Study plan

Name of study plan: Stavební inženýrství - vodní hospodářství a vodní stavby

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Civil Engineering - Water Management and Water Structures
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: platí pro nástup od akad. roku 2023/24

Name of the block: Compulsory courses
Minimal number of credits of the block: 40
The role of the block: Z

Code of the group: NV20230100
Name of the group: Stavební inženýrství - vodní hospodářství a vodní stavby, 1. semestr
Requirement credits in the group: In this group you have to gain at least 20 credits
Requirement courses in the group: In this group you have to complete at least 4 courses
Credits in the group: 20
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
141APHD	**Applied Hydrology** *Jaromír Dušek, Tomáš Vogel, Jana Votrubová, Michal Dohnal* ***Michal Dohnal*** *Jaromír Dušek (Gar.)*	Z,ZK	5	2P+2C	Z	z
141HY3V	**Hydraulics 3** *Václav Matoušek, Jan Krupička* ***Václav Matoušek*** *Václav Matoušek (Gar.)*	Z,ZK	5	2P+2C	Z	z
142VHSO	**Water-management Schemes** *Pavel Fošumpaur* ***Martin Horský*** *Pavel Fošumpaur (Gar.)*	Z,ZK	5	3P+2C	Z	z
143HPVO	**Groundwater Hydraulics** *Martin Šanda, Martina Sobotková* ***Martin Šanda*** *Martin Šanda (Gar.)*	Z,ZK	5	2P+2C	Z	z

Characteristics of the courses of this group of Study Plan: Code=NV20230100 Name=Stavební inženýrství - vodní hospodářství a vodní stavby, 1. semestr

141APHD	Applied Hydrology	Z,ZK	5
Advanced hydrology course. Quantitative description of hydrological processes. Methods of measurement and data evaluation. Deterministic and stochastic modeling in hydrology.			
141HY3V	Hydraulics 3	Z,ZK	5
Flow of real liquid (mathematical modelling, Navier-Stokes equations, turbulence). Dimensional analysis and dynamic similarity. Unsteady flow (waves and transients). Flow structure and velocity distribution. Flow around solid bodies (boundary layer, wake). Solid particles in quiescent and flowing liquid. Non-Newtonian flow. Flow in pump-pipeline systems. Application of momentum principle to water jets and pump/turbine impellers.			
142VHSO	Water-management Schemes	Z,ZK	5
The course includes an explanation of system methods for the design and management of water management systems. System definition, system representation, mathematical models. Fundamentals of programming. Optimization methods. Probabilistic methods. Basic types of probability distributions. Statistical derivation of design values of hydrological variables. Synthetic series modelling methods. Simulation models. Artificial intelligence methods. Operational management of water management systems.			
143HPVO	Groundwater Hydraulics	Z,ZK	5
The course deals with the problem of groundwater flow in saturated rock environments. The introduction of the course is devoted to the theoretical background and mathematical description of groundwater flow. The next part is devoted to simplified solutions of basic problems - flow through phreatic and confined aquifers, seepage through an earth block, flow in the vicinity of wells. At the end of the semester, students will get acquainted with the method of numerical modelling of groundwater flow, using specialized software to solve an individual problem.			

Code of the group: NV20230200
Name of the group: Stavební inženýrství - vodní hospodářství a vodní stavby, 2. semestr
Requirement credits in the group: In this group you have to gain at least 20 credits
Requirement courses in the group: In this group you have to complete at least 4 courses
Credits in the group: 20

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
142PRVD	**Management of Hydraulic Schemes** ***Milan Zukal***	Z,ZK	5	3P+2C	L	z
144CIV	**Water quality**	Z,ZK	5	2P+2C	L	z
144OUP	**Urban drainage**	Z,ZK	5	2P+2C	L	z
144MVSO	**Urban Water Management Modelling** ***Bronislava Rohanová***	Z,ZK	5	2P+2C	L	z

Characteristics of the courses of this group of Study Plan: Code=NV20230200 Name=Stavební inženýrství - vodní hospodářství a vodní stavby, 2. semestr

142PRVD	Management of Hydraulic Schemes	Z,ZK	5

Organisational and technical aspects of operation of water works in the Czech Republic, state administration of water works. Handling and operating regulations. Categorisation of water works. Monitoring and supervision of waterworks, waterworks failures and special floods. Reliability of water works. Issues of winter operation of streams, reservoirs and waterworks, ice phenomena and processes on streams, reservoirs and waterworks and management and active influence of the winter regime. Surface water quality in streams and reservoirs, modelling and management of water quality in reservoirs, temperature and oxygen regime of reservoirs. Operation of hydropower plants, surface water permits, operating regimes of continuous, peak-load and pumped storage hydropower plants. Failure conditions and their treatment. Reconstruction and modernisation of dams, weirs and navigation facilities. Optimisation of operations, damages and risks. Relationship between hydraulic structure operations and the surrounding environment, environmental impact assessment of hydraulic structures.

144CIV	Water quality	Z,ZK	5

Composition of natural waters. Types of water pollution, its effects and characteristics. Pollution sources. Running waters. Reservoirs. Water quality monitoring. Water quality classification in the Czech Republic. Water quality protection. Water quality modelling.

144OUP	Urban drainage	Z,ZK	5

Field of urban drainage. Concepts and integrated assessment of the urban drainage system. Rainfall and rainfall data. Runoff from urban areas - effective rainfall, concentration and pollution. Discharge, pollutant transport and transformation in the sewer system. Waste water treatment plant during rainfall. Urban streams. Protective measures - stormwater management, tanks. treatment, real time control. Measurement and monitoring.Basics of modelling and simulation programmes.

144MVSO	Urban Water Management Modelling	Z,ZK	5

The course is focused on the application of specialized software for design, modeling and monitoring in water supply and sewerage and drainage.

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 20
The role of the block: S

Code of the group: NV20230100_1
Name of the group: Stavební inženýrství - vodní hospodářství a vodní stavby, PV předměty, 1. semestr
Requirement credits in the group: In this group you have to gain at least 10 credits
Requirement courses in the group: In this group you have to complete at least 2 courses
Credits in the group: 10
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
141YTHH	**Methods of modelling in hydraulics nad hydrology** *Michal Dohnal, Vojtěch Bareš, Aleš Havlík* ***Michal Dohnal*** *Michal Dohnal (Gar.)*	KZ	5	4C	Z	s
142YGPV	**Geotechnical problems of hydraulic structures** *Eva Bílková, Petra Nešvarová Chvojková, Miroslav Brouček* ***Miroslav Brouček*** *Miroslav Brouček (Gar.)*	Z,ZK	5	3P+1C	Z	s
143YOPO	**Watershed Management** *Barbora Jáchymová, Tomáš Dostál, Josef Krása, Petr Kavka* ***Barbora Jáchymová*** *Tomáš Dostál (Gar.)*	Z,ZK	5	2P+2C	Z	s
144YMIB	**Urban engineering and balneology** *Filip Horký, Bohumil Šťastný* ***Filip Horký*** *Bohumil Šťastný (Gar.)*	ZK	5	4P	Z	s

Characteristics of the courses of this group of Study Plan: Code=NV20230100_1 Name=Stavební inženýrství - vodní hospodářství a vodní stavby, PV předměty, 1. semestr

141YTHH	Methods of modelling in hydraulics nad hydrology	KZ	5

Mathematical modelling of 1D non-uniform flow in open channels. A constrained approach to modelling flow in a wide floodplain. Calibration of channel and inundation roughness. Initial and boundary conditions. 1D unsteady flow in open channels. Simulation of flood wave propagation in a river channel network. Modelling of 2D free-surface flow using the finite element method. Modelling of sediment movement in watercourses. Simulation of the temporal and spatial evolution of alluvial streambeds. Modelling of the rainfall-runoff process in a natural catchment and urbanized catchment.

142YGPV	Geotechnical problems of hydraulic structures	Z,ZK	5

The subject of the course is the problems of failures and problems in the design and operation of hydraulic structures - weirs, dams, waterways and hydro power plants - with a focus on the foundation of structures. Students will be introduced to the solution of various geotechnical problems using examples of designed and operated water structures

143YOPO	Watershed Management	Z,ZK	5
Catchment management basics at agriculturaly used landscape. Basic principles of hydrology, retention processes, soil erosion, sediment transport are presented. Also negative effects of soil erosion and surface runoff generation and possible control measures design.			
144YMIB	Urban engineering and balneology	ZK	5
The course is focused on the principles applied in solving elements of urban engineering such as water supply, sewerage, gas, urban furniture, etc. and on swimming pools and spas.			

Code of the group: NV20230200_1
Name of the group: Stavební inženýrství - vodní hospodářství a vodní stavby, PV předměty, 2. semestr
Requirement credits in the group: In this group you have to gain at least 10 credits
Requirement courses in the group: In this group you have to complete at least 2 courses
Credits in the group: 10
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
141YRIM	**River Morphology and Engineering**	ZK	5	2P+2C	L	S
142OKHH	**Steel Structures in Hydraulic and Hydropower Engineering** ***Martin Králík***	Z,ZK	5	3P+1C	L	S
143YTPR	**Transport Processes** ***David Zumr***	Z,ZK	5	2P+2C	L	S
144PUCV	**Wastewater treatment** ***Kateřina Slavíčková***	Z,ZK	5	2P+2C	L	S

Characteristics of the courses of this group of Study Plan: Code=NV20230200_1 Name=Stavební inženýrství - vodní hospodářství a vodní stavby, PV předměty, 2. semestr

141YRIM	River Morphology and Engineering	ZK	5
The course consists of two parts: 1. river engineering, where the focus is not only on purely technical structural interventions but also on measures close to nature. Attention is also focused on the principles of considerate anthropogenic activities directly in and near watercourses. Such activities are aimed at ensuring the main required functions in the management, use and disposal of flowing surface waters, while not leading to damage and degradation of the river landscape, but promoting its protection against all relevant risks. 2. fluvial processes, which are the most important geomorphic manifestations in the river landscape in relation to the activities of flowing water. Their understanding provides the necessary basis for the successful application and synthesis of available knowledge on alluvial flows in the field of river engineering. The aim is to recognize the different characteristic channel types and flow development phases, including the dynamics of their changes, and to identify the processes shaping the river channel and its floodplain, including an understanding of their controlling mechanisms. It also includes a qualitative and quantitative description of processes such as the onset of sediment particle movement and sediment movement, erosion and sedimentation processes in the channel or the formation and development of bed formations, the mechanism of undercutting and bank slumping, deepening or softening of the cross-flow profile, etc. An important part of this is the study of the response of modified watercourses to channel intervention caused by sudden natural changes or anthropogenic activities in the river landscape. The common basis for both parts is a summary of the theoretical knowledge and practical principles of advanced hydraulics of fixed-bed channels in the field of non-uniform and spatially complex flow, turbulent phenomena or resistance caused by granular channel bed or (riparian) vegetation exposed to the flow.			
142OKHH	Steel Structures in Hydraulic and Hydropower Engineering	Z,ZK	5
143YTPR	Transport Processes	Z,ZK	5
Flow and solute transport in variably saturated soil profile - a complex theoretical approach. HYDRUS simulation models and its applecation. Solving of 1D, 2D and D problems.			
144PUCV	Wastewater treatment	Z,ZK	5
The goal of the part Drinking water treatment is to get acquainted with technological processes of water treatment, design and operation of drinking water treatment plant. Get to know the technology, design and operation of different types of wastewater treatment plants for different sources of pollution. Hydraulic characteristics of tanks. Operation of mechanical and biological wastewater treatment processes. Ranges of WWTP capacity, specifics of small sources. Mechanical and biological WWTPs, possibilities, plant layouts and sludge processing. WWTP protective zone. Assessment of WWTP effects on receiving waters. Amount of wastewater and pollution. Design of cesspits and septic tanks. Fat and oil traps. Biofilm reactors. Activated sludge reactors. Vegetative treatment.			

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

Code of the group: NV20230300
Name of the group: Stavební inženýrství - vodní hospodářství a vodní stavby, diplomová práce
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
141DPM	**Diploma Thesis** ***Michal Dohnal***	Z	30	24C	Z	S1

142DPM	**Diploma Thesis** *Pavel Fošumpaur, Petra Nešvarová Chvojková, Miroslav Brouček, Ladislav Satrapa, Michal Toman, Martin Horský, Martin Králík, Milan Zukal, Petr Nowak, ...* ***Martin Horský*** *Ladislav Satrapa (Gar.)*	Z	30	24C	Z	S1
143DPM	**Diploma Thesis** ***Martin Šanda***	Z	30	24C	Z	S1
144DPM	**Diploma Thesis** ***Bronislava Rohanová*** *Filip Horký (Gar.)*	Z	30	24C	Z	S1

Characteristics of the courses of this group of Study Plan: Code=NV20230300 Name=Stavební inženýrství - vodní hospodářství a vodní stavby, diplomová práce

141DPM	Diploma Thesis	Z	30
The course enables the student to prepare, write and submit a diploma thesis. The Department of Hydraulics and Hydrology provides consultations in the selected topic, especially in the person of the supervisor of the thesis.			
142DPM	Diploma Thesis	Z	30
The work is an individual activity of the student in the preparation of the topic of the final thesis for the period of study on the assigned professional topic.			
143DPM	Diploma Thesis	Z	30
Diploma thesis is selected by the student at one of departments, involved within study program, according to his specific interest.			
144DPM	Diploma Thesis	Z	30
Diploma Thesis concerning sewerage, waste water treatment, water suply, networks and balnology.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
141APHD	Applied Hydrology	Z,ZK	5
Advanced hydrology course. Quantitative description of hydrological processes. Methods of measurement and data evaluation. Deterministic and stochastic modeling in hydrology.			
141DPM	Diploma Thesis	Z	30
The course enables the student to prepare, write and submit a diploma thesis. The Department of Hydraulics and Hydrology provides consultations in the selected topic, especially in the person of the supervisor of the thesis.			
141HY3V	Hydraulics 3	Z,ZK	5
Flow of real liquid (mathematical modelling, Navier-Stokes equations, turbulence). Dimensional analysis and dynamic similarity. Unsteady flow (waves and transients). Flow structure and velocity distribution. Flow around solid bodies (boundary layer, wake). Solid particles in quiescent and flowing liquid. Non-Newtonian flow. Flow in pump-pipeline systems. Application of momentum principle to water jets and pump/turbine impellers.			
141YRIM	River Morphology and Engineering	ZK	5
The course consists of two parts: 1. river engineering, where the focus is not only on purely technical structural interventions but also on measures close to nature. Attention is also focused on the principles of considerate anthropogenic activities directly in and near watercourses. Such activities are aimed at ensuring the main required functions in the management, use and disposal of flowing surface waters, while not leading to damage and degradation of the river landscape, but promoting its protection against all relevant risks. 2. fluvial processes, which are the most important geomorphic manifestations in the river landscape in relation to the activities of flowing water. Their understanding provides the necessary basis for the successful application and synthesis of available knowledge on alluvial flows in the field of river engineering. The aim is to recognize the different characteristic channel types and flow development phases, including the dynamics of their changes, and to identify the processes shaping the river channel and its floodplain, including an understanding of their controlling mechanisms. It also includes a qualitative and quantitative description of processes such as the onset of sediment particle movement and sediment movement, erosion and sedimentation processes in the channel or the formation and development of bed formations, the mechanism of undercutting and bank slumping, deepening or softening of the cross-flow profile, etc. An important part of this is the study of the response of modified watercourses to channel intervention caused by sudden natural changes or anthropogenic activities in the river landscape. The common basis for both parts is a summary of the theoretical knowledge and practical principles of advanced hydraulics of fixed-bed channels in the field of non-uniform and spatially complex flow, turbulent phenomena or resistance caused by granular channel bed or (riparian) vegetation exposed to the flow.			
141YTHH	Methods of modelling in hydraulics nad hydrology	KZ	5
Mathematical modelling of 1D non-uniform flow in open channels. A constrained approach to modelling flow in a wide floodplain. Calibration of channel and inundation roughness. Initial and boundary conditions. 1D unsteady flow in open channels. Simulation of flood wave propagation in a river channel network. Modelling of 2D free-surface flow using the finite element method. Modelling of sediment movement in watercourses. Simulation of the temporal and spatial evolution of alluvial streambeds. Modelling of the rainfall-runoff process in a natural catchment and urbanized catchment.			
142DPM	Diploma Thesis	Z	30
The work is an individual activity of the student in the preparation of the topic of the final thesis for the period of study on the assigned professional topic.			
142OKHH	Steel Structures in Hydraulic and Hydropower Engineering	Z,ZK	5
142PRVD	Management of Hydraulic Schemes	Z,ZK	5
Organisational and technical aspects of operation of water works in the Czech Republic, state administration of water works. Handling and operating regulations. Categorisation of water works. Monitoring and supervision of waterworks, waterworks failures and special floods. Reliability of water works. Issues of winter operation of streams, reservoirs and waterworks, ice phenomena and processes on streams, reservoirs and waterworks and management and active influence of the winter regime. Surface water quality in streams and reservoirs, modelling and management of water quality in reservoirs, temperature and oxygen regime of reservoirs. Operation of hydropower plants, surface water permits, operating regimes of continuous, peak-load and pumped storage hydropower plants. Failure conditions and their treatment. Reconstruction and modernisation of dams, weirs and navigation facilities. Optimisation of operations, damages and risks. Relationship between hydraulic structure operations and the surrounding environment, environmental impact assessment of hydraulic structures.			
142VHSO	Water-management Schemes	Z,ZK	5
The course includes an explanation of system methods for the design and management of water management systems. System definition, system representation, mathematical models. Fundamentals of programming. Optimization methods. Probabilistic methods. Basic types of probability distributions. Statistical derivation of design values of hydrological variables. Synthetic series modelling methods. Simulation models. Artificial intelligence methods. Operational management of water management systems.			

142YGPV	Geotechnical problems of hydraulic structures	Z,ZK	5
The subject of the course is the problems of failures and problems in the design and operation of hydraulic structures - weirs, dams, waterways and hydro power plants - with a focus on the foundation of structures. Students will be introduced to the solution of various geotechnical problems using examples of designed and operated water structures			
143DPM	Diploma Thesis	Z	30
Diploma thesis is selected by the student at one of departments, involved within study program, according to his specific interest.			
143HPVO	Groundwater Hydraulics	Z,ZK	5
The course deals with the problem of groundwater flow in saturated rock environments. The introduction of the course is devoted to the theoretical background and mathematical description of groundwater flow. The next part is devoted to simplified solutions of basic problems - flow through phreatic and confined aquifers, seepage through an earth block, flow in the vicinity of wells. At the end of the semester, students will get acquainted with the method of numerical modelling of groundwater flow, using specialized software to solve an individual problem.			
143YOPO	Watershed Management	Z,ZK	5
Catchment management basics at agriculturaly used landscape. Basic principles of hydrology, retention processes, soil erosion, sediment transport are presented. Also negative effects of soil erosion and surface runoff generation and possible control measures design.			
143YTPR	Transport Processes	Z,ZK	5
Flow and solute transport in variably saturated soil profile - a complex theoretical approach. HYDRUS simulation models and its applecation. Solving of 1D, 2D and D problems.			
144CIV	Water quality	Z,ZK	5
Composition of natural waters. Types of water pollution, its effects and characteristics. Pollution sources. Running waters. Reservoirs. Water quality monitoring. Water quality classification in the Czech Republic. Water quality protection. Water quality modelling.			
144DPM	Diploma Thesis	Z	30
Diploma Thesis concerning sewerage, waste water treatment, water suply, networks and balnology.			
144MVSO	Urban Water Management Modelling	Z,ZK	5
The course is focused on the application of specialized software for design, modeling and monitoring in water supply and sewerage and drainage.			
144OUP	Urban drainage	Z,ZK	5
Field of urban drainage. Concepts and integrated assessment of the urban drainage system. Rainfall and rainfall data. Runoff from urban areas - effective rainfall, concentration and pollution. Discharge, pollutant transport and transformation in the sewer system. Waste water treatment plant during rainfall. Urban streams. Protective measures - stormwater management, tanks. treatment, real time control. Measurement and monitoring.Basics of modelling and simulation programmes.			
144PUCV	Wastewater treatment	Z,ZK	5
The goal of the part Drinking water treatment is to get acquainted with technological processes of water treatment, design and operation of drinking water treatment plant. Get to know the technology, design and operation of different types of wastewater treatment plants for different sources of pollution. Hydraulic characteristics of tanks. Operation of mechanical and biological wastewater treatment processes. Ranges of WWTP capacity, specifics of small sources. Mechanical and biological WWTPs, possibilities, plant layouts and sludge processing. WWTP protective zone. Assessment of WWTP effects on receiving waters. Amount of wastewater and pollution. Design of cesspits and septic tanks. Fat and oil traps. Biofilm reactors. Activated sludge reactors. Vegetative treatment.			
144YMIB	Urban engineering and balneology	ZK	5
The course is focused on the principles applied in solving elements of urban engineering such as water supply, sewerage, gas, urban furniture, etc. and on swimming pools and spas.			

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