Study plan

Name of study plan: Civil Engineering

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: valid starting in 2023/24

Name of the block: Compulsory courses
Minimal number of credits of the block: 42
The role of the block: Z

Code of the group: ND20230100
Name of the group: Civil Engineering, 1st semester
Requirement credits in the group: In this group you have to gain at least 21 credits
Requirement courses in the group: In this group you have to complete at least 5 courses
Credits in the group: 21
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
101MTST	**Mathematical Statistics** *Martin Hála* ***Martin Hála*** *Martin Hála (Gar.)*	Z,ZK	3	2P+1C	Z	z
124BS04	**Building Structures 4** *Vladimír Žďára* ***Vladimír Žďára*** *Vladimír Žďára (Gar.)*	Z,ZK	4	2P+2C	Z	z
132NAST	**Numerical Analysis of Structures** *Jan Zeman, Tomáš Krejčí* ***Jan Zeman*** *Jan Zeman (Gar.)*	Z,ZK	5	2P+2C	Z	z
133CM03	**Concrete and Masonry Structures 3** *Marek Foglar* ***Marek Foglar*** *Marek Foglar (Gar.)*	Z,ZK	5	2P+2C	Z	z
134ST02	**Steel Structures 2** *Jiří Mareš* ***Jiří Mareš*** *Jiří Mareš (Gar.)*	Z,ZK	4	2P+2C	Z	z

Characteristics of the courses of this group of Study Plan: Code=ND20230100 Name=Civil Engineering, 1st semester

101MTST	Mathematical Statistics	Z,ZK	3

Advanced methods of mathematical statistics, notions of probability, discrete and continuous random variables, multidimensional distributions and estimates of distribution parameters. Multidimensional regression and submodel testing. Different types of continuous distributions. Multidimensional distribution. Time series, especially stationary time series and their study in time and frequency domain.

124BS04	Building Structures 4	Z,ZK	4

The subject is focused on the complex design of load-bearing structures, their interaction with the surrounding environment. In the first part of the subject, the attention is focused on the issue of the mutual interaction of load-bearing structures and the negative interactions between load-bearing and non-load-bearing systems. The effects of non-force loads, temperature and volume changes, properties of structural materials are discussed. The second part of the subject is focused on the design of load-bearing structures with regard to the effects of wind, the effects of non-rigid support of walkable structures and the issue of expansion of non-load-bearing structures. The last part is devoted to the specific action of water and the protection of the building from its effects.

132NAST	Numerical Analysis of Structures	Z,ZK	5

Overview of direct stiffness method of structural mechanics. Weak solution of one-dimensional elasticity equations. Galerkin method, Gauss integration, principle of the Finite Element method. Steady state heat conduction in one dimension. Two-dimensional heat conduction problem, triangular finite elements. Two-dimensional elasticity problems. Convergence of FEM, error estimates.

133CM03	Concrete and Masonry Structures 3	Z,ZK	5

Prestressed concrete structures, shell structures, prestressed cable structures, shear and torsion, load carrying capacity of bridges, design according to older standards and code provisions

134ST02	Steel Structures 2	Z,ZK	4

The course gives the basic information to steel structural design including detailing and advanced materials and ctructural solutions. The main focus is on the industrial structures including pipelines, silos, cranes, masts and towers.

Code of the group: ND20230200

Name of the group: Civil Engineering, 2nd semester
Requirement credits in the group: In this group you have to gain at least 21 credits
Requirement courses in the group: In this group you have to complete at least 5 courses
Credits in the group: 21
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
132DS01	**Dynamics of Structures** *Jaroslav Kruis* ***Jaroslav Kruis*** *Jaroslav Kruis (Gar.)*	Z,ZK	5	2P+2C	L	z
132EXAN	**Experimental Analysis** *Tomáš Plachý* ***Tomáš Plachý*** *Tomáš Plachý (Gar.)*	KZ	3	1P+2C	L	z
133CM04	**Concrete Structures 4** *Yuliia Khmurovska, Petr Štemberk* ***Petr Štemberk*** *Petr Štemberk (Gar.)*	Z,ZK	5	2P+2C	L	z
134TS02	**Timber Structures 2** *Karel Mikeš* ***Jakub Dolejš*** *Karel Mikeš (Gar.)*	Z,ZK	4	2P+1C	L	z
135FS02	**Foundation of Structures 2** *Jan Záleský* ***Jan Záleský*** *Jan Záleský (Gar.)*	Z,ZK	4	2P+2C	L	z

Characteristics of the courses of this group of Study Plan: Code=ND20230200 Name=Civil Engineering, 2nd semester

132DS01	Dynamics of Structures	Z,ZK	5
The course is devoted to vibration of structures caused by various types of load.			
132EXAN	Experimental Analysis	KZ	3
Experiments aimed at monitoring the magnitude of climatic loads on building structures (wind, snow, temperature loads), diagnostics of building structures, tests carried out on physical models of building structures (laws of model similarity, simulation of earthquakes on shake tables, simulation of wind effects in wind tunnels, static load tests on physical models), monitoring of building structures, static load tests (civil engineering structures, industrial structures, bridge structures), dynamic load tests and dynamic informative tests (civil engineering structures, industrial structures, bridge structures, footbridges, effects of technical seismicity, assessment of adverse effects of vibrations on the human body, assessment of the effect of vibrations of the structure on installed technological equipment).			
133CM04	Concrete Structures 4	Z,ZK	5
The course is focused on the following areas: New approach to the design of bending, shear, torsion, punching Application of plastic theory in the concrete design Computer analysis of concrete structures Non-linear analysis of concrete structures Probabilistic design Advanced concrete structures			
134TS02	Timber Structures 2	Z,ZK	4
The course brings an integrative approach to structural wood design that considers the design of the individual wood members in the context of the complete wood structure so that all of the structural components and connectors work together in providing strength.			
135FS02	Foundation of Structures 2	Z,ZK	4
Advanced design approaches for selected types of foundation pits and footings, design based on soil - structure interaction.			

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 8
The role of the block: S

Code of the group: ND20230100_2
Name of the group: Civil Engineering, Optional subjects, 1st semester
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 2 courses
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
102FTB	**Thermomechanics** *Vítězslav Vydra* ***Vítězslav Vydra*** *Vítězslav Vydra (Gar.)*	Z	2	2P	Z	s
124DSHB	**Diagnosis and Surveying of Historical Buildings** *Eva Burgetová* ***Eva Burgetová*** *Eva Burgetová (Gar.)*	Z	2	1P+1C	Z	s
124EOB1	**Seminar on Energy-optimized Buildings 1** *Jan Tywoniak* ***Jan Tywoniak*** *Jan Tywoniak (Gar.)*	ZK	3	1P+1C	Z	s
124IBUD	**Integrated Building Design** *Antonín Lupíšek* ***Antonín Lupíšek*** *Antonín Lupíšek (Gar.)*	Z	2	2P	Z	s
132MMO	**Modern Methods of Optimization** *Jan Zeman, Matěj Lepš* ***Jan Zeman*** *Matěj Lepš (Gar.)*	Z	2	1P+1C	Z	s
133YBBD	**Basis of Bridges Design** *Roman Lenner* ***Roman Lenner*** *Roman Lenner (Gar.)*	Z	2	1P+1C	Z	s
134FRST	**Fire Resistance of Steel and Timber Structures** *Petr Kuklík, František Wald* ***František Wald*** *František Wald (Gar.)*	Z	2	1P+1C	Z	s
134STB	**Steel bridges** *Pavel Ryjáček* ***Pavel Ryjáček*** *Pavel Ryjáček (Gar.)*	Z	2	1P+1C	Z	s

Characteristics of the courses of this group of Study Plan: Code=ND20230100_2 Name=Civil Engineering, Optional subjects, 1st semester

102FTB	Thermomechanics	Z	2
This course will concentrate on basic principles of transport of heat and mass (conduction, convection, radiation, heat pumps; transport of moist in building materials) with practical examples such as heat loss of a pipe, solar heating/cooling systems and heat loss thru a window (two plates of glass with a gas between). An excursion to a large solar-cooling installation with a solar-powered heat pump is a part of the course.			
124DSHB	Diagnosis and Surveying of Historical Buildings	Z	2
Course sets out key consideratons and implications which require structure assessment. The course provides an objective framework and methodical and systematic approach to surveying of historic buildings. (structural diagnosis, preliminary and comprehensive survey, visual inspection, site inspections, laboratory tests, investigation kits, types of defects and damages, symptoms, manifestation, significance, criticality, reason for failures case studies)			
124EOB1	Seminar on Energy-optimized Buildings 1	ZK	3
Introduction in the theory and practice of the design of low-energy buildings of different categories. Lectures and workshops			
124IBUD	Integrated Building Design	Z	2
The main objective of the subject Integrated Building Design is to get an complex overview of the principles of integrated buildings design, life cycle assessment of buildings, evaluation of building performance, green/sustainable certificaition systems and understand environmental, social and economic aspects of the built environment.			
132MMO	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.			
133YBBD	Basis of Bridges Design	Z	2
The course Basis of Bridge Design is focused on principal problems related to design of bridges - spatial arrangement and equipment of road and railway bridges, types of bridge structures and technologies of construction of concrete bridges.			
134FRST	Fire Resistance of Steel and Timber Structures	Z	2
The aim of this course is to give students an understanding of the design methods of structures at accidental situations, fire and explosion. The course is focussed on design methods involved in fire design: prediction of fire scenario, evaluation of fire load, calculation of gas temperatures in the fire compartment and structural analysis at elevated temperature. Special attention is paid to fire modelling when several design models is presented including nominal temperature curves, simple models and advanced models.			
134STB	Steel bridges	Z	2
The subject describes the basics of the design of steel and composite bridges.			

Code of the group: ND20230200_2
Name of the group: Civil Engineering, Optional subjects, 2nd semester
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 2 courses
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
101NMT	**Numerical Methods** *Petr Mayer* ***Petr Mayer*** *Petr Mayer (Gar.)*	Z	2	1P+1C	L	S
124BRA	**BIM - Revit Architecture CE** *Pavel Chour, Renáta Hoďánková* ***Pavel Chour*** *Pavel Chour (Gar.)*	Z	2	1P+1C	L	S
125TIE	**Energy and Indoor Environment** *Karel Kabele, Zuzana Veverková, Pavla Dvořáková* ***Karel Kabele*** *Karel Kabele (Gar.)*	ZK	2	2P	L	S
125YATH	**Applied Thermomechanics** *Daniel Adamovský* ***Daniel Adamovský*** *Daniel Adamovský (Gar.)*	Z	2	1P+1C	Z,L	S
128PMDB	**Process Modeling and Data Formats for BIM** *Jiří Kaiser* ***Jiří Kaiser*** *Jiří Kaiser (Gar.)*	Z,ZK	4	1P+2C	Z,L	S
132MAC	**Microscopy and Phase Analysis of Construction Mat.** *Lubomír Kopecký* ***Lubomír Kopecký*** *Lubomír Kopecký (Gar.)*	Z	2	1P+1C	Z,L	S
133CASD	**Computer Aided Structural Design** *Josef Novák* ***Josef Novák*** *Josef Novák (Gar.)*	Z	2	1P+1C	Z,L	S
133YCB	**Concrete Bridges** *Roman Lenner* ***Roman Lenner*** *Roman Lenner (Gar.)*	Z,ZK	4	2P+2C	L	S
134GSTR	**Glass Structures** *Martina Eliášová* ***Martina Eliášová*** *Martina Eliášová (Gar.)*	Z	2	1P+1C	L	S
134SAL	**Stainless Steel and Aluminium Structures** *Michal Jandera* ***Michal Jandera*** *Michal Jandera (Gar.)*	Z	2	1P+1C	L	S
135CMGE	**Computing and Computer Modelling in Geotechnical Eng.** *Jan Salák, Matouš Hilar, Alena Zemanová* ***Matouš Hilar***	Z	2	1P+1C	L	S

Characteristics of the courses of this group of Study Plan: Code=ND20230200_2 Name=Civil Engineering, Optional subjects, 2nd semester

101NMT	Numerical Methods	Z	2
The introduction to the basic numerical methods. Great attention is paid to methods for solving systems of linear equations. Further we will study methods of approximation of functions and numerical quadrature. Finally, methods for solving ordinary and partial differential equations, will be studied.			
124BRA	BIM - Revit Architecture CE	Z	2
The seminar introduces the basic principles of building design as an information model. Teaching takes place on the Autodesk platform. Teaching is focused on the interpretation of the principle of modeling building elements, their relationships and properties. During the exercise, students will create a simple BIM model, they will learn to work with other SW - data export and import, they will learn basic principles of creating 2D documentation, scheduling, 3D presentation - render, animation.			

125TIE	Energy and Indoor Environment	ZK	2

The course introduces students to the theoretical knowledge of aspects of indoor environmental quality (IEQ) in relation to the energy performance of buildings. During the lectures, the basic principles of technical systems of heating, ventilation, air conditioning, water management and electricity supply and the different components of the indoor environment are presented and described. The lectures are complemented by seminars where students learn about the development of the HVAC concept and have a hands-on experience with IEQ measurement and evaluation.

125YATH	Applied Thermomechanics	Z	2

The course contains three basic groups, in which the student is gradually introduced to selected chapters on moist air, vapour thermodynamics and heat sharing. The aim of each chapter is to introduce students to the principles of equipment common in heating, ventilation and cooling systems that they will encounter in practice. The chapter on humid air will discuss typical and lesser used processes occurring in air handling units. The vapor thermodynamics section focuses on the familiar compressor and absorption chillers and heat pumps. The final chapter will explain the processes and principles related to heat exchangers.

128PMDB	Process Modeling and Data Formats for BIM	Z,ZK	4

Fundamental terms from fields of information management, business process management, and BIM. General business process modeling using Business Process Model and Notation (BPMN) and Unified Modeling Language (UML). Advanced Business Process models - collaboration of processes and choreography diagrams, Adaptation of business process modeling languages for modeling of BIM processes in BIM Execution Plan (BEP) - using BPMN for modeling of BIM overview map and detailed BIM uses map, process modeling for Information Delivery Manual (IDM). Other uses of process modeling methods in civil engineering. Basics of data formats for BIM - IFC/STEP, Express modeling language.

132MAC	Microscopy and Phase Analysis of Construction Mat.	Z	2

Fundamentals of transmission and reflexion optical microscopy. Polarization of light and its application in the phase study of materials. The sample preparation for microscopical research. Fundamentals of scannig electron microscopy and microanalysis. X-ray phase diffraction and structural analysis. The fundamentals of XRD analysis and its application in the structural and phase exploration of building materials.

133CASD	Computer Aided Structural Design	Z	2

Computer-Aided Structural Design has been implemented as an optional compulsory course which provides students to gain knowledge in a computer-aided design and analysis of reinforced concrete structures. The objective of the course is to demonstrate the practical use of selected FEM software for the limit state design of various concrete structures. Namely, the focus is on computational models, reinforcement design, numerical modelling, crack control, deformation control and internal forces distribution.

133YCB	Concrete Bridges	Z,ZK	4

The course of Concrete Bridges is focused on design and construction of this type of bridge structures. Lectures are devoted to spatial arrangement and equipment of road and railway bridges, bridge substructure, effects and realization of prestressing, types of concrete bridge structures and technologies of their construction. Seminars are split into interesting issues and provide an opportunity to apply the learnt principles.

134GSTR	Glass Structures	Z	2

The course is intending to introduce the students the field of structural applications of glass and to give them some specific skills for calculation and detailing of for basic glass structures: panes beams and fins, columns and walls, point-supported glass, as well as for glazing systems such as glass facades, canopies and roofs, stairs and floors. On this purpose the properties of glass as structural material will be presented in comparison with other basic building materials, together with selected examples of glass/glazing applications. Design details and connecting technology, relevant technical regulations, specification and current methods applied in design will be described. Worked examples will accompany the lectures for better understanding, and design project will help to fix specific knowledge.

134SAL	Stainless Steel and Aluminium Structures	Z	2

The course covers two parts, design of aluminium and stainless steel structures. The first part covers 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. In the second part of the subject, the same topics are covered for aluminium structures. Welding and heat-affected zones are discussed in detail in terms of weld design, section design and local welds effect in members.

135CMGE	Computing and Computer Modelling in Geotechnical Eng.	Z	2

Students get familiar 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 ground deformation, and selected specifics associated with numerical modeling in geotechnics. This knowledge is further applied in the modelling of foundation, embedded walls, and stability problems.

Name of the block: Povinně volitelné předměty, doporučení S1
Minimal number of credits of the block: 40
The role of the block: S1

Code of the group: ND20230100_1
Name of the group: Civil Engineering, Project, 1st semester
Requirement credits in the group: In this group you have to gain at least 5 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 5
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
122SDP3	**Structural Design Project 3** *Alexander Ilkström Kravcov, Vjačeslav Usmanov*	KZ	5	4C	Z	S1
124SDP3	**Structural Design Project 3** *Tomáš Vlach* ***Tomáš Vlach*** *Tomáš Vlach (Gar.)*	KZ	5	4C	Z	S1
132SDP3	**Structural Design Project 3** *Jan Zeman*	KZ	5	4C	Z	S1
133SDP3	**Structural Design Project 3** ***Iva Broukalová***	KZ	5	4C	Z	S1
134SDP3	**Structural Design Project 3** ***Michal Jandera*** *Michal Jandera (Gar.)*	KZ	5	4C	Z	S1

135SDP3	**Structural Design Project 3** *Jan Salák (Gar.)*	KZ	5	4C	Z	S1

Characteristics of the courses of this group of Study Plan: Code=ND20230100_1 Name=Civil Engineering, Project, 1st semester

122SDP3	Structural Design Project 3	KZ	5

Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.

124SDP3	Structural Design Project 3	KZ	5

The subject of the course provides a complex approach to practice design, analysis and optimalization of advanced multistorey or long span building structures, or their reconstruction, with a subsequent focus on a specific part of the building, construction. General analysis of load, functional and technologic requirements, design of basic load-bearing system with preliminary bearing elements dimensions calculation, choice of most suitable version. Closer focus on the problematic and difficult part of the construction. Construction details, detailed analysis from the point of view of building physics - conducted heat and humidity, detailed static action of selected construction detail, numerical modeling, according to the student's preferences and focus.

132SDP3	Structural Design Project 3	KZ	5

Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.

133SDP3	Structural Design Project 3	KZ	5

The subject is focused on concrete and masonry structures. The assignment can be: elaboration of the structural design documentation, the analysis of the given problem requiring subject matter search and literature retrieval, the numerical analysis of the selected element or part of the structure, the preparation, execution and evaluation of experiments, etc. Collaboration of several students on one assignments is also possible. Consultation with participating departments K124 and K135 is not mandatory for all students. The extent of outputs depends on the type of assignment and the decision of the leading teacher.

134SDP3	Structural Design Project 3	KZ	5

Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. The project is assigned by the seminar leader.

135SDP3	Structural Design Project 3	KZ	5

Design, static calculation and drawing documentation of the building substructure

Code of the group: ND20230200_1
Name of the group: Civil Engineering, Project, 2nd semester
Requirement credits in the group: In this group you have to gain at least 5 credits
Requirement courses in the group: In this group you have to complete at least 1 course
Credits in the group: 5
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
122SDP4	**Structural Design Project 4** *Alexander Ilkström Kravcov Alexander Ilkström Kravcov (Gar.)*	KZ	5	4C	L	S1
124SDP4	**Structural Design Project 4** *Eva Burgetová, Tomáš Vlach* ***Tomáš Vlach*** *Eva Burgetová (Gar.)*	KZ	5	4C	L	S1
132SDP4	**Structural Design Project 4** *Jan Zeman, Tomáš Janda*	KZ	5	4C	L	S1
133SDP4	**Structural Design Project 4**	KZ	5	4C	L	S1
134SDP4	**Structural Design Project 4** ***Michal Jandera*** *Michal Jandera (Gar.)*	KZ	5	4C	L	S1
135SDP4	**Structural Design Project 4** ***Jan Salák*** *Jan Salák (Gar.)*	KZ	5	4C	L	S1

Characteristics of the courses of this group of Study Plan: Code=ND20230200_1 Name=Civil Engineering, Project, 2nd semester

122SDP4	Structural Design Project 4	KZ	5

Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.

124SDP4	Structural Design Project 4	KZ	5

The subject of the course is closer focus on the problematic and difficult part of the construction. In the first half of the semester general project requirements, then focus on construction details, detailed analysis from the point of view of building physics - conducted heat and humidity, detailed static action of selected construction detail, numerical modeling, according to the student's preferences and focus. By prior arrangement, it is also possible to experimentally verify selected material or construction properties and combine theoretical work with laboratory work. It is possible especially when student is focused on new types of materials and applications.

132SDP4	Structural Design Project 4	KZ	5

Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.

133SDP4	Structural Design Project 4	KZ	5
The subject is focused on concrete and masonry structures. The assignment can be: elaboration of the structural design documentation, the analysis of the given problem requiring subject matter search and literature retrieval, the numerical analysis of the selected element or part of the structure, the preparation, execution and evaluation of experiments, etc. Collaboration of several students on one assignments is also possible. Consultation with participating departments K124 and K135 is not mandatory for all students. The extent of outputs depends on the type of assignment and the decision of the leading teacher.			
134SDP4	Structural Design Project 4	KZ	5
Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. The project is assigned by the seminar leader.			
135SDP4	Structural Design Project 4	KZ	5
Design, static calculation and drawing documentation of the building substructure			

Code of the group: ND20230300
Name of the group: Civil Engineering, Diploma Project
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 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
122DPP	**Diploma Project** *Čeněk Jarský, Pavel Svoboda, Mária Párová Čeněk Jarský (Gar.)*	Z	30	24C	Z	S1
123DPP	**Diploma Project** *Michal Jandera (Gar.)*	Z	30	24C	Z	S1
124DPP	**Diploma Project** *Tomáš Vlach, Pavel Kopecký, Malila Noori, Tomáš Čejka, František Kulhánek* ***Tomáš Vlach*** *František Kulhánek (Gar.)*	Z	30	24C	L,Z	S1
132DPP	**Diploma Project** *Jan Zeman, Milan Jirásek, Bořek Patzák, Michal Šejnoha, Pavel Kuklík*	Z	30	24C	Z	S1
133DPP	**Diploma Project** ***Michaela Frantová*** *Lukáš Vráblík (Gar.)*	Z	30	24C	Z	S1
134DPP	**Diploma Project** ***Michal Jandera*** *Michal Jandera (Gar.)*	Z	30	24C	Z	S1
135DPP	**Diploma Project** ***Jan Salák***	Z	30	24C	Z	S1
210DPP	**Diploma Project**	Z	30	24C	Z	S1
220DPP	**Diploma Project** *Jiří Svoboda, Radek Vašíček* ***Radek Vašíček*** *Jiří Svoboda (Gar.)*	Z	30	24C	Z	S1

Characteristics of the courses of this group of Study Plan: Code=ND20230300 Name=Civil Engineering, Diploma Project

122DPP	Diploma Project	Z	30
In this thesis, the student deals with the theme of preparation, construction and operation of buildings. How to solve problems of operating practices and areas of development and research. It contains a part of text, drawing and possibly documentation. At the end of the work, the student picks up his own contribution to the given topic.			
123DPP	Diploma Project	Z	30
In accordance with the thesis proposal			
124DPP	Diploma Project	Z	30
The topics of diploma theses are based on the needs of practice or the scientific research activity of the department, the scope and difficulty corresponds to the student's knowledge acquired during the master's studies. The supervisor of the thesis can designate additional consultants to the student.			
132DPP	Diploma Project	Z	30
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.			
133DPP	Diploma Project	Z	30
Master's thesis.			
134DPP	Diploma Project	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.			
135DPP	Diploma Project	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.			
210DPP	Diploma Project	Z	30
220DPP	Diploma Project	Z	30
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).			

List of courses of this pass:

Code	Name of the course	Completion	Credits
101MTST	Mathematical Statistics	Z,ZK	3
Advanced methods of mathematical statistics, notions of probability, discrete and continuous random variables, multidimensional distributions and estimates of distribution parameters. Multidimensional regression and submodel testing. Different types of continuous distributions. Multidimensional distribution. Time series, especially stationary time series and their study in time and frequency domain.			
101NMT	Numerical Methods	Z	2
The introduction to the basic numerical methods. Great attention is paid to methods for solving systems of linear equations. Further we will study methods of approximation of functions and numerical quadrature. Finally, methods for solving ordinary and partial differential equations, will be studied.			
102FTB	Thermomechanics	Z	2
This course will concentrate on basic principles of transport of heat and mass (conduction, convection, radiation, heat pumps; transport of moist in building materials) with practical examples such as heat loss of a pipe, solar heating/cooling systems and heat loss thru a window (two plates of glass with a gas between). An excursion to a large solar-cooling installation with a solar-powered heat pump is a part of the course.			
122DPP	Diploma Project	Z	30
In this thesis, the student deals with the theme of preparation, construction and operation of buildings. How to solve problems of operating practices and areas of development and research. It contains a part of text, drawing and possibly documentation. At the end of the work, the student picks up his own contribution to the given topic.			
122SDP3	Structural Design Project 3	KZ	5
Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.			
122SDP4	Structural Design Project 4	KZ	5
Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.			
123DPP	Diploma Project	Z	30
In accordance with the thesis proposal			
124BRA	BIM - Revit Architecture CE	Z	2
The seminar introduces the basic principles of building design as an information model. Teaching takes place on the Autodesk platform. Teaching is focused on the interpretation of the principle of modeling building elements, their relationships and properties. During the exercise, students will create a simple BIM model, they will learn to work with other SW - data export and import, they will learn basic principles of creating 2D documentation, scheduling, 3D presentation - render, animation.			
124BS04	Building Structures 4	Z,ZK	4
The subject is focused on the complex design of load-bearing structures, their interaction with the surrounding environment. In the first part of the subject, the attention is focused on the issue of the mutual interaction of load-bearing structures and the negative interactions between load-bearing and non-load-bearing systems. The effects of non-force loads, temperature and volume changes, properties of structural materials are discussed. The second part of the subject is focused on the design of load-bearing structures with regard to the effects of wind, the effects of non-rigid support of walkable structures and the issue of expansion of non-load-bearing structures. The last part is devoted to the specific action of water and the protection of the building from its effects.			
124DPP	Diploma Project	Z	30
The topics of diploma theses are based on the needs of practice or the scientific research activity of the department, the scope and difficulty corresponds to the student's knowledge acquired during the master's studies. The supervisor of the thesis can designate additional consultants to the student.			
124DSHB	Diagnosis and Surveying of Historical Buildings	Z	2
Course sets out key consideratons and implications which require structure assessment. The course provides an objective framework and methodical and systematic approach to surveying of historic buildings. (structural diagnosis, preliminary and comprehensive survey, visual inspection, site inspections, laboratory tests, investigation kits, types of defects and damages, symptoms, manifestation, significance, criticality, reason for failures case studies)			
124EOB1	Seminar on Energy-optimized Buildings 1	ZK	3
Introduction in the theory and practice of the design of low-energy buildings of different categories. Lectures and workshops			
124IBUD	Integrated Building Design	Z	2
The main objective of the subject Integrated Building Design is to get an complex overview of the principles of integrated buildings design, life cycle assessment of buildings, evaluation of building performance, green/sustainable certificaition systems and understand environmental, social and economic aspects of the built environment.			
124SDP3	Structural Design Project 3	KZ	5
The subject of the course provides a complex approach to practice design, analysis and optimalization of advanced multistorey or long span building structures, or their reconstruction, with a subsequent focus on a specific part of the building, construction. General analysis of load, functional and technologic requirements, design of basic load-bearing system with preliminary bearing elements dimensions calculation, choice of most suitable version. Closer focus on the problematic and difficult part of the construction. Construction details, detailed analysis from the point of view of building physics - conducted heat and humidity, detailed static action of selected construction detail, numerical modeling, according to the student's preferences and focus.			
124SDP4	Structural Design Project 4	KZ	5
The subject of the course is closer focus on the problematic and difficult part of the construction. In the first half of the semester general project requirements, then focus on construction details, detailed analysis from the point of view of building physics - conducted heat and humidity, detailed static action of selected construction detail, numerical modeling, according to the student's preferences and focus. By prior arrangement, it is also possible to experimentally verify selected material or construction properties and combine theoretical work with laboratory work. It is possible especially when student is focused on new types of materials and applications.			
125TIE	Energy and Indoor Environment	ZK	2
The course introduces students to the theoretical knowledge of aspects of indoor environmental quality (IEQ) in relation to the energy performance of buildings. During the lectures, the basic principles of technical systems of heating, ventilation, air conditioning, water management and electricity supply and the different components of the indoor environment are presented and described. The lectures are complemented by seminars where students learn about the development of the HVAC concept and have a hands-on experience with IEQ measurement and evaluation.			

125YATH	Applied Thermomechanics	Z	2
The course contains three basic groups, in which the student is gradually introduced to selected chapters on moist air, vapour thermodynamics and heat sharing. The aim of each chapter is to introduce students to the principles of equipment common in heating, ventilation and cooling systems that they will encounter in practice. The chapter on humid air will discuss typical and lesser used processes occurring in air handling units. The vapor thermodynamics section focuses on the familiar compressor and absorption chillers and heat pumps. The final chapter will explain the processes and principles related to heat exchangers.			
128PMDB	Process Modeling and Data Formats for BIM	Z,ZK	4
Fundamental terms from fields of information management, business process management, and BIM. General business process modeling using Business Process Model and Notation (BPMN) and Unified Modeling Language (UML). Advanced Business Process models - collaboration of processes and choreography diagrams, Adaptation of business process modeling languages for modeling of BIM processes in BIM Execution Plan (BEP) - using BPMN for modeling of BIM overview map and detailed BIM uses map, process modeling for Information Delivery Manual (IDM). Other uses of process modeling methods in civil engineering. Basics of data formats for BIM - IFC/STEP, Express modeling language.			
132DPP	Diploma Project	Z	30
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.			
132DS01	Dynamics of Structures	Z,ZK	5
The course is devoted to vibration of structures caused by various types of load.			
132EXAN	Experimental Analysis	KZ	3
Experiments aimed at monitoring the magnitude of climatic loads on building structures (wind, snow, temperature loads), diagnostics of building structures, tests carried out on physical models of building structures (laws of model similarity, simulation of earthquakes on shake tables, simulation of wind effects in wind tunnels, static load tests on physical models), monitoring of building structures, static load tests (civil engineering structures, industrial structures, bridge structures), dynamic load tests and dynamic informative tests (civil engineering structures, industrial structures, bridge structures, footbridges, effects of technical seismicity, assessment of adverse effects of vibrations on the human body, assessment of the effect of vibrations of the structure on installed technological equipment).			
132MAC	Microscopy and Phase Analysis of Construction Mat.	Z	2
Fundamentals of transmission and reflexion optical microscopy. Polarization of light and its application in the phase study of materials. The sample preparation for microscopical research. Fundamentals of scannig electron microscopy and microanalysis. X-ray phase diffraction and structural analysis. The fundamentals of XRD analysis and its application in the structural and phase exploration of building materials.			
132MMO	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.			
132NAST	Numerical Analysis of Structures	Z,ZK	5
Overview of direct stiffness method of structural mechanics. Weak solution of one-dimensional elasticity equations. Galerkin method, Gauss integration, principle of the Finite Element method. Steady state heat conduction in one dimension. Two-dimensional heat conduction problem, triangular finite elements. Two-dimensional elasticity problems. Convergence of FEM, error estimates.			
132SDP3	Structural Design Project 3	KZ	5
Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.			
132SDP4	Structural Design Project 4	KZ	5
Focus on complex approach to practic design, analysis and optimalization of multi-storey or long-span building structures, or their reconstruction. Analysis of load, functional and technologic requirements, design of load-bearing system alternatives including foundations, preliminary bearing elements dimensions calculation, choice of most suitable version. Detailed statical design of chosen version, calculation, technical report and drawings. Check of bearing and non-bearing structures interaction and assembly techniques. Public presentation.			
133CASD	Computer Aided Structural Design	Z	2
Computer-Aided Structural Design has been implemented as an optional compulsory course which provides students to gain knowledge in a computer-aided design and analysis of reinforced concrete structures. The objective of the course is to demonstrate the practical use of selected FEM software for the limit state design of various concrete structures. Namely, the focus is on computational models, reinforcement design, numerical modelling, crack control, deformation control and internal forces distribution.			
133CM03	Concrete and Masonry Structures 3	Z,ZK	5
Prestressed concrete structures, shell structures, prestressed cable structures, shear and torsion, load carrying capacity of bridges, design according to older standards and code provisions			
133CM04	Concrete Structures 4	Z,ZK	5
The course is focused on the following areas: New approach to the design of bending, shear, torsion, punching Application of plastic theory in the concrete design Computer analysis of concrete structures Non-linear analysis of concrete structures Probabilistic design Advanced concrete structures			
133DPP	Diploma Project	Z	30
Master's thesis.			
133SDP3	Structural Design Project 3	KZ	5
The subject is focused on concrete and masonry structures. The assignment can be: elaboration of the structural design documentation, the analysis of the given problem requiring subject matter search and literature retrieval, the numerical analysis of the selected element or part of the structure, the preparation, execution and evaluation of experiments, etc. Collaboration of several students on one assignments is also possible. Consultation with participating departments K124 and K135 is not mandatory for all students. The extent of outputs depends on the type of assignment and the decision of the leading teacher.			
133SDP4	Structural Design Project 4	KZ	5
The subject is focused on concrete and masonry structures. The assignment can be: elaboration of the structural design documentation, the analysis of the given problem requiring subject matter search and literature retrieval, the numerical analysis of the selected element or part of the structure, the preparation, execution and evaluation of experiments, etc. Collaboration of several students on one assignments is also possible. Consultation with participating departments K124 and K135 is not mandatory for all students. The extent of outputs depends on the type of assignment and the decision of the leading teacher.			
133YBBD	Basis of Bridges Design	Z	2
The course Basis of Bridge Design is focused on principal problems related to design of bridges - spatial arrangement and equipment of road and railway bridges, types of bridge structures and technologies of construction of concrete bridges.			
133YCB	Concrete Bridges	Z,ZK	4
The course of Concrete Bridges is focused on design and construction of this type of bridge structures. Lectures are devoted to spatial arrangement and equipment of road and railway bridges, bridge substructure, effects and realization of prestressing, types of concrete bridge structures and technologies of their construction. Seminars are split into interesting issues and provide an opportunity to apply the learnt principles.			

134DPP	Diploma Project	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.			
134FRST	Fire Resistance of Steel and Timber Structures	Z	2
The aim of this course is to give students an understanding of the design methods of structures at accidental situations, fire and explosion. The course is focussed on design methods involved in fire design: prediction of fire scenario, evaluation of fire load, calculation of gas temperatures in the fire compartment and structural analysis at elevated temperature. Special attention is paid to fire modelling when several design models is presented including nominal temperature curves, simple models and advanced models.			
134GSTR	Glass Structures	Z	2
The course is intending to introduce the students the field of structural applications of glass and to give them some specific skills for calculation and detailing of for basic glass structures: panes beams and fins, columns and walls, point-supported glass, as well as for glazing systems such as glass facades, canopies and roofs, stairs and floors. On this purpose the properties of glass as structural material will be presented in comparison with other basic building materials, together with selected examples of glass/glazing applications. Design details and connecting technology, relevant technical regulations, specification and current methods applied in design will be described. Worked examples will accompany the lectures for better understanding, and design project will help to fix specific knowledge.			
134SAL	Stainless Steel and Aluminium Structures	Z	2
The course covers two parts, design of aluminium and stainless steel structures. The first part covers 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. In the second part of the subject, the same topics are covered for aluminium structures. Welding and heat-affected zones are discussed in detail in terms of weld design, section design and local welds effect in members.			
134SDP3	Structural Design Project 3	KZ	5
Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. The project is assigned by the seminar leader.			
134SDP4	Structural Design Project 4	KZ	5
Design of steel / timber load bearing building structure according to external requirements in relation to interaction of load bearing and final completion structural elements. The project is assigned by the seminar leader.			
134ST02	Steel Structures 2	Z,ZK	4
The course gives the basic information to steel structural design including detailing and advanced materials and ctructural solutions. The main focus is on the industrial structures including pipelines, silos, cranes, masts and towers.			
134STB	Steel bridges	Z	2
The subject describes the basics of the design of steel and composite bridges.			
134TS02	Timber Structures 2	Z,ZK	4
The course brings an integrative approach to structural wood design that considers the design of the individual wood members in the context of the complete wood structure so that all of the structural components and connectors work together in providing strength.			
135CMGE	Computing and Computer Modelling in Geotechnical Eng.	Z	2
Students get familiar 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 ground deformation, and selected specifics associated with numerical modeling in geotechnics. This knowledge is further applied in the modelling of foundation, embedded walls, and stability problems.			
135DPP	Diploma Project	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.			
135FS02	Foundation of Structures 2	Z,ZK	4
Advanced design approaches for selected types of foundation pits and footings, design based on soil - structure interaction.			
135SDP3	Structural Design Project 3	KZ	5
Design, static calculation and drawing documentation of the building substructure			
135SDP4	Structural Design Project 4	KZ	5
Design, static calculation and drawing documentation of the building substructure			
210DPP	Diploma Project	Z	30
220DPP	Diploma Project	Z	30
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).			

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