to problems based on differential equations are shown.			
101YMAV	Mathematics 4 - Selective Course	Z,ZK	5
To be added.			
101YMCD	Methods of Time Discretization	Z	2
The course is devoted to a universal and very effective method for solving problems involving time, the so-called evolutionary problems, especially for partial differential equations with a time variable. This method represents a modern approach to modeling and solving engineering tasks. These problems, both linear and non-linear, model events in many engineering fields, such as heat conduction, oscillations, also in rheology and other parts.			
101YMST	Mathematical statistics for technicians	Z	2
Inferential statistics. Theory of probability. Random variables and its characteristics. Basic methods of mathematical statistics.			
101YNUM	Numerical Methods	Z	2
Numerical computing in applied mathematics: course for beginners.			
102YFPL	Solid State Physics in Civil Engineering	Z	2
Solids, crystal structure, atomic shell theory, valence layer chemical bonds, dislocation disturbances, critical crack energy,vibration of masses, systems natural frequency of vibration and damped vibration, basics concepts of fracture mechanics, types of fracture, electron microscopes, scanning tunneling microscope, atomic force microscope, diffraction, diffraction methods, semiconductors, p-n junction, photovoltaic effect, solar cells, heat and moisture transport.			
126YBIM	Building Information Modelling - Fundamentals	Z	2
Subject deals with Building Information Modeling (BIM) topic as with the modern tool for management and operation of construction projects. It is oriented to handling basic relevant software (Autodesk Revit, Autodesk Navisworks) and especially to understanding meaning of BIM in current construction business and its future and importance in specific phases of construction projects.			
132DISE	Diploma Seminar	Z	4
The course precedes the thesis and prepares students for writing their future thesis. The assignment of the final thesis is always individual based on the agreement of the teacher and the student. The vast majority of assignments are connected with the scientific and research activities of the respective employee. The output of the solution may be a brief research study of the given problem, experimental activity, programming and others according to the respective assignment.			
132DPM	Diploma Thesis	Z	30
In accordance with the thesis proposal.			
132EADK	Experimental Analysis and Diagnostics K	KZ	3
Experiments focused on monitoring of the amount of climatic loads on building and engineering structures (wind, snow, temperature loads), diagnostics of building and engineering structures, tests carried out on physical models of building and engineering structures (model similarity laws, seismic simulations on shake tables, wind tunnel simulations of wind effects, static load tests on physical models), monitoring of building and engineering structures, static load tests (building structures, engineering structures, bridges), dynamic load tests and experimental modal analysis (building structures, engineering structures, bridges, footbridges), effects of technical seismicity, evaluation of adverse effects of vibration on the human body, assessment of the influence of building vibrations on installed machines and devices).			

132KMAT	Composite materials	Z,ZK	5
The course introduces the theory of homogenization which allows prediction of effective properties of heterogeneous materials by exploiting both classical micromechanics and numerical modeling of periodic structures. Grounding on the theory of elasticity the students will become familiar with the behavior of general anisotropic materials. Application of theoretical formulations is illustrated on several examples of heterogeneous structures encountered in civil as well as mechanical engineering. Such structures include wood, masonry, asphalt mixtures, fibrous composites, metal foams, etc. Determination of effective elastic (Hooke's law) will be accompanied by homogenization of parameters governing various mass transport processes assuming steady state heat flow (Fourier's law, coefficient of thermal conduction) and moisture (Fick's law, coefficient of diffusion). These basic concepts will be eventually presented in the framework of multi-scale homogenization. The students will also become familiar with the CELP software intended for a quick estimate of properties of mutli-phase material systems.			
132NAK	Numerical Analysis of Structures	Z,ZK	5
Variational principles of mechanics. Method of weighted residuals, conditions of convergence (continuity, integrity). Principles of FEM. Isoparametric elements, area coordinates, numerical integration. Application of method to selected 1D and 2D problems (Elasticity, heat transfer, consolidation). Algorithmic aspects of the method.			
132YDDS	Dynamics of Transport Structures	Z	2
Understanding of the problems of the Dynamics of transport structures (especially of road bridges, railway bridges and footbridges), explanation of experimental and theoretical analysis procedures - the arrangement of an experiment "in situ?, monitored parameters, measuring line, modal analysis, the monitoring systems for observation of building structure dynamics behaviour and of traffic flow characteristics, numerical methods for solving dynamical interaction between building structure and moving load, modelling of structures, traffic flow and pedestrians, dynamical wind effects, practical examples.			
132YDSK	Diagnostics of Building Structures	Z	2
132YMCK	Micromechanics of Cement-Based Composites	Z	2
Cement composites form the basis of today's civilization and construction industry; traditional concrete is now the most produced material in the world with an average consumption of over 1 m3 / person / year. The properties of these composites can be changed in a wide range according to needs - compressive strength up to 800 MPa, creep, shrinkage, resistance to environmental influences or the formation of cracks. The subject presents a multi-scale description of these cement composites, from the atomic level to the building structure level. It includes an overview of experimental methods used to identify properties, analytical and numerical methods for modeling hydration, heat transfer, elasticity, creep and strength across different levels of resolution. The subject is supplemented by a whole range of engineering applications on which these methods have been successfully used - designs and optimization of massive concrete structures (arches with cooling, foundation blocks, guide faces of dams), cement concrete highway covers with extended durability, sprayed concrete with replacement of Portland cement with calcium sulphide binders, innovative crack-resistant materials, alkali-activated fly ash. Most of the used numerical models have been implemented in the open-source software OOFEM, which you can freely use, for example, for your prediction of temperatures during hydration, stress and crack analysis including the influence of reinforcement and boundary conditions.			
132YMMO	Modern Methods of Optimization	Z	2
The course is aimed at an overview of numerical optimization methods applicable not only in the Civil Engineering area. The emphasis is put more on the introduction of driving principles, however, practical applications in MATLAB environment are also conducted during exercises.			
132YNA2	Numerical Analysis of Structures 2	Z,ZK	4
Advanced course on finite element method. Formulation of plate elements suitable for thin and thick plates, plates on elastic foundation. Introduction to nonlinear problems: geometrical and material nonlinearity, solution methods, implementation aspects.			
132YNAK	Nonlinear Analysis of Materials and Structures	Z	2
Students become acquainted with the concepts of linear stability and calculation of elastoplastic load capacity. Linear stability - evaluation of the critical load and buckling shape. Analysis of structures according to the 2nd order theory - equilibrium conditions on a deformed structure, initial stress matrix. Elastoplastic analysis of structures - evaluation of the limit load capacity, distribution of internal forces at the limit state - static incremental method, kinematic method. Solving stability and elastoplasticity problems by means of a general-purpose finite element program.			
132YSEI	Seismic Engineeering	Z	2
Basic principles of design of earthquake resistant structures. Methods of calculating the response of structures to earthquake loads according to Eurocode 8.			
132YSSK	Reliability of Structures	Z	2
The course is devoted to the reliability of elements and systems. Element reliability is time dependent while the reliability of systems is of type strength-load. Complicated cases are solved by the FORM method. Two simulation methods are introduced: Monte Carlo and LHS.			
132YUPM	General Principles of Mechanics	Z,ZK	4
Tensors, differential operators and their application in mechanics, Gauss and Green theorems. General structure of the basic equations of linear and nonlinear statics, energy and duality. Principle of virtual work (power), variational principles (Lagrange, Castigliano, Hellinger-Reissner, Hu-Washizu) and their application to continuous and discrete models of beams, frames, plates, walls and three-dimensional bodies.			
133B03D	Concrete Structures 3D	Z,ZK	5
Concrete structures with a focus on infrastructure			
133DISE	Diploma Seminar	Z	4
The topic of the assignment is individual, mostly related to the expected topic of the Diploma Thesis.			
133DPM	Diploma Thesis	Z	30
In accordance with a thesis proposal.			
133YATK	Applied Theory of Structures	Z,ZK	4
Detailed introduction to theoretical approaches to the effects of creep and shrinkage on structures. Principles of time-dependent analysis. Methods for the analysis of thin-walled concrete structures, stability theory.			
133YBEX	Concrete under Extreme Conditions	Z	2
The course is focused on concrete and concrete structures under extreme conditions.			
133YBM2	Concrete Bridges 2	Z	2
Extension of the field of concrete bridges. The technologies of bridge construction represent main part of the study. Specifications of individual structural systems.			
133YPNB	Fire desgn og concrete and mnsory structures	Z	2
The course is focused on fire resistance of concrete and masonry structures: concrete and concrete structures exposed to fire, design rules, thermal analysis, loads, design principles, design methods, material properties of concrete and steel reinforcement at high temperatures, fire design of masonry structures.			
133YPRK	Failures and Rehabilitation of Concrete Structures	Z	2
The course focuses on the description of failures of concrete structures, explanation of the causes of these failures and the design of remedial measures. Methods of strengthening existing concrete structures are also discussed. Surface repairs, strengthening of contactors, strengthening of structural elements to the effects of bending moment and shear, and foundation structures are discussed. The course appropriately combines theoretical approaches with common practice.			
133YRZM	Reconstruction and strengthening of bridges	Z	2
The course focuses on the assessment of existing concrete and masonry bridges, determination of carrying capacity, design of rehabilitation and strengthening.			

133YVHB	Ultrahigh Performance Concretes	Z	2
The aim of the course is to present a special type of concrete that achieves great strength and high durability, which enables the realization of very thin structures. The components of high performance concrete are presented and the main differences in composition of ordinary concrete and HPC. A large part of the lectures is devoted to the components of high performance concrete, the composition and the method of manufacturing, which are subsequently accompanied by laboratory exercises, where the students can experience the theoretical knowledge in practical use.			
134DISE	Diploma Seminar	Z	4
Semestral project of master study.			
134DPM	Diploma Thesis	Z	30
Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. A study focused on research of load bearing structures may be also the topic of the the project. The project is assigned by a final project superisor individually.			
134O02D	Steel Structures 2D	Z,ZK	5
Deepening of knowledge received from courses 133NNK and 134OK01. Amplifying of theoretical knowledge in the field of steel grade selection, toughness, global analysis of structures, buckling of structural systems, joint classification, and high strength steel and demanding composite steel and concrete structures. Complementation of knowledge from fire resistance of steel and composite structures and detailed design of industrial buildings and crane girders. Design of masts, towers, chimneys, tanks, silos and pipelines, technological structures, pre-stressed steel structures and basis of design from aluminium alloys and stainless steel, and cable and membrane structures.			
134YDKM	Timber structures and bridges	Z	2
Timber structures focused to national strategy of sustainable development. New timber-based materials. Structural systeme of houses and bridges. Repairing and strengthtening. Fire design. Production, protection, erection and maintenance. Design and evaluation of bridges, roofs structures in normal temperature and in fire.			
134YHNK	Stainless steel and aluminium structures	Z	2
Subject YHNK covers two parts: the first concerns design of structures from aluminium alloys, the second deals with stainless steel structures. Structures of aluminium alloys: Introduction and practice in designing of aluminium structures. Structures of stainless steel: Evolution of stainless steel materials/structures and examples of realized structures. Stainless steels suitable for structures are described in a detail, including their properties. Dissimilarities in assessments of members under common loadings with respect to low-carbon steels is described for both ultimate and serviceability limit states. In the end the possibilities concerning connections of stainless steel members, erection and installation of stainless steel members are described.			
134YNDK	Load-bearing timber roof constructions	Z	2
System of roofs structures. Creation of numerical models for assessment of internal forces and deformations for main different roof systems and structures. Analysis of the static function and behaviour of main individual elements and their design. Historic structures and their reconstruction. Designing typical structural details based on carpentry joints. We will discuss also using modern methods of joining elements of timber structures.			
134YPOD	Fire Resistance of Steel and Timber Structures	Z	2
The class gives introduction to fire modeling, fire safety and fire resistance of steel, steel-concrete composite and timber structural elements.			
134YROK	Extending the Life of Steel and Timber Structures	Z	2
Materials used for bearing structures. Developments in the area of regulations and standardization. Causes of defects, malfunctions, survey of objects, static assumptions of reconstruction. Possibilities of strengthening, strengthening of steel and timber structures and strengthening of connections. Using of computers in reconstructions and development of numerical models.			
134YSDO	Connections of steel and timber structures	Z,ZK	4
The subject allows insight and ability to apply the knowledge related to structural connections and its application by software.			
134YSKO	Special steel structures	Z,ZK	4
The course follows the basic education in the field of steel structures. It focuses on a design of some special construction types, includes parts: High-strength steel construction, Crane supporting structures, Silos and Rope structures.			
134YSMK	Stability and modelling of steel structures	Z	2
Subject YSMK covers two parts. The first one deals with stability and strength of steel plates, the second one with stability and strengths of steel frame structures. In the first part the historic collapses of steel structures are analysed including the importance of imperfections for a design of thin plated structures. Presented are principles of theory of buckling, linear and nonlinear theory of buckling of thin plates. The results are applied to the 4th class cross sections in harmony with Eurocode. Buckling due to normal, shear and local loadings including their combination is analysed in a detail. In the end the application of the results is shown together with design of necessary stiffeners. The second part is focused on member and structure stability. Possible global analysis methods are presented together with methods for compression and bending interaction for slender members. In detail, specific cases of lateral torsional buckling are explained including also tapered members.			
135DISE	Diploma Seminar	Z	4
Deepening of knowledge in the field according to the choice of the assignment as preparation for the Diploma Thesis, study of specialized literature and knowledge from implementations, preparation of theoretical research and variant solutions , or preparation for the implementation of an experimental program.			
135DPM	Diploma Thesis	Z	30
In the diploma thesis, the student deals with a topic chosen by the department from those regularly announced by the department. It addresses, for example, problems related to the design and construction of geotechnical structures, civil engineering structures, special foundations for industrial, transport, housing and water management structures, earth and rock structures in complex cases and waste disposal structures. The thesis builds on and develops the findings of the thesis project.			
135DYGK	Dynamics of geotechnical structures	Z,ZK	4
The course builds on the knowledge acquired by students of the Dynamics of Building Structures course. The student will get acquainted with the determination of the loading of geotechnical structures from natural and technical seismicity, will get an overview of the properties of dynamically loaded soils and rocks, including the procedures for determining these properties. In addition, the student will learn the basic procedures for assessing the effects of technical seismicity and earthquakes on selected geotechnical structures (slab foundations, frame and retaining walls, embankments, slopes, tunnels).			
135GET	Geotechnics	Z,ZK	5
Familiarization with specific issues of building foundation, mastering the basic methods of technology of implementation of individual elements and structures and the use of methods of their static assessment.			
135YGEM	Geotechnical monitoring	Z	2
Monitoring of structures and subsoil as a tool for confirmation of assumptions made at the design stage, selection of input data and reliability assurance. Relation between application of sensors and gathered data for back analyses and modelling of field performance.			
135YGSM	Geotechnical Software for Numerical modelling	Z	2
Students get acquainted with the Finite Element Method, the currently dominant tool for numerical modeling in Geotechnics. Emphasis is placed on introducing the basic principles of the Finite Element Method and their subsequent application to selected problems of Geotechnical Engineering. The course summarises the types of finite elements used in geotechnical applications, material models suitable for the description of soil deformation, and selected specifics associated with numerical modeling in geotechnics. This knowledge is further applied in the modeling of foundation, embedded walls, and stability problems.			

135YGZP	Environmental Geotechnics	Z	2
Environment. Natural factors of mass movements. Mass movements caused by human activities - landfills, tailings, dumps, underground storage sites including radioactive waste. Environmental changes during construction. Protection of historic towns and monuments. Aspects of site selection, information sources, conflicts of interest. The perspective of the engineer and the naturalist is presented.			
135YMPK	Mechanics of underground structures	Z	2
The course is a continuation of the course Underground structures and rock mechanics, which is part of the Bachelor's degree programme. The course deepens the knowledge in the field of underground construction and provides practical experience in the design and implementation of underground structures. The student tries out the application of the knowledge gained on a simple tunnel project. An integral part of the course is also an excursion to a completed underground construction in Prague.			
135YZAL	Basics of mining	Z	2
The Fundamentals of Quarrying course introduces students to all the essential aspects of aggregate mining, an important part of the national economy, in a concise and understandable way. Aggregates extracted and processed in various ways are essential raw materials for most construction industries.			
135YZKS	Soil structures	Z	2
Principles of soil structures design			
136DISE	Diploma Seminar	Z	4
Preparation of the basic documents for the assignment of a master thesis and their processing. Lectures by experts from the practice (road design, construction technology, information about new procedures and software)			
136DPM	Diploma Thesis	Z	30
The assigned topic of diploma theses can be a project, traffic surveys, research of selected issues with application in practice for various technical solutions of road structures, laboratory tests to verify the functionality of various materials for pavements, etc. In terms of design, the most common topics of theses are, for example, the design of a new construction or reconstruction of a selected section of a road (bypass, flyover), the design of a road network in a selected area of the city, the design of a new construction or reconstruction of intersections, the design of an airport, heliport, etc. In terms of pavement structures and road construction technologies, the most frequent topics of work are, for example, comparison of different material solutions for asphalt or concrete pavements, including the relevant composite materials or input components (binders, aggregates, etc.), assessment of the behaviour of a particular material or type of structure by laboratory methods, or carrying out simulations, etc.			
136S03D	Road construction 3D	Z,ZK	5
Introduction to urban engineering, solutions in built-up areas - reconstruction. Parking - solution methods, technical parameters and requirements, garages. Bus stations and bus stops. Public mass transport and its preferences. Pedestrian and bicycle traffic. Traffic signs. Adaptations for the blind and partially sighted, barrier-free adaptations. Utilities.			
136S04D	Road construction 4D	Z,ZK	4
Course 13604D is the final professional course for students who have chosen to specialization in road construction. The course deepens the knowledge previously acquired in the field of technologies and technical solutions of road structures including pavements and extends it to other special or otherwise specific technologies. The student will be introduced to key technologies for asphalt pavements, concrete pavements, stone paved pavements and bridge pavements.			
136YEES	Environmental Aspects and Esthetics of Road Structures	Z	2
Terminology of evironmental terms, Laws 114/1991 and 100/2000, Detailed description of the EIA process from the point of view of the investor, the designer and the public, physical principles of acoustics, noise from traffic and anti-noise measures, emissions and immissions from traffic, historical development of emitted pollutants on characteristic roads in the relationship between increasing traffic intensity and decreasing emissions from better-quality vehicles, animal migration and its reasons, ways of financing road construction and maintenance according to categories and owners, functioning of municipal and city authorities, competence of mayors, councils, councils and officials of the Department of Transport and Construction, advantages and risks transition to electric cars, technical, economic and environmental aspects and risks, issues of transition to hydrogen cells, history of highway construction in the Czech Republic, basics of automobile traffic modeling, aesthetics of off-road road design, landscape profile considerations, relationships between directional and height profile, most common mistakes in proposals, risks of ill-advised acceptance of data from CRMV for transport ex numbers, the principle of determining the dynamic composition of the vehicle fleet, the differences between static and dynamic composition in the data.			
136YLET	Airports	Z	2
Types of airports, organization, data about airports, legislature, choice notions, movement of aeroplanes, flight and touch - down, assesment longitude RWY,aerodrome code, geometric characteristics , ACN / PCN, protective zone, visual aids, traffic processes at the airport, structureof terminals and aprons, proposal airport.			
136YMVZ	Pavement mechanics	Z	2
Rise and development of road pavement mechanics, fundamental data for designing, characteristics of traffic load, thermic and water relation of subbase,load-bearing capacity of subgrade, road pavement materials, pavement design methods - partition, development and possibilities. Stress and transformation analysis on road pavement construction and subgrade, pavement design specificity for different constructional types, road pavements with special loads.			
136YPPK	Intersection Highway Design	KZ	2
Design of interchange. Based on capacity assessment, evaluation of the most suitable form of interchange and its design processing. Roundabout design.			
137DISE	Diploma Seminar	Z	4
After agreement with the teacher, a preliminary thesis topic is determined. The student should responsibly prepare for the creation of the work itself by studying the documents, creating research, and obtaining background materials (e.g. maps). Furthermore, he should determine the outline of the work and master the work with any measuring technique, etc.			
137DPM	Diploma Thesis	Z	30
The diploma thesis is the final complex work prepared by students at the end of their university studies. The diploma thesis describes the given issue in a broader context, in which the student demonstrates the ability to work independently and an engineering approach. The diploma thesis takes the form of either a project (reconstruction of a section of a railway line, study of new railway lines), a research (processing of an overview in a certain area) or a laboratory (including the execution and evaluation of specified laboratory tests), or a combined one.			
137YAZS	Project - Progressive application of substructure	KZ	2
The content of the subject is focused on the presentation of the latest knowledge and results of research and development in the field of railway undercarriage, which have not yet entered into common practice or the regulatory base in the Czech Republic. It complements and expands students' knowledge from basic subjects Z01, Z02 and Z03.			
137YDKP	Diagnostics of rail transport construction	Z	2
Diagnostics of the railway track - Czech regulation 177/1995 as amended, regulations for assessing the operability of the lines, means of diagnostics of the railway superstructure and switches, railway substructure - ballast bed. Measurement of other track parameters. Examples of defects and shortcomings of the railway track.			
137YEAD	Ecological Aspects of Transport	Z	2
Negative impacts of noise and vibration on human. Assessment of varied transport noise Acoustic levels. Noise maps. Noise study. Traffic noise characteristics of different transport means. Propagation of noise. Ways of environment protection before adverse impacts of transport noise (urban, architectural, traffic-organizing, technical).			
137Z02D	Railway structures 2D	Z,ZK	5
Track design of individual types of railway stations, structural elements of railway stations, equipment for passenger and freight transport, connection to the European railway network, modernisation and optimisation of railway lines, design of tram and metro lines, ecological impacts of rail transport.			
137Z03D	Railway Structures 3D	Z,ZK	4
The subject is aimed at a detailed introduction to the construction and maintenance of railway lines. Students are introduced to working procedures and mechanization tools that are used for the construction of the railway bottom and top and for the establishment and maintenance of the geometrical position of the track.			

220DISE	Diploma Seminar	Z	4
Preparatory works on diploma thesis elaboration. Literature review, study on problematics to be solved - practical cases in geotechnical laboratory and the Josef underground laboratory (http://ceg.fsv.cvut.cz).			
220DPM	Diploma Thesis	Z	30
Diploma thesis elaboration with possible use of geotechnical laboratory and underground facility the Josef underground laboratory (http://ceg.fsv.cvut.cz).			
220YLPG	Geotechnical laboratory	Z	2
A course dealing with practical exercise on geotechnical tests in laboratory and in-situ activities (The Josef underground laboratory, http://ceg.fsv.cvut.cz). It focuses on laboratory determination of soil and rock parametres neccessary for geotechnical calculations and design - basic physical and hydrophysical properties, strength and deformation parametres.			

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