

Master's degree program – N2301
2302T010 Construction Machinery and Equipment
Energy equipment

The aim of the study is to provide graduates the knowledge to design and innovate in the field of construction machinery, equipment and production lines. Graduates will learn the methods of design and experiments and learn vocational skills to support creative activities.

FINITE ELEMENT MODELLING

The technology of digital prototype based on FEM. Characteristics of software tools and their connection to CAD systems. Computer models creation, methods of finite element mesh generation, automatic generators. Convergence and accuracy of the FEM, h-method and p-method. Solving problems of flexible body mechanics in specific software. Technology of calculations for machine parts and units design (clamping connections, interference fits and contact problems). Solving problems through software FLUENT. Outline with the FVM (finite volume method). Solving incompressible fluid flow in the sudden expansion section, compressible fluid flow through channel solution. Interpretation and verification of results.

APPLIED FLUID MECHANICS

The subject extends knowledge of students from fluid mechanics in fields of flow of compressible fluid - gas dynamics (flow in nozzles and diffusers with shock waves, flow of gases with friction and heat transfer, visualisation of gas flow), flow of viscous fluids (i.e. turbulent flow, calculation and measuring of turbulence, examples of shear layers, hot wire probe anemometry) and turbo-machinery (fans, turbines and ejectors).

POWER MACHINES

The course gives basic information on energetics and power machines for the entire study program Construction machinery and equipment. Depending on the type of power machines instructions are motivated by Engineers approach, i.e. in addition to a thorough understanding of the basics of thermodynamics cycles as well as identifying the main constructive dimensions, selection of suitable materials of construction for given purpose etc.

NUMERICAL SIMULATION OF ENERGETICS SYSTEMS

The basic physical knowledge and the basic laws for the solution of the problems of heat and mass transfer and of fluid mechanics, especially of the internal and external aerodynamics. The basic Mathematical models of this cases and their numerical solution.

ALTERNATIVE ENERGY SOURCES

Renewable energy is a topic dealing with renewable energy sources. The aim is to acquaint students with the basic forms of renewable energy sources and their use in the Czech Republic.

Master's degree program – N2301
2302T010 Construction Machinery and Equipment
Energy equipment

HEAT AND MASS TRANSFER

The course is focused on basic mechanisms transport phenomena. The main topics are: Balance equations, Euler and Lagrangian description, the basic mechanisms of heat transfer, steady and unsteady heat conduction, convective heat transfer, heat transfer with phase change, radiation heat transfer, radiation coefficient calculation methods. Molecular diffusion mass transfer, convective mass transfer, simultaneous heat and mass transfer, Reynolds analogy, Chilton-Colburnova analogy.

ENERGY SAVING BUILDINGS AND EQUIPMENT

The lectures introduce students into the fundamentals in design of low energy and passive buildings. It includes applications of the heat pumps, solar panels and other renewable energy sources in heating and air conditioning systems. It also includes applications of the environmentally save systems for the heating, the air conditioning and cooling and the fundamentals of the classification of the energetic demand of buildings and the economic classification of the payback period.

TECHNICAL BUILDING EQUIPMENT

The lectures introduce students into the fundamentals in design of the ventilation and the air conditioning systems. It includes the definition of the parameters defining the buildings microclimate, the thermal properties of constructions, the calculation of the buildings heat load, fundamental calculations of the air conditioning air treatment, the design of the air distribution systems, filtration principles, components of the ventilation and the air conditioning systems, chillers and heat sources for the air conditioning, air conditioning systems and reheat systems. The lectures introduce students also into the fundamentals of the design and calculation of base types of heating systems and its components, including selected heating sources and into the design of the warm air heating.

ENVIROMENTAL TECHNICS

The lectures introduce into a special issue of the energy recovery from waste. The design of the waste to energy plants is explained. In the lectures are introduced: description of the fuel and the feed water preparation, the transformation of the waste energy – combustion process, the kettle construction, the cleaning process of the combustion products and emission limits. Also the issue of the waste management with the application of the international knowledge of the design, the operation and newest research in this area is explained. The energy recovery from waste is explained as the necessary tool and scale for the sustainable development. The issue includes the description of the phenomena of communal wastes, industrial wastes and cleaning plant sediments.

SELECTED PARTS OF ENERGETIS EQUIPMENT

Thermodynamics properties of the real matter. Energetic and entropy form of the Gibbs fundamental equations and the use of the energetic function properties to the thermodynamics properties. Thermodynamics properties during the phase changes. Thermodynamics properties of the mixture of the ideal and real gases. The Selected Parts of the Thermodynamics of the multi-component system with chemical reactions. The application of the method of solution to the technical problem.

EXPERIMENTAL METHODS IN FLUID MECHANICS

The systems of data processing, the analysis of experiment, the measurement of noise and vibration, the analysis of combustion gases, the methods of visualization, the hydrodynamic analogy, the thermoanemometry, the optic measurement method of the temperature and velocity fields.

DIPLOMA THESIS

The diploma thesis is the solution of theoretical or practical problem stating results achieved or construction project. The solution can also include functional model or its parts of designed equipment.