

Institute of Environmental Engineering – COURSES – winter term

Subject: Chemistry (prof. RNDr. Adriana Eštoková, PhD.)
Code: 2503991
Number of credits: 5
Semester of study: WT
Academic degree: bachelor

The objective of this course is to provide a comprehensive view on a structure and reactivity of matter and the principles of chemical reactions in relation to the building materials and their protection against the degradative influences of the environment. The lecture include topics: structure of matter, phase transitions of matter, chemistry of water, chemistry of inorganic binders and concrete, chemistry of metals, corrosive processes of metals, chemistry of organic building materials and fuels, chemistry of polymer matter.

Subject: Environmental chemistry (prof. RNDr. Adriana Eštoková, PhD.)
Code: 2503831
Number of credits: 5
Semester of study: WT
Academic degree: bachelor

The objective of this course is to provide a basic knowledge in order to understand the chemical principles of anthropogenic processes in the environment and global and regional environmental problems. The lectures include topics: hydrogen and oxygen compounds, nitrogen compounds and their role in air pollution, sulphur compounds and their role in air and water pollution, carbon compounds and global warming, halogens and ozone depletion, risk heavy metals, radioactivity, carbohydrates and derivatives and their negative role in the environment. The exercises are focused to the application of presented information in form of calculations and simply laboratory demonstrations of pollutants determination.

Subject: Environmental engineering I (prof. RNDr. Adriana Eštoková, PhD., prof. RNDr. Magdaléna Bálintová, PhD., assoc. prof. Natália Junáková, PhD.)
Code: 2506531
Number of credits: 3
Semester of study: WT
Academic degree: bachelor

The aim of the course is to provide the fundamental knowledge on pollution of the components of natural environment (air, water and land) and consequent significant global environmental problems and to present technologies to pollution control and reduction. The lectures include topics: air pollution, air pollution control and prevention, water quality, waste water management, land and soil protection, radiation protection, waste management, environmental impact of building materials and constructions.

Subject: Chemical technology basics (prof. RNDr. Adriana Eštoková, PhD.)
Code: 25000109
Number of credits: 3
Semester of study: WT
Academic degree: bachelor

The course is aimed at the basic knowledge of manufacturing the building materials based on chemical technologies and their impacts to the environment. The lectures include topics: cement and lime

production technologies and related environmental loads, iron and steel production and the environmental impacts, polymers production processes and the impacts of polymers to the human health and environment, ceramics production technologies, glass production technologies, fossil fuels production and related environmental impacts.

Subject: Landscape protection and revitalisation (assoc. prof. Natália Junáková, PhD.)
Code: 25000052
Number of credits: 3
Semester of study: WT
Academic degree: bachelor

The aim and content of the subject is centred on the conservation and maintenance of natural and cultural environment, especially representative biotopes, species populations and biodiversity in accordance with the principles of sustainability. Because landscape is the vehicle of human relation with nature and human footprint on the planet is considerable, focus is also on its restoration that means returning some degraded portion of landscape to an improved and more natural preexisting condition. The topics of lectures include: protected areas and their categories, policy regarding protected areas, main threats of landscape and protected areas and their management by treatments for cultural landscapes like remediation, rehabilitation, restoration or revitalisation.

Subject: Hydrology and meteorology (prof. Ing. Martina Zeleňáková, PhD.)
Code: 2506483
Number of credits: 5
Semester of study: WT
Academic degree: bachelor

Prevision of basic knowledge from structure of atmosphere, weather development mechanisms, long term development of earth climate and natural cycle of water required to study of civil and environmental engineering. Brief contents of the subject: components and structure of the atmosphere, air pressure and humidity, radiation in the atmosphere, temperature of the solid earth surface, water and air, condensation of water vapour, air stream, basic pressure objects, impacts of weather, sorting of earth's climates, Europe's climate, natural hydrological cycle.

Subject: Water structures (prof. Ing. Martina Zeleňáková, PhD.)
Code: 2506501
Number of credits: 5
Semester of study: WT
Academic degree: bachelor

The aim of the subject is to present the kinds of water structures, their purposes in technical and environmental practise as well as principles of their design and operations. Also to point out significance of water structures and their place in economic society and in water management of the country. Brief synopsis of the course: Water stream regulations. Weirs. Water reservoirs and dams. Hydroelectric plant. Waterways and navigation. Hydromelioration structures – drainage and irrigation systems. Water supply and sewage systems. The emphasis is put on practical knowledge of water engineering with close relation to other disciplines of civil engineering.

Subject: Environmental impact assessment (prof. Ing. Martina Zeleňáková, PhD.)
Code: 2504891
Number of credits: 4

Semester of study: WT
Academic degree: bachelor

Aim of the course is to explain to students Environmental Impact Assessment (EIA) process, which is considered as one of the main apparatus in the international ecological politics for the implementation of sustainable development. It represents effective preventive method of Environment preservation, which comes out from a prognosis and an assessment of the expected impacts of planned intents, projects and developed conceptions on Environment. Brief synopsis of the course: The purpose of the course is the same as purpose of Environmental Impact Assessment - complete, expert and public assessment of planned constructions, facilities and activities before the decision on their permission under special provisions from the point of view of their presumed impact on the environment.

Subject: Pedology and erosion control practices (assoc. prof. Natálie Junáková, PhD.)
Code: 2502111
Number of credits: 6
Semester of study: WT
Academic degree: master

The aim of this course is to obtain knowledge about soil, its properties and their deterioration and degradation caused by the intervention of man. The emphasis is placed on the main environmental issues associated with soil contamination and water erosion as a widespread problem connected to soil degradation. The course gives a survey of the erosion control measures for preventing or controlling of accelerated erosion. The first part of this course deals with soil and its composition; functions of soil in the global ecosystem; soil formation; physical, chemical and engineering properties of soils and soil water. In that connection the second part is focused on an adverse effect of soil erosion on environment, classification of erosion, water erosion intensity, methods of water erosion assessment, technological options for erosion and sediment management, erosion preventive techniques and control measures.

Subject: Architectural and indoor engineering (assoc. prof. Ing. Silvia Vilčeková, PhD.)
Code: 2507891
Number of credits: 5
Semester of study: WT
Academic degree: master

On the base of knowledge from physics, chemistry and biology and their environment the advanced knowledge to understand the strategy of architectural design that meet the aesthetic, functional and technical requirements, while respecting the interaction of individual components of complex envirosystem of buildings are being handed over. Lectures are focused on the principle and practice of building and environment; interaction of architectural, structural and environmental making of buildings and their environment; physical, chemical and biological factors of buildings and their environment (temperature, humidity, light, acoustics, VOCs, odorous, particles, fibers, radon, oxidants, microorganisms, etc.) as well as the strategy of development and design of healthy and environmentally friendly buildings while respecting the sustainable building design.

Subject: Working environment (assoc. prof. Ing. Silvia Vilčeková, PhD.)
Code: 25000429
Number of credits: 4
Semester of study: WT
Academic degree: master

Subject provides an overview of hygienic requirements for working environment and protection against harmful factors of the working environment in line with the latest legislation. Lectures are focused on the basic concepts in the work environment; hygiene requirements for the working environment; physical, chemical and biological factors as well as other hazardous factors by which the employers are exposed, safety and protection of the employees, occupational accidents and traffic accidents.

Subject: Power engineering (assoc. prof. Ing. Silvia Vilčeková, PhD.)
Code: 25000107
Number of credits: 5
Semester of study: WT
Academic degree: master

The subject gives the basic knowledge about processes of production, transport, distribution and conversion of different energy forms, which are necessary for provision of building's operation; energy supply at present and in the future; conventional and unconventional heating systems; heat pumping technologies; heat energy management; power supply and management; energetic use of biomass; technologies for solar energy; wind and water energy use for power production; geothermal energy and its use for heat supply of buildings; and finally energy storage.

Subject: Water supply and sewerage (prof. Ing. Martina Zeleňáková, PhD.)
Code: 2503901
Number of credits: 6
Semester of study: WT
Academic degree: master

Aim of the course is to obtain knowledge about design of construction oriented to water supply and sewage systems. Brief synopsis of the course: Water sources. Demand and consumption of water. Design of water supply. Water supply systems. Components of water supply systems. Principles of construction water supply networks. Water towers. Basic principles of water treatment. Pipe line systems. Sewage. Wastewater collection. Design of gravity systems.

Institute of Environmental Engineering – COURSES – summer term

Subject: Special issues of physical chemistry (prof. RNDr. Adriana Eštoková, PhD.)
Code: 25000155
Number of credits: 4
Semester of study: ST
Academic degree: bachelor

The aim of the course is to understand the principles of thermodynamic processes and chemical equilibrium. The lectures include topics: thermodynamic processes; thermodynamic laws; thermal capacity; thermal equilibrium; thermodynamics of phase systems; phase equilibrium in one-component systems; phase equilibrium in two-component systems; chemical potentials and chemical equilibrium; equilibrium in homogeneous and heterogenic systems.

Subject: Landscape and urban planning (assoc. prof. Natália Junáková, PhD.)
Code: 2505741
Number of credits: 4
Semester of study: ST
Academic degree: bachelor

The mission of the subject is to introduce the basics of landscape and urban planning in accordance with the principles of sustainable development and to understand the ecological processes and interactions within landscape and urban or rural environment. The student will gain an overview about approaches to landscape planning and its urbanization. The first part of this course is focused on the theory of landscape as a subject of landscape and urban planning. It describes the landscape structure and basic units of a landscape; landscape features, mainly the ecological networks as a concept of ecological stability in practise. In next part the student will get acquainted with the regulations for preparing of landscape and urban plans, and also with the application of elements used in landscape and urban planning. The result of this course is to increase the students' comprehensive preparation in landscape and spatial planning and permitting process for construction works in landscape.

Subject: Waste management (Ing. Jozef Junák, PhD.)
Code: 2504491
Number of credits: 5
Semester of study: ST
Academic degree: bachelor

The course is focused on legislative, terminology and the aims of waste management. It addresses physical, chemical and biological properties of waste. It provides an overview of the collection, recovery and disposal of municipal and industrial waste for the participants. At the end of the course, a look into the near future of the waste management is offered- Smart city concept.

Subject: Hydromechanics (prof. Ing. Martina Zeleňáková, PhD.)
Code: 2505431
Number of credits: 4
Semester of study: ST
Academic degree: bachelor

Prevision of basic theoretical knowledge from the laws of hydromechanics thus motion and equilibrium of liquids. Student obtains required knowledge from the application of this laws in field of the civil and environmental engineering practice. Brief contents of the subject: basic properties of liquids, liquid pressure and its impact, basic equation of hydrostatic, motion of liquids in laminar and turbulent flow,

equation of continuity, Bernoulli equation of motion, energy and pressure losses in piping and pipe fittings, motion of liquids in beds, pipe systems and hydraulic systems, power impact of liquid flows.

Subject: Environmental management (prof. RNDr. Adriana Eštoková, PhD.)
Code: 25000071
Number of credits: 5
Semester of study: ST
Academic degree: master

The aim of the course is to provide an overview of analytical and management methods and procedures that are used in practice to assess the environmental impacts of constructions and quality of construction products in order to minimize negative impacts on the environment. The lectures include topics: Principles of environmental management; tools of environmental management in civil engineering; environmental management systems EMAS, ISO 14001; quality management systems; methods for environmental evaluation of building materials; EIA; LCA analysis; eco labeling process; environmentally friendly building materials; environmental design; environmental risks.

Subject: Building materials durability (prof. RNDr. Adriana Eštoková, PhD.)
Code: 25000387
Number of credits: 3
Semester of study: ST
Academic degree: master

The aim of the course is to provide essential knowledge on the causes and mechanisms of degradation of building materials with special regard to concrete composites. The lectures include topics: factors influencing the degradation of building materials, aggressiveness of the environment, agents affecting concrete structures, chemical corrosion, biological corrosion, mechanisms of penetration of aggressive substances into concrete, protection against corrosion of concrete, corrosion of metals, concrete reinforcement corrosion.

Subject: Sustainability assessment of buildings (assoc. prof. Ing. Silvia Vilčeková, PhD.)
Code: 25000470
Number of credits: 5
Semester of study: ST
Academic degree: master

Well known sustainability assessment methods and systems used over the world are introduced. Main fields such as location, sustainable sites, transport, management, building materials, life cycle assessment, indoor environmental quality, energy performance, water and waste management are presented in terms of LEED and BREEAM requirements. Finally, the building certification process and granting of a certificate according to LEED, BREEAM and other systems are included in the lectures. Assessment of student's own design of a building according to the selected indicators represents a practical benefit.

Subject: Sustainable construction (assoc. prof. Ing. Silvia Vilčeková, PhD.)
Code: 25000506
Number of credits: 3
Semester of study: ST
Academic degree: master

The main goal of the subject is to gain the knowledge about fundamental aspects of the sustainable construction. New construction and renovation of the buildings as well as revitalization of the built-up

areas according to the principles of sustainable construction are the main topic. Lectures are focused on the main principles and concept of sustainable construction; features, aesthetics and revitalization of the built-up area, selection of environmentally friendly building materials, passive and active use of energy, aspects of reducing the consumption of operational energy and water; indoor environmental aspects and waste management. Design of single-family house respecting sustainable principles is the main benefit with practical output.

Subject: Building Materials LCA (Ing. Marcela Ondová, PhD.)

Code: 25000386

Number of credits: 3

Semester of study: ST

Academic degree: master

The course is aimed at obtaining the basic knowledge in the field of environmental assessment of building materials. The lectures are focused on the assessment of building materials through LCA (Life Cycle Assessment) method, which is one of the leading environmental assessment tools today and points to main environmental impacts of building materials during their life cycle. During the course, lectures are gradually focused on a more detailed specification of LCA in the following areas: LCA objectives, Legislation, Main phases of LCA, System boundaries and unit, Databases, Input data and their verification, Environmental impact categories / LCA indicators, LCA outputs as well as Significance and benefits of LCA for practice. The last lecture presents and discusses the issue of EPD (Environmental Product Declaration), which is closely linked to the LCA report. Exercises are focused on determining the environmental impacts of a single-family house using LCA calculation software.

Institute of Environmental Engineering – RESEARCH

Life cycle assessment of buildings

Analysis of environmental and economic impacts of life cycle phases of buildings in terms of sustainable building design. Responsible approach to the selection of building materials and structures as well as technologies respecting energy and water efficiency of buildings. Determining the contribution of life cycle phases to the environmental impact categories and cost during whole lifespan. Design of a sustainable building based on in-depth analysis of aforementioned aspects.

Indoor environmental quality monitoring

Analysis of new approaches for evaluation and certification of buildings in terms of air, water, light, movement, thermal comfort, sound, materials, mind, community, location, and others. Measuring the indoor environmental quality factors and performing questionnaire survey. Analysis of results based on certification schemes (WELL, FITVEL) focused on health, comfort and well-being.