THE FUTURE
IS YET TO BE BUILT

INFORMATION FOR ZHAW STUDENTS

2024/2025

Zürcher Hochschule
für Angewandte Wissenschaften

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Univerza *v Ljubljani*
Fakulteta *za gradbeništvo in geodezijo*

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Welcome to Faculty of Civil and Geodetic Engineering

Information for ZHAW students

About the faculty:
https://www.en.fgg.uni-lj.si/about/

Student quick links page:
https://www.en.fgg.uni-lj.si/students/

Short guide to UL FGG for foreign students:
https://www.en.fgg.uni-lj.si/students/short--guide-to-ul-fgg-for-international-students/

Courses MSc Water Science and Environmental Engineering

In order to obtain the competences of the MSc study programme Water Science and Environmental Engineering, at least 8 ECTS from the following courses are mandatory for ZHAW students:

Semester	Course Name	Category	ECTS	Language
Autumn	Drinking Water Supply and Treatment	Water Science	8	English*
Autumn	Urban Drainage and Waste Water Treatment	Water Science	8	English*
Autumn	Hydraulic Structures	Water Science/Civil Engineering	8	English*
Autumn	Geotechnics of Infrastructural Facilities	Civil Engineering	6	English*
Autumn	Water Management Systems	Water Science	4	English*
TBA**	Hydroelectric Power	Water Science/Civil Engineering	4	English*
Spring	River Engineering	Water Science	8	English*
Spring	Drainage and Irrigation	Water Science	6	English*
Spring	Open Sea and Coastal Area	Water Science	4	English*

English* - with less than 5 foreign students the lectures are given in the form of consultations, while practicum and seminars are done in English language.

TBA** - Elective course may be held either in the autumn or in the spring semester, depending on the demand of the foreign students.

Master thesis*** – is written in English language under supervision of two mentors, one from each Institution

The remaining ECTS may be selected from the following modules:

Semester	Course Name	Category	ECTS	Language
Autumn	Socioeconomical Assessment of Flood Protection	Water Science	5	English*
Autumn	Hydrological Modelling	Water Science	6	English*
Autumn	Spatial Planning for Flood Protection	Water Science/Spatial Planning	5	English*
Autumn	Efficient Energy Use	Buildings / Environment	9	English*
Autumn	Hydraulic Modelling	Water Science	8	English*
Autumn	Environmental Technologies	Water Science / Environment	4	English*
Autumn	Mathematical Modelling of Environmental Processes	Water Science / Environment	5	English*
Autumn	Water Policy	Water Science	4	English*
Autumn	Decision Support Systems in Water Management	Water Science	5	English*
Autumn	Introduction to Research Work	Basic	4	English*
Autumn	Selected Topics from Mathematics III	Basic	4	English*
Spring	Environmental Geotechnics	Water Science	5	English*
Spring	Remote Sensing in Environmental Civil Engineering	Geodesy/Water Science	4	English*
Spring	Water Protection	Water Science	4	English*
Spring	Regional Spatial Planning	Spatial Planning	4	English*
Spring	Urban Planning	Spatial Planning / Civil Engineering	4	English*
Spring	Smart House	Buildings	4	English*
TBA**	Ecohydrology	Water Science	4	English*
Autumn / Spring	Master Thesis/Work***	Water Science	30	English

MSc Water Science and Environmental Eng.

Autumn semester

Drinking Water Supply and Treatment (8 ECTS)

This course covers the following topics from water supply systems: Water demand analyses and water uses; Water sources and water catchment; Types and classification of water supply systems; Elements of water supply systems; Pipes and pumps; Hydraulics of water supply systems; Water quality; Basic concepts of water treatment; Filtration – sand and membranes; Settling and flotation, coagulation and flocculation; Softening, ion exchange, treatment of iron and manganese; Primary and secondary disinfection, disinfection by-products; Advanced water treatment processes.

Focal points:

- To gain knowledge and skills for the design and implementation of water supply systems.

Prerequisites: **hydraulics**, **fluid mechanics**, **chemistry**, **biology**

Contact: natasa.atanasova@fgg.uni-lj.si

Autumn semester

Urban Drainage and Wastewater Treatment (8 ECTS)

In the beginning of the course the historical development of the profession is examined. Water consumption, precipitation, and industry water consumption is analyzed in advance. The analysis of the discharge and quality parameters of waste water is followed. Some modern approaches of retention of precipitation water are presented. The basics of sewage system designing are explained. Different types and schemes of sewage systems are presented. Special attention is paid to the runoff of contaminated precipitation water, its controlled drainage and structures for the overflow and retention. It is necessary to familiarize with various procedures for dimensioning of sewage systems and structures based on the precipitation analysis, retention and overtopping of sewage water and determine the inflow to the treatment plant.
The second part of the course is dedicated to the designing of waste water treatment plant. Students get acquainted with the pre-treatment procedures of waste water and natural and technical treatment procedures with suspended and attached biomass. Objects of a treatment plant are treated such as sandblasting, sedimentation, and aeration basins. In sludge treatment processes, students get acquainted with aerobic and anaerobic processes and appropriate constructions for the sludge treatment. Within the course, the sewage system and the treatment plant of some settlement is designed.

Focal points:

- Waste water and precipitation water characteristics – discharge and quality;
- Types and schemes of sewage systems;
- Dimensioning of sewage systems;
- Wastewater treatment procedures;
- Dimensioning of structures of waste water treatment plant.

Prerequisites: **hydraulics**, **hydrology**, **chemistry**, **biology**

Contact: mario.krzyk@fgg.uni-lj.si
natasa.atanasova@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Autumn semester

Hydraulic Structures (8 ECTS):

Within this course the students will meet with the problem of designing, construction and exploitation of dams and other hydraulic structures: a historical overview of the dam construction development, preparing of the project for the planning of dam structures, basics of the design of typical dams (embankment dams, concrete-gravity dams, arch dams), monitoring and safety assurance during the exploitation of those structures, review and a plan of basic types of hydraulic gates, basics of the design of hydraulic structures (intake structures, channels, tunnels, surge tanks, ...). Acquired competence of this course is capability of designing and planning the dams and other hydraulic structures.

Focal points:

- Planning of dam structures (concrete, embankment dams)
- Abstraction of water from natural watercourses (withdrawal works, for surface water or groundwater)
- Water flow through weir structures (spillways, cascades, water jumps, slides, stilling basins)
- Gates and dam structures (various types of surface and submerged gates)
- Inlet and outlet works (reservoirs, desanding facilities, canals, pipes, pressure conduits, surge chambers).

Prerequisites: **hydraulics**, **geotechnics**, **concrete structures**

Contact: andrej.kryzanowski@fgg.uni-lj.si

Autumn semester

Geotechnics of Infrastructural Facilities (6 ECTS)

This is an advanced course on geotechnical engineering with the focus on infrastructural facilities as traffic routes, dams and tunnels. Within each topic, an overview of the methods/technologies is given, followed by design procedures. These are trained through worked examples during tutorials.

The following main topics are covered:

- Methods of ground improvement
- Groundwater flow through saturated isotropic and anisotropic soil
- Earthfill and rockfill dams
- Analysis and management of geotechnical risks
- Tunnel design and constructions with fundamentals of rock mechanics
- Fundamentals of advanced numerical methods in geotechnics

Prerequisites: **soil mechanics and engineering geology**, **seotechnics**/ **foundation engineering**

Contact: janko.logar@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Autumn semester

Water Management Systems (4 ECTS):

The lectures, seminar work and tutorial will cover the following main topics:

- Placement of water management (WM) in standard classification of activities and classification of structures.
- Design of WM systems and regulations, WM postulates, principles, objectives and functions, and approaches in water management
- Institutional frameworks of WM measures, stakeholders and water policy, legal status of waters, comparison with foreign forms of organization.
- Design of control, monitoring and data resources and compliance with relevant EU directives.
- Integrated water management, WM development, relations with protective planning, sectorial and spatial planning and water funds planning.

Intended learning outcomes:

- Understanding of legal-economic-technical aspects for WM systems.
- Application of the achieved knowledge as a starting point for consideration at individual fields of Hydraulics incorporated in WM systems.
- Acquaintance with the state of affairs of the Water Management Sector and institutional contexts, understanding of operating conditions of WM systems.
- Ability of application and critical assessment of design, operation and boundary conditions.

Prerequisites: **hydraulics**

Contact: mateja.skerjanec@fgg.uni-lj.si

Autumn semester

Selected Topics from Mathematics III (4 ECTS)

The aim of the course is to upgrade previously acquired mathematical knowledge to enable the understanding of mathematical tools used by engineering courses. The focus is on mathematical modeling of various natural processes by differential equations.
We consider linear systems of ordinary differentilal equations, initial and boundary value problems, Fourier series and some basic partial differential equations. Apart from wellposedness and analytical methods we also study qualitative behavior and show some simple numerical methods.

Intended learning outcomes:

- formulation of practical problems in mathematical language
- identification of the appropriate mathematical model
- basic theoretical knowledge for using in practical problems
- skills in using literature and modern technologies

Prerequisites: **differential**, **integral** and **multivariable calculus**

Contact : marjeta.kramar-fijavz@fgg.uni-lj.si

Autumn semester

Socioeconomical Assessment of Flood Protection (5 ECTS)

Introduction in socioeconomics aspect of water policy and flood protection. Communication and public participation in water policy (Aarhus c.). Sociological aspects of flood risk perception. Legitimization and communication of emergency information. Public opinion v. expert knowledge. Public perception of floods and emergency information vulnerability. Stakeholders competences in communicating flood warnings. Basic principles of water policy. Social and economical aspects of decision making process. Different cultural and political aspect in up-down and down-up decision making process. Historical overview.
Understanding o social assessment problems of flood protection. Economy of flood protection. Cost-benefit analyse of flood protection measures and decision making. Economical methods for damage evaluation. Economic incentives for flood prevention and regulative aspects. Risk management.

Focal points:
Obtained in-depth theoretical knowledge of sociological, economic and psychological problems of floods.
Understanding the social and economic problems and how to solve them.

Prerequisites: **sociology**, **economy**, **hydrology**

Contact: matjaz.mikos@fgg.uni-lj.si

Hydrological Modeling (6 ECTS)

The focal point of the course is acquaintance with hydrological modelling, their application and critical judgment of input data and calculated results for planning measures. In the first part of the course basic principles of models will be introduced – types of models, their classification, application of basics of systems theory, basics of application of stochastic in hydrology, unit hydrograph (UH) and synthetic unit hydrograph theory, methods for estimating accuracy of modeling results, regionalisation in hydrology, floods and hydrological forecast. The second part of the course reveals basics of groundwater, groundwater modelling, the influence of individual structures on changes in water regime. Through the practical part of the course students implement acquired knowledge to develop hydrological and groundwater model in combination with the basic GIS tools for the model input data assessment. Knowledge of basic hydrology is required.

Focal points:

- Acquaintance with basics of hydrological modeling.
- Upgrading of basic knowledge in hydrology by application of hydrolological models.
- Ability of abstract formulation of natural processes.
- Using different hydrological models for water regime management.
- Theoretical background of analysing the results of hydrological models.
- Ability of using different hydrological models for water regime management.
- Ability of critical judgment of input data and calculated results for planning measures and compliance of models with observations in nature.

Prerequisites: **hydrology**

Contact: mojca.sraj@fgg.uni-lj.si

Autumn semester

Efficient Energy Use (9 ECTS)

Energy efficiency of buildings represents a key element for achieving a sustainable future as buildings represent approximately 40% of total world energy use. The focal point of the course is the calculation and design methodology of integrated energy performance of buildings, focused on climate based (bioclimatic) engineering. In the first part of the course basic principles of thermodynamics, climatology and bioclimatic design are discussed. The second part of the course is dedicated to specific and detailed engineering procedures of energy efficient envelope design (transparent and non-transparent parts), thermal bringing calculations, 2D thermal analysis and whole building dynamic heating, cooling and lighting energy consumption as well as solar energy utilisation and integration. Through the practical exercises students implement acquired knowledge on a specific design project where the final goal is to achieve building's energy efficiency, which is considered in relation to current and future predictions of climate (in relation to climate change).

Focal points (objectives):

- Acquaintance with key principles and terminology of bioclimatic building design.
- Principles of climate and climate change processes in relation to building design.
- Methodology for energy efficient design of building components and buildings as a whole.
- Modelling of energy use in buildings, optimisation of envelope elements, planning of buildings in relation to the predicted future performance.
- Final objective is to enable efficient energy use and utilisation of renewable energy sources in the built environment.

Prerequisites: **physics**, **materials**, **building engineering**

Contact: mitja.kosir@fgg.uni-lj.si

Autumn semester

Spatial Planning for Flood Protection (5 ECTS)

Introduction to spatial planning, foundations of sustainable planning and overview of legal foundations of spatial planning. Review of current knowledge in spatial planning in the EU countries. International (spatial) planning at the national, regional and local planning. Flood protection at all levels of planning. Legal aspects of spatial planning. Comprehensive and sectoral planning. Planning with respect to flood protection at state, regional and local levels. Local and site planning with respect to flood control, and protection and flood mitigation by spatial planning. Methods and techniques. Analysis of practical examples and examples of good practice. Collection and processing of spatial data. Vulnerability mapping, analysis of the impact of floods, environmental impact assessments and spatial planning. Methods and techniques of urban planning with regard to flood control.

Focal points:

- Obtained in-depth theoretical knowledge of spatial planning and floods.
- Understanding the practice of spatial planning and the impact of floods on spatial planning.
- Using the methods of spatial planning for protection against flooding.
- Ability to assess the possibilities of considering the possibility of spatial planning for planning flood protection.
- Creating the basics of flood protection for the needs of spatial planning.

Prerequisites: **sociology**, **economy**, **hydrology**, **spatial/urban planning**, ArcGIS and/or AutoCAD (or other adequate software)
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MSc Water Science and Environmental Eng.

Autumn semester

Hydraulic Modelling (8 ECTS)

The first part of the course deals with unsteady free surface flow: types of waves, basic St. Venant equations, numerical solution methods including method of characteristics, explicit and implicit finite difference methods, initial and boundary conditions, basics of two-dimensional problems. The second part is dedicated to transient flow in pipes under pressure: description of the phenomenon, derivation of dynamic and continuity equation, solution methods, initial and boundary conditions, measures to mitigate water hammer, surge tanks design and stability requirements. In the third part of the course students get acquainted with the computations of special cases of steady non-uniform flows (demanding boundary conditions, software description) and with physical hydraulic models (dimensional analysis, principles of the theory of similarity, distorted models, processes of model design, criteria for the selection of physical or mathematical model, laboratory work). Two one-day field visits of the selected hydro power plant and Litostroj Power consulting company are also foreseen.

Focal points:

- Acquaintance with physical phenomena of waves in fluids;
- Unsteady flow in open channels, basic equations and numerical modelling;
- Transient pressure flow in pipes, principles of water hammer analyses;
- Surge tanks in pipeline systems;
- Physical models of hydraulic structures, laboratory work and measurement techniques;
- Seminar work using 1D and 2D mathematical models for flood wave simulations in open channels and flow analyses in demanding pipeline systems.

Prerequisites: **physics**, **fluid mechanics**, **hydraulics**

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Autumn semester

Environmental Technologies (4 ECTS)

The course will present the latest environmental technologies as well as integrated solutions for environmental problems. Topics include: Earth's carrying capacity, climate change impacts, natural resources – water supply in particular and advanced treatment and management of drinking and waste water; advanced treatment of leachate and highly loaded wastewater with membrane and advanced oxidation processes and cavitation; remediation of soils; gas treatment; ecoremediation; water reuse, zero waste paradigm and approaches for integrated solutions of environmental problems. Students are expected to analyse given environmental problem from different aspects.

Prerequisites: **fluid mechanics, hydraulics, basic environmental engineering**

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MSc Water Science and Environmental Eng.

Autumn semester

Mathematical Modelling of Environmental Processes (5 ECTS)

Basic principles of modelling natural processes in water: hydrodynamic circulation, transport and dispersion of pollutants, biochemical processes.
Comparison of physical and mathematical models. Modelling processes and equations: continuity, momentum, advection-diffusion equation, turbulence models and stratification, biochemical processes. Connecting hydrodynamic, transport-dispersion and biochemical module into a complex ecological model. The applicability of 1D, 2D and 3D models. Individual work on analytical and numerical solutions of mass transport equation in 1D, 2D and 3D models.

Intended outcome:

- Connecting hydrodynamic, transport-dispersion and bio-chemical processes in water environment.
- Understanding water quality processes and ability of their quantification.
- Assessment of various time-scale processes based on physical and bio-chemical processes.
- Integration of modules into complex ecological models for short- and long term simulations.
- Planning measurements of environmental parameters for calibration of mathematical models.
- Application of complex ecological models for water quality.

Prerequisites: **hydraulic modelling, hydrological modelling**

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Autumn semester

Water Policy (4 ECTS):

The main topics of the course are:

- Baseline water management and environmental protection.
- Culture and tradition in water management.
- Legal basics, principles and doctrines of water law.
- Characteristics and interests of different activities.
- Information systems in water policy.
- Geographic information systems, characteristics, standards.
- Determination of water balance
- Determination of the impact on the environment and their evaluation
- Evaluating and comparing interventions in the water regime with the help of SWOT.
- Economic base of water policy.
- Methods for the determination of optimal solutions.
- Water policy and public participation.
- Policy of more space for water.
- Impact of Climate Change on Water Policy.

Intended outcome:

- Critical assessment of interests of the parties in the decision-making process.
- Consideration of the dynamics of the implementation of procedures for planning human activities in water policy.
- Ability to use information technology in the context of Water Policy.

Contact: andrej.kryzanowski@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Autumn semester

Decision Support Systems in Water Management (5 ECTS)

The main topics of the course are:

- Decision making process and tools for their simulation in multi-objective environment, pareto-optimal frontier, scenario identification
- Status identification and decision-making variables, tools for the status identification
- Resolution problem in decision-making process, aggregation, dis-aggregation
- Validation in complex system modelling, data and information redundancy
- Managing uncertainties and risks in the DS process
- End user experience, integration of user experience, back-loop approach in use and development of DSS, project definition, SCRUM approach, OLAP (Online Analytical Processing), dynamic status follow- up, and transactional modelling
- Classification of the DSS (single use, multiple use, data driven, model driven, etc.) and their environmental engineering
- Challenges of the future DSS developments

Intended outcome:

- Understanding the decision making process and its theoretical background, large dataset management, uncertainty in the decision making process
- Critical analysis of existing decision making processes and tools for their support;
- Application DSS models on various levels in engineering practice

Contact: primoz.banovec@fgg.uni-lj.si

Autumn semester

Introduction to Research Work (4 ECTS):

Basics of scientific communication in research work will be presented and discussed:

- Writing a rough draft. Searching and reviewing of scientific literature. Preparation of proposals. Graduate theses and dissertations. Publishing in scientific journals. Forming the final draft.
- Reviewing and revising. Publishing data. Professionalism, ethics, and legal issues when publishing results of research work. Scientific presentations (scientific and professional seminars, job interviews). Communication without words and visualisation of presentations. Oral presentations. Poster presentations. Group communications. Communicating with the non-scientists.
- Preparation of a draft of research master thesis. Preparation of the presentation of a draft of master thesis and its oral presentation in front of the fellow students.

Intended outcome:

- Acquaintance with basic terms of communication in research.
- Specifics of different forms of communication with the accent on master thesis.
- Application of acquired knowledge for working out a research master thesis.
- Critical judgment of other professionals' and researchers' results.

Contact: matjaz.mikos@fgg.uni-lj.si

Spring semester

River Engineering (8 ECTS)

River engineering basics: river hydraulics, river mechanics (bed load and suspended loads), river morphology, erosion and sedimentation. Classic river engineering: flood protection works, river channel works, dimensioning and maintenance of different river structures, weirs and fish passages. Natural river engineering: river corridor, hydro-morphological status of rivers, basics of bioengineering, catalogue of river bioengineering river works, planning and maintenance of river bioengineering works. Modelling of river water and sediment flow on a physical (hydraulic) model. Hydraulic computation of a selected river reach.

Focal points:

- Upgrade of basic knowledge of hydraulics with knowledge of river hydraulics, mechanics and morphology.
- Giving an overview of classical and modern (bioengineering) river engineering methods with the basics of their planning, design and maintenance.
- Ability to field identification of conditions in a stream.
- Ability to prepare river engineering plans for stream reaches.

Prerequisites**: hydraulics**, **hydrology**, **geology**, **geotechnics**

Contact: matjaz.mikos@fgg.uni-lj.si
simon.rusjan@fgg.uni-lj.si

Drainage and Irrigation (6 ECTS)

The focal point of the course is acquaintance with the drainage and irrigation systems, how to plan and design them, understanding of their operation, implementation and maintenance. In the first part of the course basic principles of soil hydrology are introduced. The second part of the course is dedicated to the drainage systems - types of drainage systems, soil science, groundwater, planning, construction and maintenance of drainage systems, drainage in specific circumstances, project of the drainage system, structures for flood protection. The third part of the course is dedicated to the irrigation systems - types of irrigation systems, the importance and the impact of the irrigation on food production, natural resources and the selection of irrigation system, irrigation methods, design, construction and maintenance of irrigation systems, use of pesticides and herbicides, facilities in the irrigation system. Through the practical part of the course students implement acquired knowledge to develop concepts for a drainage and irrigation project.

Focal points (objectives):

- Acquaintance with basics of soil science and principles of agro-hydrology.
- Understanding of the nature and importance of drainage and irrigation systems.
- Ability of abstract formulation of natural processes.
- Planning and design of facilities for irrigation and drainage systems.
- Planning, design, implementing and maintenance of drainage and irrigation systems and exploitation and protection of water resources.

Prerequisites: **hydraulics**, **hydrology**

Contact: mojca.sraj@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Spring semester

Open Sea and Coastal Area (4 ECTS)

Numerous physical processes take place in the open and coastal sea. The first part – basic physical oceanography – reveals origin of currents, waves, mixing, and transfer of heat, water and substances (e.g. salt, pollutants). The second part of the course is dedicated to coastal engineering. Students get acquaintance with physical processes in the near-shore environment. They learn to design various coastal and coast-protection measures and facilities. An introduction to protecting the sea against the pollution stemming from anthropogenic sources is also provided within the course. During a two-day field work the students get acquainted with the coastal facilities and structures.

Focal points:

- Acquaintance with basic physical oceanography and its terminology;
- Characteristics of sea motion, water, substance, heat and energy transport processes;
- Distinguishing processes in the open sea and in the coastal area;
- Interaction sea – coast – structures/facilities;
- Designing of various coast protection measures and structures;
- Basic coastal models and modelling, critical interpretation of results.

Prerequisites: **fluid mechanics**, **geotechnics**, **concrete structures**

Contact: dusan.zagar@fgg.uni-lj.si

Environmental Geotechnics (5 ETCS)

Geotechnical engineers and geologists are increasingly challenged to solve environmental problems related to old waste disposal facilities, remediation of contaminated sites, the improved use of recycled wastes in civil engineering, sustainable development etc.
To full-fill the needs of new era (circular economy), civil and geotechnical engineers must be able to understand principles of hydrogeology, chemistry and biological processes.

Focal points:

- History of environmental geotechnics, origin of regulations and implication of regulations in geotechnical engineering.
- Geological materials as a conductor, isolator or accumulator of pollutants. Flow of water in soils, specific properties of soils relevant in EG: unstable minerals, ground swelling, concrete deterioration, soluble substances in natural ground.
- Industrial by products and construction demolished wastes: physical and chemical properties and test methods (focal materials: fly asf, slag, foundry sand, demolished concrete...). Use of recycled materials in earth construction. The misuse of by products in the past in different civil engineering and land use applications.
- Landfill sites: introduction, engineered landfill, base and surface sealing systems. Lining materials, water balance analysis.
- Remediation of contaminated sites and abandoned landfills: approach to remedial planning and implementation, remedial investigation, remedial design, execution works and monitoring.
- Geosynthetics and special materials in environmental geotechnics.

Prerequisites: **geology**, **geotechnics**

Contact: matej.macek@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Spring semester

Remote Sensing in Environmental Civil Engineering (4 ECTS)

Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites. The aim of this subject is to acquaint students with the basic theory of remote sensing, whereas the emphasis is given to practical aspects and applications in environmental engineering. The course is composed of three main parts that include optical imaging systems (satellite and aerial imagery), airborne laser scanning or lidar, as well as understanding and use of topographic databases. Students learn to use different computer tools for processing images and lidar data in laboratory exercises, based on cases and real data from the engineering practice. Students in small groups prepare a seminar work on a current topic, where they accomplish some additional research and study of relevant literature, and present it in the class. The main topics of the course are:

- Overview of developments in remote sensing
- Electromagnetic radiation, interaction of light with the atmosphere and the Earth's surface
- How image sensors work, technical features of digital image
- Image interpretation, basics of digital image processing, image classification (pixel based, object based)
- Georeferencing and different corrections of images
- Technology of laser scanning and processing of lidar data (generation of point cloud, filtering, classification and modelling)
- Production and use of orthophoto
- National topographic databases
- Current global satellite systems

Prerequisites: **physics**

Contact: mojca.kosmatin-fras@fgg.uni-lj.si

Water Protection (4 ECTS)

Familiarization with characteristics of water, types and sources of water pollution and substances that cause pollution. Monitoring of water quality parameters is briefly presented. Basic hydrological and biological circles are explained (oxygen, carbon, nitrogen, phosphorus and metal). The basic concepts of the kinetics of organisms are presented and the modeling of natural processes in the rivers, lakes and seas. Students get acquainted with the procedures for assessing the self-purification ability of water bodies. Engineering methods for improving water quality are introduced - preventive and curative measures. Impact of waste water outflow in the sea is analyzed and basic measures for the protection of bathing waters are presented. Students get acquainted with the problem of eutrophication of water bodies, procedures and models for its evaluation and possible approaches to solve the problem of eutrophication.

Focal points:

- Water characteristics;
- Types and sources of water pollution;
- Water quality assessment methods;
- Auto-purification water ability;
- Engineering approaches to increase purification ability;
- Phenomenon of eutrophication.

Prerequisites: **hydrology**, **hydraulics**, **biology**, **chemistry**

Contact: mario.krzyk@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Spring semester

Regional Spatial Planning (4 ECTS)

Regional spatial planning course acquaints students with fundamental theoretical, methodological and professional knowledge and skills for elaboration, implementation and monitoring of regional policies, regional strategies and plans at transnational, national, interregional and regional levels. Students receive basic theoretical, methodological and practical knowledge in social geography to understand phenomena and processes at the regional scale: system of settlement, urbanisation processes, settlement typologies, etc.

Focal points (objectives and competencies)

- Definition, content, the aim, development and the role of regional planning in the system of planning.
- Definition of a region, methods of regionalization.
- Theories of regional development.
- Regional policy in EU and Slovenia.
- Elements of regional spatial plans.
- Spatial planning on the regional level: experiences from Slovenia and selected EU regions.
- Recent regional spatial planning approaches in Slovenia and EU.
- Selected topics from social geography.

Contact: simon.kusar@ff.uni-lj.si

Spring semester

MSc Water Science and Environmental Eng.

Spring semester

Urban Planning (4 ECTS)

Basic notions and terminology in urban spatial planning. Sustainable principles of urban and settlement development. Settlement typology, urban system, urbanization and urban land use, urban planning documentation and administrative services. Implementation of urban planning documents. Urban information systems, databases and their application. Urban ecology, urban renovation, lectures on housing, green infrastructure, other infrastructure systems industrial land uses and services of public interests. Visits to urban planning institutions and the Urban Planning Department of the City Administration.

Focal points (objectives and competences):
To provide comprehensive knowledge of urban planning, construction of settlements, environmental protection in urban areas, implementing spatial planning documents and implementation of plans of building land development.
Understand of spatial conditions and land development processes.
Understand the options of urban design in town planning
Knowledge and understanding of implementing spatial planning documents, and development of building plots.
Connections with geoinformation, courses on municipal management, capability of team and interdisciplinary work.
Affiliation to the areas of real estate management, land development, urban design, rural studies.

Prerequisites: **spatial/urban planning**, AutoCAD (or other adequate software)

Contact: gregor.cok@fgg.uni-lj.si

MSc Water Science and Environmental Eng.

Spring semester

Spring semester

Smart House (4 ECTS)

Integration of "smart" technologies in current and future buildings is one of crucial elements in formation of more sustainable built environment. However, the term "smart house" is more than just implementing automatisation in buildings. It represents an integrated design approach based around building's occupant needs and demands. The course deals with the implementation of integrated design methodology in the field of built environment with special focus on the optimization of energy, daylighting, occupant comfort and implementation of automated indoor environment. The potential of new emerging technologies (e.g. electro activated polymers, memory alloys, thermochromics etc.) are discussed and presented with special focus on the design of adaptable building envelopes. At the end, methods based on international standards for evaluation of automatisations' impact on energy efficiency of buildings are also presented. During the practical exercises, students prepare a project proposal of a smart building following the presented integrated design approach using appropriate analytical design tools.

Focal points (objectives):

- Acquaintance and implementation of integrated design approach.
- Understanding of interactivity between occupant, environment, building and technology.
- Simultaneous modelling and evaluation of luminous and thermal indoor environment.
- Being able to design the framework of automated indoor environment and evaluate its impact on energy and overall building efficiency.

Prerequisites: **physics**

Contact: mitja.kosir@fgg.uni-lj.si

Semester TBA **

Ecohydrology (4 ECTS)

Ecohydrology as interconnection between hydrological, biogeochemical and biological processes. Cycling of water, matter, energy in hydrosphere and geosphere. Spatial and temporal changeability of rainfall runoff formation. Processes of flushing and dissolving of matter: erosion processes, inflow of dissolved matter in water bodies, dynamical equilibrium of ecosystems. Seasonal regimes: seasonal variability of hydrological conditions and processes; seasonal variability of biogeochemical conditions and processes. Anthropogenic impacts on hydrological and biogeochemical conditions in water bodies (agriculture, industry, urbanisation, river regulations). Monitoring of ecohydrological processes: hydrological monitoring, monitoring of physical and chemical water parameters. Modelling: modelling of hydrological processes, modelling flushing of matter, modelling of biogeochemical processes.

Prerequisites: **hydrology, hydraulics, geology**

Contact: matjaz.mikos@fgg.uni-lj.si; simon.rusjan@fgg.uni-lj.si

TBA** - Elective course may be held either in the autumn or in the spring semester, depending on the demand of the foreign students.

Semester TBA **

Hydroelectric Power (4 ECTS)

Within this course the students will meet with the operation of electric power industry, the role of water energy in the overall energy balance, planning the energy usage of water resources: design of accumulations and other hydraulic structures, an assessment of energetic and economic factors for planning of hydropower production, planning of hydropower plants, operational optimization of hydropower plants, and environment aspects of planning. Acquired competence of this course is capability of designing and planning of hydropower plants and their role and placement in the frame of electric power industry.

Prerequisites: **hydrology, hydraulics**

Contact: andrej.kryzanowski@fgg.uni-lj.si

TBA** - Elective course may be held either in the autumn or in the spring semester, depending on the demand of the foreign students.

ENROLMENT TO THE UNIVERSITY OF LJUBLJANA, FACULTY OF CIVIL AND GEODETIC ENGINEERING

Once you are nominated by ZHAW to study at the UL FGG, you can start the procedure for the enrolment.

1. Enrolment application

Prior to enrolment all candidates must apply for enrolment online at the Ministry's portal called **EVŠ** and print the application. The address where candidates should send the printed enrolment application for study and other supplemental documents by registered post is indicated in the upper left corner of the application form.

For more information please check the link below:
http://portal.evs.gov.si/information-in-english

The deadline for application for academic year 2024/25 will be published in the **call for enrolment**:
http://portal.evs.gov.si/

First application for the academic year 2024/2025 will be published in February 2024 in the call for enrolment. Enrolment application for study is available on the link below:
https://portal.evs.gov.si/prijava/?locale=en

2. Recognition of prior education

You will enrol to the 2nd cycle master study of Water Science and Environmental Engineering. Enrolment requires adequate prior education. For the evaluation procedure, you are required to send us the following documents:

- **original** document evidencing education finished at a foreign institution with **apostille seal**
- chronological description of education
- non-attested copy of the proof of contents and duration of education

3. Enrolment

Based on your prior enrolment application and decree on recognised prior education, you will be invited to enrol to the UL FGG. The enrolment normally starts in the second half of July and is open until the second half of September.

For the enrolment to our faculty you will receive in due time detailed instructions and required documents.

University of Ljubljana

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University of Ljubljana

University of Ljubljana was established in 1919. It consists of 26 members; 23 faculties and 3 academies: Biotechnical Faculty, Faculty of Economics, Faculty of Architecture, Faculty of Education, Faculty of Electrical Engineering, Faculty of Pharmacy, **Faculty of Civil and Geodetic Engineering**, Faculty of Chemistry and Chemical Engineering, Faculty of Health Sciences, Faculty of Law, Faculty of Mathematics and Physics, Faculty of Maritime Studies and Transport, Faculty of Computer Science and Informatics, Faculty of Social Work, Faculty of Mechanical Engineering, Faculty of Social Sciences, Faculty of Sports, Faculty of Administration, Faculty of Arts, Faculty of Medicine, Faculty of Natural Sciences and Engineering, Faculty of Theology, Veterinary faculty, Academy of Music, Academy of Theatre, Radio, Film and Television, and Academy of Fine Arts and Design

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