

Study plan

Name of study plan: obor Vodní hospodá ství 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

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: 40

The role of the block: Z

Code of the group: NV20160100

Name of the group: obor Vodní hospodá ství 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 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, Jana Votrubová, Tomáš Vogel, Michal Dohnal Michal Dohnal Jaromír Dušek (Gar.)	Z,ZK	5	2P+2C	Z	z
141HY3V	Hydraulics 3 Václav Matoušek, Jan Krupíka, Mikoláš Kesely, Daniel Mattas 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=NV20160100 Name=obor Vodní hospodá ství 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: NV20160200

Name of the group: obor Vodní hospodá ství a vodní stavby, 2. semestr

Requirement credits in the group: In this group you have to gain 20 credits

Requirement courses in the group: In this group you have to complete 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
142PRVD	Management of Hydraulic Schemes <i>Pavel Fošumpaur, Petr Nowak, Martin Horský, Ladislav Satrapa, Martin Králík, Miroslav Brou ek, Milan Zukal, Tomáš Dally, Petra Nešvarová Chvojková Milan Zukal Ladislav Satrapa (Gar.)</i>	Z,ZK	5	3P+2C	L	z
144CIV	Water quality <i>Ivana Kabelková Ivana Kabelková Ivana Kabelková (Gar.)</i>	Z,ZK	5	2P+2C	L	z
144OUP	Urban drainage <i>Ivana Kabelková, David Stránský Ivana Kabelková David Stránský (Gar.)</i>	Z,ZK	5	2P+2C	L	z
144VHO4	Urban water management 4 <i>Ivana Kabelková, David Stránský, Bohumil Š astný, Kate ina Slaví ková Kate ina Slaví ková Bohumil Š astný (Gar.)</i>	Z,ZK	5	2P+2C		z

Characteristics of the courses of this group of Study Plan: Code=N20160200 Name=obor Vodní hospodá ství 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.			
144VHO4	Urban water management 4	Z,ZK	5
The subject in the water supply part builds on the content of UDPV, which it further deepens in terms of practical examples that are focused on modeling in the Epanet 2 software. In part of urban drainage, modelling in the SWMM software is solved.			

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 20

The role of the block: PV

Code of the group: NV20160200_1

Name of the group: obor Vodní hospodá ství a vodní stavby, povinn volitelné p edm ty

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
141YTHH	Methods of modelling in hydraulics nad hydrology <i>Michal Dohnal, Vojt ch Bareš, Aleš Havlík, Tomáš Pícek, Petr Sklená Michal Dohnal Michal Dohnal (Gar.)</i>	KZ	5	4C	Z	PV
142YGPV	Geotechnical problems of hydraulic structures <i>Miroslav Brou ek, Petra Nešvarová Chvojková Miroslav Brou ek Miroslav Brou ek (Gar.)</i>	Z,ZK	5	3P+1C	Z	PV
143YOPO	Watershed Management <i>Tomáš Dostál, Josef Krása, Petr Kavka Petr Kavka Tomáš Dostál (Gar.)</i>	Z,ZK	5	2P+2C	Z	PV
144YCOV	Water and Waste Water Treatment <i>Jaroslav Pollert Jaroslav Pollert Jaroslav Pollert (Gar.)</i>	Z,ZK	5	3P+1C	Z	PV
141YRIM	River Morphology and Engineering <i>Václav Matoušek, Petr Sklená Petr Sklená Petr Sklená (Gar.)</i>	ZK	5	2P+2C	L	PV
142YOKV	Steel Constructions of Water Structures <i>Petr Valenta Petr Valenta Petr Valenta (Gar.)</i>	Z,ZK	5	3P+1C	L	PV
143YTPR	Transport Processes <i>Milena Císlerová, David Zumr, Jakub Je ábek David Zumr Milena Císlerová (Gar.)</i>	Z,ZK	5	2P+2C	L	PV

144YMIB	Urban engineering and balneology <i>Bohumil Š astný, Filip Horký Filip Horký Bohumil Š astný (Gar.)</i>	ZK	5	4P	Z	PV
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Characteristics of the courses of this group of Study Plan: Code=NV20160200_1 Name=obor Vodní hospodá ství a vodní stavby, povinn volitelné p edm ty

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 agriculturally 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.			
144YCOV	Water and Waste Water Treatment	Z,ZK	5
To learn technology, design and operation of various types of wastewater treatment plants (WWTPs) for different pollution sources.			
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.			
142YOKV	Steel Constructions of Water Structures	Z,ZK	5
The course focuses on the design of steel water structures. The lectures cover the following topics: Loading of water structures. Steel in water engineering, profiles used and minimum dimensions, connections. Design of structural elements subjected to tension, compression, bending. Stability of sections subjected to bending, torsion. Combination of stresses in the section. Stability of cross-sections loaded in bending and pressure. Torsional stability - beam buckling, wall buckling. Principles of design of covering plates with high and low stiffness. Load bearing systems of gates. Basic types of gates used and their design principles. Design of reservoirs and special structures - pipelines of large dimensions and gradients.			
143YTPR	Transport Processes	Z,ZK	5
Flow and solute transport in variably saturated soil profile - a complex theoretical approach. HYDRUS simulation models and its application. Solving of 1D, 2D and D problems.			
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.			

Name of the block: Povinn volitelné p edm ty, doporu ení S1

Minimal number of credits of the block: 30

The role of the block: S1

Code of the group: NV20160300_1

Name of the group: obor Vodní hospodá ství a vodní 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 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
141DPM	Diploma Thesis <i>Jaromír Dušek, Michal Dohnal, Václav Matoušek, Vojt ch Bareš, Aleš Havlík, Tomáš Pícek, Petr Sklená , Josef K e ek Michal Dohnal Michal Dohnal (Gar.)</i>	Z	30	24C	Z	S1
142DPM	Diploma Thesis <i>Pavel Fošumpaur, Petr Nowak, Martin Horský, Ladislav Satrapa, Martin Králík, Miroslav Brou ek, Milan Zukal, Tomáš Dally, Petra Nešvarová Chvojková, Martin Horský Ladislav Satrapa (Gar.)</i>	Z	30	24C	Z	S1
143DPM	Diploma Thesis <i>Martin Šanda Tomáš Dostál (Gar.)</i>	Z	30	24C	Z	S1
144DPM	Diploma Thesis <i>Bronislava Rohanová Filip Horký (Gar.)</i>	Z	30	24C	Z	S1

Characteristics of the courses of this group of Study Plan: Code=NV20160300_1 Name=obor Vodní hospodá ství 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 supply, networks and bathology.			

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.			
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 focuses on 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			
142YOKV	Steel Constructions of Water Structures	Z,ZK	5
The course focuses on the design of steel water structures. The lectures cover the following topics: Loading of water structures. Steel in water engineering, profiles used and minimum dimensions, connections. Design of structural elements subjected to tension, compression, bending. Stability of sections subjected to bending, torsion. Combination of stresses in the section. Stability of cross-sections loaded in bending and pressure. Torsional stability - beam buckling, wall buckling. Principles of design of covering plates with high and low stiffness. Load bearing systems of gates. Basic types of gates used and their design principles. Design of reservoirs and special structures - pipelines of large dimensions and gradients.			
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 agriculturally 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 application. Solving of 1D, 2D and 3D 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 supply, networks and balneology.			
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.			
144VHO4	Urban water management 4	Z,ZK	5
The subject in the water supply part builds on the content of UDPV, which it further deepens in terms of practical examples that are focused on modeling in the Epanet 2 software. In part of urban drainage, modelling in the SWMM software is solved.			
144YCOV	Water and Waste Water Treatment	Z,ZK	5
To learn technology, design and operation of various types of wastewater treatment plants (WWTPs) for different pollution sources.			
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.			

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

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