

**TECHNICAL UNIVERSITY OF KOŠICE**  
**Faculty of Civil Engineering**

FACULTY

The **FACULTY** of Civil Engineering of the Technical University of Košice was founded in 1977. Over the 43 years, more than 8,000 graduates in all three levels of study have left the gateway to various positions, such as civil engineers and designers, structural engineers, site managers, CEOs, researchers, and teaching staff.

Faculty's achievements in scientific research and education have been recently ranked us among stable and progressive faculties of the Technical University of Košice, evidenced by the EUR-ACE, international accreditation certificate according to the criteria of the European Accreditation Agencies, which guarantees that the faculty level corresponds to the European technical universities. Nowadays, more than 700 students study at the bachelor, master and doctoral degrees of the study in the fields of civil engineering and environmental engineering.

NEWS

## VISION

**The Faculty of Civil Engineering as an irreplaceable and stable faculty within the structure of the Technical University in Košice and the structure of educational institutions in Slovakia and Central Europe. Faculty, which at the level of Slovakia is one of the leaders in innovation and creativity in education in the field of construction. It is characterized by professionalism, cooperation, interdisciplinarity and social responsibility in education, research and entrepreneurship at the domestic and international levels. It is attractive to applicants for study, cooperates with important partners from practice and with its research pushes the boundaries of knowledge in favor of the development of society. It has a modern and extensive infrastructure needed for quality education and research, it has a stable innovation potential. It is financially independent and efficient in every activity.**

MISSONI

The basic **MISSION** of the Faculty of Civil Engineering is to contribute to the fulfillment of the mission of the Technical University in Košice by providing and constantly developing university education and creative scientific research in the field of civil engineering and environmental engineering. The faculty carries out basic and applied research, uses the latest knowledge of science and technology in the education of students, performs development, business and expert activities and provides further education. The Faculty of Civil Engineering assists in the scientific and technological development of the construction industry in order to shape a beneficial future and increase the quality of life.

INSTITUTES

AND

DEPARTMENTS



# INSTITUTE OF STRUCTURAL ENGINEERING

**Department of Steel and Timber Structures**

**Department of Concrete and Masonry Structures**

**Department of Geotechnics and Transportation Engineering**

**Department of Structural Mechanics**

**Laboratory of Structural Engineering**

# INSTITUTE OF ARCHITECTURAL ENGINEERING

**Department of Building Design**

**Department of Building Services**

**Laboratory of Architectural Engineering**

# INSTITUTE OF ENVIRONMENTAL ENGINEERING

**Department of Environmental Engineering**

**Department of Material Engineering**

**Laboratory of Material and Environmental Engineering**

# INSTITUTE OF TECHNOLOGY, ECONOMICS AND MANAGEMENT IN CONSTRUCTION

**Department of Technologies and Innovations in Construction**

**Department of Economics, Management and Information Systems in Construction**

**Department of Applied Mathematics and Descriptive Geometry**

**Laboratory of Digitization and Virtualization in Construction**

STRICTLY PRIVATE  
SINGLES

## STEEL AND TIMBER STRUCTURES

Target of this course is to acquaint students with principle of design of metal and timber structures according to relevant technical standards and principles. In practical part of the subject, students will design simple steel and timber civil structures with focus on structural design and detailing.

## METAL STRUCTURES AND BRIDGES

Target of this course is to acquaint students with principle of design of metal and timber structures according to relevant technical standards and principles. In practical part of the subject, students will design simple steel and timber civil structures and bridges with focus on structural design and detailing.

## TIMBER STRUCTURES AND BRIDGES

The target of this subject is to acquaint the students with the principle of design of timber structures according to valid technical standards and regulations.

Students are familiar with design an extensive range of timber load-bearing structures: the planar trusses, frames, and arches, timber roof structures, spatial structures, construction systems of timber multi-storey buildings, and timber bridges and footbridges. Principles and methods for protecting wood and timber structures are introduced.

## ELASTICITY I

Objective of the Elasticity I is to analyze simple state of stress (Simple tension (compression), Simple shear, Simple torsion, Simple bending), Buckling of centric loaded columns and combined state of stress (Shear under bending, General bending, Bending with tension (compression)).

## STATIC ANALYSIS OF CONSTRUCTIONS

The goal of subject Static of structures is inform students with solving of statically determinate planar structures (simple, continuous beams with hinge, frames, three-hinged frames, arches and orthogonally loaded frames), calculation of displacements at statically determinate structures and methods for solving of statically determinate structures: force method, force method, slope deflection method and displacement method.

## TRANSPORT ENGINEERING PLANNING

The goal is to manage the design process in the area of transport - principles of transport-planning process, defined by the functions of roads in the area, design of road network, the relationship of roads and local roads and their impact on the environment.

## TRANSPORT STRUCTURES

The course is focused on the issue of explaining the design and construction of transport structures. The aim is to become familiar with the principles of design of roads and highways and to get basic knowledge about geometry problems of transport structures.

## SOIL MECHANICS

The goal is to teach students the basic properties of soils, methods of detection and classification of soils. Apply strength and deformation characteristics of soils for solution of geotechnical task for stress in soils, earth pressure, compressibility and consolidation as well as compacting and its control.

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## SOIL MECHANICS

The goal of the subject is to acquaint students with the theoretical and practical thesis of basic geotechnics. At the end of study students will be able to use the relevant standards and regulations, assess the geological environment and its properties, describe and classify the soil and to calculate the stresses and strain in the ground.

## CONCRETE AND CONCRETE BEARING STRUCTURES

Design of concrete window lintels, consoles, loggias, and reinforced concrete rings in masonry structures. Solving plates and principles of their reinforcement. Stress analysis and deformation of slabs/plates acting in two directions, design and arrangement of reinforcement. Solution and reinforcement of circular and intercircular plates. Design and assessment of a reinforced concrete wall on supports. Calculation and assessment of frame structures in interaction with the foundation structure. Design and assessment of masonry structures.

## METAL BRIDGES II

Target of this subject is to acquaint students with principle of design of metal bridges according to technical standards and principles. It includes design of truss, box girder, arch, cable-stay and suspension bridges. The problems of stability of compressed elements of openly arranged bridges, arch ridges, etc. are discussed. Practical part of the subject is focused on the specific solution of railway truss bridge

## SELECTED CHAPTERS OF METAL AND TIMBER STRUCTURES

I

To offer the special theoretical and practical set-out oriented on selected current strength-stability problems of reliability and economical design

of metal and timber structures, in accordance with new theoretical knowledge, practical experiences and relevant technical standard.

## ELASTICITY II

The object of the Elasticity II is to analyze the typical design elements such as walls, plates, beams in Cartesian and Polar coordinate system. Besides the closed solutions there is devoted focus to numerical methods, especially the Finite Element Method. There are analyzed the simple structural elements in the non-linear -plastic zone.



## STEEL AND TIMBER BEARING MEMBERS

This course is focused on design of steel and timber bearing members according to relevant technical standards. It will be pointed to elastic and plastic stress response, local and global buckling of steel members under compression and bending and design and detailing of connections. As well as basic principles in design of timber bearing members will be given.

## STEEL BEARING MEMBERS

This course is focused on design of steel bearing members according to relevant technical standards. It will be pointed to elastic and plastic stress response, local and global buckling of steel members under compression and bending and design and detailing of connections.

## THEORETICAL MECHANICS

Objectives of the Theoretical Mechanics is to analyze concurrent system of forces, General system of forces, Statics of rigid particles and bodies, Trusses, Internal loadings developed in structural members (beams, frames, arches), Reactions of composed structures and transverse loading frames.

## CONSTRUCTION MECHANICS

The aim of the course is to acquaint students with the solution of statically indeterminate structures the force and deformation method of constant load, the effect of temperature and tempering supports. Indicate the calculation of influence and fold lines for statically determinate and indeterminate structures, and computation structures on flexible base substrate.

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## ROADS AND MOTORWAYS

The course is focused on problems of design of roads and highways, the construction of road earthbody and layers of pavement. It clarifies the principles of design and construction of roads and highways. Theory of movement of motor vehicles after road communication. The size and length of longitudinal profile - design of lane for heavy vehicles. Drainage - a design of culver. Road equipment - safety equipment on roads. Design of intersections. Capacity and level of service of intersections. Classification and structure of pavements. Material for road pavements.

## RAILWAY STRUCTURES I

The objective of the subject is to introduce of students with problems of railway track geometry components and alignment, clearances and to practice acquires knowledge and skills.

## FOUNDATION I

The goal is to teach students to solve problems of foundations. The subject also covers the issue of foundation soil's stability and strain, issues of choice and statical solution of foundation structure according to Eurocode 7 and selection of most suitable technological procedures when executing foundation of building structures.

## CONCRETE AND MASONRY BEARING MEMBER

Definitions of basic terms and conditions of their use in the design of load-bearing elements and structures. Methods of design of load-bearing structures. Loads on structures and their calculation. Design of load-bearing elements for bending shear, torsion and compression. Principles of drawing documentation of concrete structures. Design of masonry elements for simple stress methods.



## METAL BRIDGES I

**Target of this subject is to acquaint students with principle of design of metal bridges according to technical standards and principles. It includes general lecture about divisions of metal bridges; problems of loading and spatial modification of road and railway bridges; solutions of decks of road and railway bridges; design of girder bridges – including bridges with thin-walled cross-sections and composite steel-concrete bridges with design of composite elements. Practical part of the subject is focused on the specific solution of railway girder bridge and road composite bridge.**

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## DEPARTMENT OF STRUCTURAL MECHANICS AND DEPARTMENT OF STEEL AND TIMBER STRUCTURES

**Structural Health Monitoring, dynamics of structures, modal analysis.**

## DEPARTMENT OF STEEL AND TIMBER STRUCTURES

**Wind Engineering, aerodynamics of structures, numerical methods in wind engineering and aerodynamics.**

## DEPARTMENT OF STEEL AND TIMBER STRUCTURES

**The research program in-depth analyses the behaviour of timber-concrete composite member. Various types of shear connections have already been used, such as an inclined pair of screws, a notched connection, and an adhesive connection. The research consists of shear tests of connections, short and long-term bending tests, tests in the climate chamber, and extensive theoretical analysis.**

## DEPARTMENT OF STRUCTURAL MECHANICS

**The research is focused on multiscale modeling of multi-physical problems of composite structural elements. The attention will be given to the problem with the inclusion of material heterogeneity, numerical and experimental analysis of structural elements made of composite materials, and delamination of laminated structural members.**

**The developed field of numerical analysis of composite structures will be focused on the development of material models for numerical simulations of multi-physical interaction problems of laminate and sandwich structures. Delamination of laminates and sandwich with contact element application will be investigated for delamination in mode I, II, and III or in the mixed mode of delamination. The application of composite materials in the members will be focused on laminate and sandwich plates and**

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## DEPARTMENT OF GEOTECHNICS AND TRANSPORTATION ENGINEERING

The research is focused on theoretical and experimental analysis of traffic-technical characteristics of roads, traffic flow characteristics and technical characteristics of roads for numerical modeling of traffic noise for different types of roads, intersections and roads. The SPB method, the modified SPB method with reflect board and the CPX method are used for the measurement.

## DEPARTMENT OF GEOTECHNICS AND TRANSPORTATION ENGINEERING

The research is focused on the theoretical and experimental analysis of layered road structures and their response to traffic loads, road construction materials and their verification in the laboratory and in situ. Viscoelastic properties and fatigue of asphalt mixtures in order to prolong the life of layered structures. For static and dynamic analysis of track structural elements.

# RESEARCH



ARCHITECTURAL PRACTICE

## ARCHITECTONICAL DRAWING

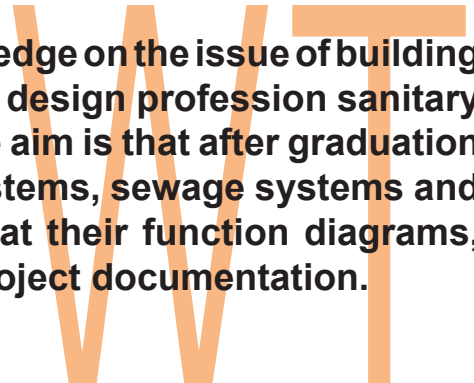
Drawing and sketching are for civil engineer a means of expression and communication. Drawing preparation is necessary to acquire the necessary spatial imagination, sense of proportion, skill in graphic and color expression of surface, mass and spatial formations. Civil engineer should be able to express and convey his idea or intention to the relevant team of other co-workers. The drawing should therefore be accurate, factually correct and unambiguous. Such a drawing cannot be identified with the drawing of an artist. It is necessary to understand the differences of artistic and aesthetic expression.

## FIRE SAFETY OF BUILDINGS

General Requirements and Binding Standards Applicable to Assessment of Fire Safety of Buildings in terms of layout and design. Design principles and requirements for the division of buildings into fire compartments, ensuring the fire resistance of structures, solving and assessing escape routes, spacing distances, access roads and access areas and facilities for effective firefighting intervention. Design and assessment of firefighting equipment.

## BUILDING SERVICES I

Students have to obtain cross-sectional knowledge on the issue of building equipment and specialized knowledge for the design profession sanitary technology to different types of buildings. The aim is that after graduation understand the principles of water supply systems, sewage systems and pipelines in buildings and outside, know what their function diagrams, sizing handle basic parts and drawn in the project documentation.



## ENERGETIC SIMULATION AND MODELLING

**Students will gain information about computational simulation of energy flows in building. On the base of energy simulation they will can to analyse impact of building constructions and equipments on energy performance of building. The part of energy performance of buildings is the evaluation of indoor air quality. Students will gain deeper and more detailed picture about interactions between building construction and building equipment. The students can use gained knowledge by designing building projects and elaboration of diploma thesis. Students will learn to use energy simulation software in the area of energy analysis of buildings. You can analyze energy consumption for heating, cooling or mechanical ventilation system. This dynamical energy simulation uses all needed data of external environment like a air temperature, relative humidity of air, solar gains, speed and direction of wind and also other parameters. User of this simulation program creates the 3D model of building at the beginning. In the next steps the user must define all boundary conditions for all building constructions (walls, roof, windows, etc.) and also for internal environment (occupancy, internal heat gains, etc.). Than the user set up the operation conditions for HVAC systems.**

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## TPOLOGY I

To get acquainted with functional-operational relations and connections within the apartment and to acquire typological principles for designing buildings housing. Further acquire basic skills in the application of typological principles in order to prepare for independent design in architectural design I.

## BUILDING SERVICES II

Students have to obtain cross-sectional evidence on the issue of human thermal comfort in indoor hot water, hot air and radiant heating. The content of the lectures and exercises is to address sources of heat, heat transfer materials distribution, how to spread heat from radiators and the interior surfaces, the use of renewable heat for heating buildings and hot water. The aim is to handle a project of central heating in a small building.

## BUILDING SERVICES COMPUTER DESIGN

To enable students make a building services and HVAC complex design with available computer software. This course is designed to familiarize you with the basic programs on PC for HVAC professionals and their use in solving examples of design practice. Teach freely available software business and school software versions that allow heat loss calculation, calculation of hydraulic-pipe system design underfloor heating, wall heating, the calculation of the expansion tank and the like.

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## DOUBLE SKIN FAÇADE RESEARCH

Double skin facades are architectural and structural building elements, which fundamentally affect the state of the indoor environment in buildings. If properly designed, they contribute to the reduction of the need for HVAC systems. The correct design results in low energy needs and a healthy indoor environment. The focus of a research is to measurements of the intermediate cavity temperatures in an experimental double skin facade in Central European climate (ASHREA Cold Humid). It is an open-circuit facade with natural ventilation. The facade is oriented to the south and it is 4 floors high. In this façade, it is possible to change the height and width of the intermediate cavity, to change the positions of its air inlets and outlets and to change the position of the venetian blinds placed in the intermediate cavity.

# RESEARCH





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## CHEMISTRY

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.

## ENVIRONMENTAL CHEMISTRY

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.

## ENVIRONMENTAL ENGINEERING I

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.**

### **CHEMICAL TECHNOLOGY BASICS**

**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.**

### **LANDSCAPE PROTECTION AND REVITALISATION**

**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.**

### **HYDROLOGY AND METEOROLOGY**

**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.

## **WATER STRUCTURES**

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.

## **ENVIRONMENTAL IMPACT ASSESSMENT**

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.**

## **PEDOLOGY AND EROSION CONTROL PRACTICES**

**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.**

## **ARCHITECTURAL AND INDOOR ENGINEERING**

**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.**

## **WORKING ENVIRONMENT**

**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.**

## **POWER ENGINEERING**

**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.**

## **WATER SUPPLY AND SEWERAGE**

**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.**

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## SPECIAL ISSUES OF PHYSICAL CHEMISTRY

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.

## LANDSCAPE AND URBAN PLANNING

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.

## WASTE MANAGEMENT

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.

## HYDROMECHANICS

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.

## ENVIRONMENTAL MANAGEMENT

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.

## BUILDING MATERIALS DURABILITY

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.

## SUSTAINABILITY ASSESSMENT OF BUILDINGS

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.

## SUSTAINABLE CONSTRUCTION

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.**

## **BUILDING MATERIALS LCA**

**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.**

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## 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.**

## ENVIRONMENTAL IMPACT ASSESSMENT

**The research points to the possibility of improving existing methods of assessing the impacts of proposed activities applying risk analysis in assessing the impact of proposed activity on the environment.**

## FLOOD AND DROUGHT RISK ASSESSMENT AND MANAGEMENT

**The floods and drought effects have been observed on all continents and over the past decade the frequency of floods and drought increases mainly in consequences of climate variability. Flood/drought risk - the combination of the probability of a flood/drought event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event. The**

**purpose is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community. This research includes flood damages assessment and hydraulic modelling.**

## **RAINWATER MANAGEMENT**

**The following points can be included in the contributions of this research. Theoretical analysis of solution to the problem and subsequently use of numerical calculations under experimental conditions. Field measuring of total precipitation and monitoring of the mutual relation of precipitation intensity for the relevant periodicity, and thus confirmation of the current state of meteorological tables. Experimental and numerical analysis of the percolation of precipitation water focused on processing the necessary values for determining the filtration coefficient by hydrodynamic tests, as well as laboratory tests and calculations of empirical equations. Evaluation and selection of an optimal solution for design of percolation facility for draining rainwater – modelling of emptying time of percolation facility.**

# RESEARCH



## MATHEMATICS I

The main goal of this object is to learn of the students to work with basic mathematical conceptions, especially as derivative of the function of one real variable and its application for solutions of the geometrical, physical and technical problems.

## DESCRIPTIVE GEOMETRY

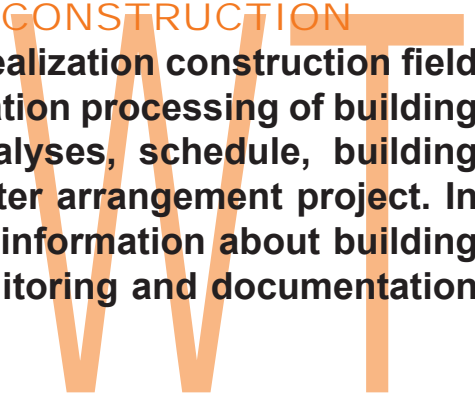
The main goal of the object is to learns tudents to make the acquaintance of elementary projection methods, to apply these methods for projection of basic geometrical solids, to construct plane sections of solids mainly in Monge projection, description of elementary characteristics of linear surfaces and surfaces of revolution. Gained knowledge of this object is practical for manually drawings.

## TECHNOLOGIES OF CONSTRUCTION PROCESSES I

The aim of this subject is to inform students about building machines and plants issue. Technology of ground works as a selected chapter of building processes technology. Introduction into problems connected with choice and using of building machines and equipments in building.

## PREPARATION AND REALIZATION OF CONSTRUCTION

Information obtaining from preparation and realization construction field from point of all building partners, documentation processing of building preparation, tenders, building schedule analyses, schedule, building site plan, control and test building plan, winter arrangement project. In the part of building realization, to obtain the information about building sources management, progress of work monitoring and documentation updating for building realization.



## CHARGES AND COSTS

The aim of this subject, together with subject ; building economy, is to give information about building prices and costs issue. To emphasize a relevance of prices in building industry, mainly from building market point of view. To mention a relevance of cost as a basic part of price, to emphasize their function and role at disposal production factors evidence, finding out of production efficiency, production factors control efficiency, compared competitive. The possibilities and exploiting of various cost models at the optimization and decreasing of building processes cost. To explain the creation of building works offering prices and to emphasize the creation of market prices in building business.

## TECHNOLOGIES FOR RECONSTRUCTION

The aim is to inform the students with technologies, which are used in the building reconstruction. The students are progressively informed with particular groups of technologies for buildings reconstructions, their realization processes, including demands on applied materials, workers and machines and equipments facilities.

## NUMERICAL MATHEMATICS AND MATHEMATICAL STATISTICS

The aim of the subject is to render mathematical knowledge necessary for understanding theoretical bases of civil engineering applications, with an emphasis to statistical and numerical methods and their computer implementations in MATLAB.

## CONCRETE CONSTRUCTION REALISATION

The content of subject is detailed concrete realization analysis of object construction, which is involved process factors in sequence on parameter, requirements specification on concrete construction. The planning of



**concrete construction realization and principle for design of elements form structure and dimension are the most important. The part of this subject is computer program using for system form design.**

## **MANAGEMENT AND MARKETING OF THE BUILDING INDUSTRY**

**Subject Management and marketing in the construction industry is focused on the acquisition and mastery of basic knowledge of management and marketing - role and tasks of the manager in the construction business, motivation, selection and evaluation of staff, teamwork, communication, leadership staff, creativity, change management, organizational structures and culture of the organization. In addition, students should master the elements of marketing and communications mix with the possibility of their use in construction companies and marketing activity that is seen as part of the strategy, tactics and operational companies in ensuring the competitiveness and prosperity of businesses in the construction industry.**

**WWT**

## MATHEMATICS II

The main goal of this object is to give some theoretical knowledge needed for the study and application of the special technical problems, mainly using of the integration's methods and differential equations.

## BUILDING ECONOMY

The aim of the course is to understand the importance of the strategic importance of the economy in construction practice. Understanding the specifics of economic construction in the analysis, planning, setting goals and strategies. Explain the process of organizing, planning and construction management using economic methods, standardization and pay in the construction industry. Emphasize the importance of prices in the construction industry particularly in terms of activity in the construction market. Highlight the importance of cost as a basic component of prices, features and emphasize their role in the design and operation of the works.

## TECHNOLOGIES OF CONSTRUCTION PROCESSES II

The aim of this subject is to explain a basic technological mechanizes issue for concrete processes, prefabricated, mason, scaffolding and all finishing process ; surface treatment, floors, plumber constructions, insulations and installation, whit requirements on building machines, material and spatial standard. The aim of the subject is to explain main problems connected with the building processes performance, technological methods for all building processes of framework and final works including requirements on building machines, material, spatial and professional covering of these processes. Students are also informed with problems connected with quality and safety in building processes performance.

## TECHNOLOGICAL PROJECT

The aim of this subject is to apply the obtained theoretical knowledge from technology and building economy fields into the terminal technological development.

## BUILDING PLANNING AUTOMATIZATION

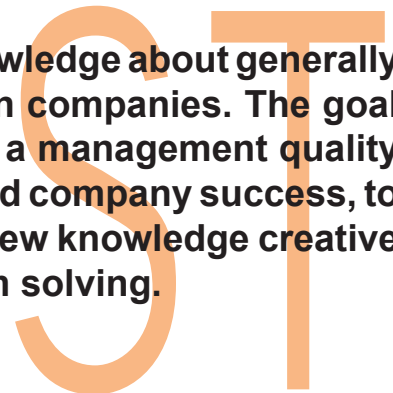
Students learn to plan the construction of automated processes and understand their importance for the efficiency of the construction process. They become acquainted with the possibilities of automation planning for the individual participants in the construction process.

## CONSTRUCTION PROJECT MANAGEMENT

To obtain the basic information about project management, which presents the management philosophy of unique and unrepeatable activities. This theory is especially suitable for building industry, can be apply at complex management of investment building projects, at management of construction projects, construction technological projects, at more particular subprojects, which are necessary at preparation and realization all building activities as well.

## QUALITY IN CONSTRUCTION INDUSTRY

The aim of this subject studying is to obtain the knowledge about generally and theoretical basis of integrated management in companies. The goal of this subject is to teach the students to analyse a management quality issue as a significant element of building quality and company success, to support their synthetic thinking and the ability of new knowledge creative application into another subjects and real problem solving.



## MODELLING OF 3D OBJECTS OF CONSTRUCTION SITE FACILITIES FOR INFORMATION ENVIRONMENT OF CONSTRUCTIONS

**Creation of new and modification of existing 3D models of objects (equipment, products, materials, etc.). Allocation of objects of construction site facilities in the construction site plan, conditioned by mutual connections (interactions, relationships, connections, relations, ...) in software systems. Visualization of 3D model of construction site operation in the environment of a software solution intended for the BIM platform.**

## USING A 3D SCANNER TO DIGITIZE BUILDINGS

**Specification of terrestrial laser scanning approaches to 3D modelling and geometric analysis of buildings. The process of transforming the spatial geometry of existing buildings into a 3D digital copy. Graphic post-processing - the process of 3D modelling and extraction of geometric characteristics from laser data.**

## WOOD-BASED CONSTRUCTIONS - TECHNOLOGICAL AND MATERIAL CONTEXT

**Study of construction systems of wood-based buildings within various segments of construction (residential, civil, agricultural buildings ...). Sustainability parameters of wood-based buildings in terms of construction, material, social and environmental parameters. Process innovations in the production and implementation of wooden structures.**

## MODELS FOR INITIATION AND PROPAGATION OF CRACKS IN STRUCTURAL ELEMENTS

**Physical and mathematical models that combine approaches based**

**on smeared cracks of damage phase-field models inside materials and cohesive zone models for cracks at material interfaces; Numerical simulations of structural elements with such defects by the proposed model implemented in a MATLAB computer code featuring finite element methods.**

RESEARCH

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