International Programme

List of English taught courses offered to Erasmus+ programme and international exchange students

Mechanical Engineering

Summer 2023

VŠTE
Okružní 517/10
370 01 České Budějovice

IČO: 75081431
DIČ: CZ75081431
www.VSTECB.cz

Mechanical Engineering

Course code	Course title	Number of ECTS credits
S_PPK_1	Computer Aided Construction I.	6
S_PPK_2	Computer Aided Design II.	6
S_PPV	Computer Aided Production	6
S_CED_1	Czech Language for Foreigners	6
S_ENG_4	English Language IV	6
S_EIP	English in Practice	6
S_MET	Fluid Mechanics	6
S_UVG	Introduction to Geophysics	6
S_FYS	Physics	6
S_NOM_1	Material Science I	6
S_TEM	Termomechanics	6

Computer Aided Construction I. (Code: S_PPK_1) | Number of credits: 6

Course objectives

Students will acquaint with basic problems of parametric 3D simulation parts in programme Autodesk Inventor. Students will gain a basic overview of the issue. The graduate of the course can model components, assemblies and create production and assembly drawings.

Topics

1. Environment of autodesk inverter, configuration and basic setting, fundamentals of parametric simulation

2. Production of 2D sketch, dimensioning, bindings, work with planes, axis and articles

3. components moulding – setting of personal material, protrusion, rotation, hole, shell, rounding, chamfer

4. components moulding – strickling, traction, rib, relief, spiral, thread

5. components moulding by the help of 3D sketchs

6. Simulation sheet metal components – profiled bend, border, draw profile, hem, excision, puncheon, unreel

7. assembly creation – setup project, inserting and bindings components

8. Creation of formations – inserting normalized components of libraries and contentual centre

9. Creation of formations – weldment, cutting weldment

10. Creation manufactural drawings – default view, projection , cross - section, detail, break - in, partial cut

11. Production manufactural drawings, quote styles, surfaces

12. Production modular drawings, piece list, position

13. Transmission – export, import data among various 3D CAD systems

Computer Aided Design II. (Code: S_PPK_2) | Number of credits: 6

Course objectives

Students will be familiarized with sophisticated features of the program Autodesk Inventor. They will learn to work with tools to create piping and electrical wiring. Students will also know how to use i-components and i-elements including their bonds and to acquire knowledge in creation of presentations, use and application of Inventor studio. They will get acquainted also with the creation of plastic parts including molds.

Passing the subject means, that student is able to:

- to create and modificate a custom stamp and custom drawing standard

- to create a so-called i-compoment which means a component based on original geometry, but with different dimensions

- to create a decomposition of assemblies and to render its video

- to work with module Inventor Studio

- to create a proposal of mold and flow system for a specific component

Topics

1. The creation and modification of custom stamp and custom drawing standard.

2. Electrical wiring - working with cables and harnesses.

3. Pipe lines - working with pipes and tubes, fittings, splices.

4. The creation and modification of i-components.

5. The creation and modification of i-elements, i-bonds.

6. Presentation - decomposition of assemblies, video.

7. Inventor Studio - motion of components, rendering styles, styles of scenes, timeline of animation, video creator.

8. Inventor Studio - attenuation of components, camera settings, lighting styles, local lights, surface styles.

9. The creation of plastic components, analysis of shrinkage.

10. Proposal of molds for plastic parts, familial form.

11. Flow system, plunger, cavity.

12. Kinematics of form.

13. Work with module iLogic - creation of regulations and parameters within the parametric model.

Computer Aided Production (Code: S_PPV) | Number of credits: 6

Course objectives

The aim of the course is to acquaint students with modern practices NC programming using CAD / CAM system. The courses will gain basic knowledge of programming NC milling machines, lathes, wire cutters and lasers. Seminar work is awarded in cooperation with the Training center. At the end of the course students should be able to:program CNC machines. After successful completion of the course, students will be able to:

- describe the development of CAD/CAM systems

- evaluate the benefits of CAD/CAM systems with the usability for NC machine programming

- describe the individual operations used in the HSC and HSM programming

- fully develop the program for production of specified components by means and operations in HSC and HSM

Topics

1. Introduction to the development of CAD-CAM systems: machines controlled by cams, the first numerically controlled machines - management using paper tape; laborious effort to facilitate the programming of numerically controlled machines - the first CAD / CAM systems, linking design with technology - the use of data for programming NC machines; 2D drawing and the use of 2D data, drawing in 3D - 3D data processing; evaluate the advantages of CAD / CAM systems for NC programming and direct programming of NC machine; economic evaluation of the support program from the perspective of several years of development, overview of application areas machining - turning milling, wire EDM - shaft, wire cutting, laser cutting, plasma cutting, flame, water jet cutting, welding – 2 axis, multi-axis cutting.

2. Milling 2D, 2.5D Milling: machine cycles; advantages of 2D programming - using radius compensation, the use of 3D models - feature recognition model for acceleration and production programming.

3. 3D milling - roughing strategy: roughing, rest roughing, strategies for HSC and HSM - adoptive roughing.

4. 3D milling - a strategy for finishing: Finishing strategies for steep and flat areas, combined machining, machining residual.

5. Multi-axis indexed milling, five-axis milling smoothly.

6. Turning - rotating parts machining, machining with driven tools, multi-axis machines.

7. Repetition: machining.

8. Wire: the notion of programmatic and auxiliary plane; 2-axis machining, with constant and variable askance; production of cutting tools - planes position, production dies, punch, unattended cutting.

9. Wire: four axis cutting, synchronization connections for four-axis cutting, production of cutting tools with variable shear plane in the Z plane, production lathe tools, waste-free cut.

10. Trenching, excavating track, production of electrodes.

11. Laser cutting, water jet cutting, plasma: manual deployment work-pieces in sheet metal, auto machining; treatment pathways and technologies; semiautomatic and automatic deployment of the work-piece on the board plate.

12. Multi-axis laser cutting, water jet.

13. Repetition: unconventional machining methods.

Czech Language for Foreigners (Code: S_CED_1) | Number of credits: 6

Course objectives

The course is prepared for foreign students. The aim of the course is reaching of A1 level of their Czech language according to the descriptor of the Common European Framework of Reference for Languages. After the completion of the course, the students will gain the following language skills:

- the students understand basic phrases which are needed for everyday communication and can use these expressions and phrases

- can introduce themselves and other people and ask simple questions concerning well known: places, people and things and react to similar questions

- they can read simple texts (notices, signs, etc.)

- they can write a simple text in Czech language (holiday postcard, fill in a simple form, etc.)

- they are introduced with culture and everyday life in the Czech Republic

- they are able to perceive the intercultural differences between their native country and the Czech Republic

Topics

1. Who is who? Verbs: to be, to have. 2. How are you?

3. People, things, relations – nouns. 4. How much is it? Money.

5. Where am I? 6. The Czech Republic, Budweis.

7. At school, at the school canteen -prepositions, conjunctions.

8. Time, days, months. 9. My family.

10. Signs. 11. Food and drink.

12. Travel. 13. Services, shopping.

English Language IV (Code: S_ENG_4) | Number of credits: 6

Course objectives

The course objective is to deepen student´s language knowledge to the level B2- of the Common European Framework of Reference for Languages. After the successful completion of the course, students are able to: understand extended speech and follow even complex arguments, understand articles dealing with contemporary problems, present a detailed descriptions on a wide range of subjects and interact with a degree of fluency and spontaneity, write clear, detailed texts on a wide range of subjects.

Topics

1. Work-life balance
2. Gender difference
3. The world of work
4. Meetings
5. Formal letters
6. Shopping and making a complaint
7. Films
8. Famous people
9. News
10. Superstitions
11. Murder mysteries
12. Television
13. How to write an article

English in Practice (Code: S_EIP) | Number of credits: 6

Course objectives

The objective of the course is to deepen students´ knowledge, enrich vocabulary and practise using English in real-life situations concerning work and study in a foreign country, the ability to give a presentation in English, improve listening, reading, speaking and writing skills. After successful completion of the course, the students are able to understand lectures, debates and participate in discussions on general topics/topics of their interest. Students understand TV and radio news, programmes and newspaper/online articles on topical issues and are able to present their views and discuss. Upon successful completion of the course, students are able to prepare and give presentation on a selected topic, communicate effectively and appropriately in real life situation, to use English effectively for study purpose across the curriculum, to develop and integrate the use of the four language skills (Reading, Listening, Speaking and Writing) and to be able to use them in any situation concerning travelling, work and study in a foreign country.

Topics

1. Providing and obtaining personal information in social situations (work, study, travelling, participation in social events); small talk. Present simple vs present continuous

2. Housing. Living in a country or in a town. Big towns in the Czech Republic. Prepositions – time, place, movement.

3. Travelling; means of transport, problems you may encounter while travelling, accommodation. Infrastructure in the Czech Republic in comparison with the student´s native country. Verbs and adjectives with prepositions.

4. System of Education (in the Czech Republic vs the student´s native country – primary, secondary, tertiary education. Grading. Comparisons.

5. Social life, culture, literature (student´s life, cultural events). Idioms.

6. Nature and environment. Environmental protection. Modals – obligation, probability. Modals in the past.

7. Health and illnesses. Human body and illnesses, health system and insurance in the Czech Republic. At the doctor´s.

8. Holidays and celebrations (the CR vs student´s native country). Shopping. Past simple, past continuous.

9. Food. Traditional meals. Eating habits, trends, healthy food. Restaurants. First conditional.

10. Jobs and occupation. Labour market in the Czech Republic. Work conditions. Second conditional.

11. CV, job applications. Job advertisements. Interviews. Word order in questions, indirect questions.

12. Media. TV, Internet, press. Fake news. Passive voice.

13. Revision. Spoken exam - presentation.

Fluid Mechanics (Code: S_MET) | Number of credits: 6

Course objectives

In subject of Fluid mechanics students obtain the knowledge of application of conservation laws and force balance in case of steady and unsteady fluid flow. They will realize simple experiments to understand the theory. They will be able to solve the fluid flow mechanics problems, pressures and pressure forces in case of steady and unsteady flow. After successful completion of the course, students are able to apply knowledge from the subject of fluid mechanics in solving problems in hydrostatic and hydrodynamics.

Topics

1. Basic laws of hydrostatics, pressure, Pascal's, Archimedes' law, wall force.

2. Euler's equation of hydrostatics and its integration, absolute and relative equilibrium.

3. Basics of hydrodynamics. Basic laws. Measurement of pressure, speed and flow.

4. Basics of similarity in hydro and aerodynamics, similarity numbers.

5. Laminar and turbulent flow, transition to turbulence.

6. Basics of flow in tubes and channels. Discharge from containers, losses.

7. One-dimensional flow in a tube of circular and non-circular cross-section with losses.

8. Non-stationary one-dimensional flow. 9. One-dimensional flow with relative motion, rotating channel.

10. Integral theorems about change of momentum flow and momentum of momentum flow, forces on a wall.

11. More complex cases of flow, the principle of vane machines, pumps and turbines.

12. Basics of body flow. Boundary layer and its tearing.

13. Aerodynamic characteristics of flowing bodies, buoyancy, resistance, polar.

Introduction to Geophysics (Code: S_UVG) | Number of credits: 6

Course objectives

Introduction to basic topics of modern geophysics for students of natural and technical sciences. Upon successful completion of the course, students have knowledge of following topics: Earth tectonics, dynamics of mantle and core, seismology and ground motions, gravity and magnetic field of Earth.

Topics

1. Spherically symmetrical Earth model. Crust, mantle and core – physics and composition. Seismically determined interfaces. Mantle processes, mineralogy and phase transitions.

2. Plate tectonics, Wegener theory. Sea floor spreading – subduction zones, rift and transform plate boundaries, trench zones, collision zones. Heat flow, deformation and stress, seismic and volcanic manifestation.

3. Lithosphere and its history. Lithosphere thickness, heat flow and cooling.

4. Earth mantle, asthenosphere. Heat sources and transfer in mantle – convection, conduction. Plumes, subduction and seismisity of subduction zones. Hot spots and shield volcanoes.

5. Earthquakes, seismicity, source zones. Tectonic earthquakes. Seismicity and volcanism – Pacific Ring of Fire. Historical earthquakes. Seismic waves, rays and hodochrones. Earthquake location and magnitude. Seismic tomography and Earth seismic models. Seismic interfaces in Earth models. Seismic waves in Earth core.

6. Earth magnetic field and its features. Earth dynamo, role of core on magnetic field generation. Earth core composition – fundamental findings.

7. Gravity field. Density anomalies and gravitational potential. Geoid. Anomalies, topography and isostatic compensation. Free oscillations of the Earth, seismic tomography and gravity – viscosity, density and interfaces determination.

8. Methods and tools of global geophysical research: Paleotechniques in age determination. Analysis of potential fields. Direct and reverse problems solutions. Modelling and simulation techniques and their features.

Physics (Code: S_FYS) | Number of credits: 6

Course objectives

The aim of subject is repeat the basic knowledge from grammar school mechanics, thermodynamics, acoustics and optic, define and characterize the basic physical principles and law. Student will solve simple problems and discuss their results. . Upon successful completion of the course, students are able to explain and apply the fundamentals of physics from following fields: mechanics, thermodynamics, optics and hydromechanics. The students are also able to use common sense to estimate the nature of physical processes.

Topics

1. System of physical quantities and units; Time and Distance
2. Kinematics of Mass Point
3. Dynamics of Mass Point
4. Work, Power, Energy
5. Mechanics of the System of Particles and Rigid Body
6. Gravitational and Gravity Field
7. Mechanical Oscillations
8. Mechanical Waves
9. Acoustics
10. Hydromechanics
11. Kinetic Theory of Matter
12. Thermodynamics
13. Optics

Material Science (Code: S_NOM_1) | Number of credits: 6

Course objectives

In terms of subject student obtains knowledge in the field matter, chemical composition, structure, properties and usage of metal materials. Student will be acquaint with basic technologies of processing and checking as well as with factors, which affect characteristics of metal materials. It will especially relate to steels and their alloyes and nonferrous metals. Integral part of education will be introduction of concrete examples of using discussed materials especially in mechanical engineering and also development trend in this area. Graduate of this subject will be able to describe structure and properties of material, will bw able to analyse chemical composition and structure and will be able to carry out composition testing and will be able to review usability of using selected material for application in construction.

Knowledge - the student will be able to: - Be able to describe the basic properties of metallic engineering materials, introduce the basic methods of processing engineering materials, to explain the principles of changes in the properties of fundamental technological materials, describe the possibility of degradation processes in engineering materials and be able to classify the types of basic materials used in engineering. Skills - the student will be able to: - Be able to evaluate basic structural processes in machine parts during their lifetime, to design fundamental properties of engineering materials testing and evaluate results, assess the adequacy of the choice the material simple machine parts with respect to the stress. Be able to determine the basic properties of materials to use certain technology, compare the basic material characteristics and in the field of materials to assess the economic aspects of its activities.

Topics

1. Introduction to study of material problems – meaning of subject, schedule of lectures and exercising, requirements for grading of the course; materials characterization

2. Principles of metals theory , atomic structure of metals, interatomic bonding in crystals; structure of crystals and their imperfections

3. Basic related thermodynamic concept – state and energy of system, Gibbs phase rule; diffusion in metals

4. Metals and alloys under incidence of outer forces – elastic and plastic deformation, strengthening and recovery

5. Bare metals and alloys, structure of metal systems, solid solutions and intermediate phases 6. Phase transformation in metal systems, crystallization and transformation in solid state, allotropy and polymorphism

7. Phase diagrams of binary systems, phase and structural analysis of systems in accordance with solubility of components

8. Technical alloys of iron, bare iron, influence of chemical elements on characteristics of alloys

9. Phasic and structural analysis of Fe-C based alloyes, binary diagrams of metastable system Fe-Fe3C and stable system Fe-C, influence of other elements on characteristics

10. Principle of heat treatment steel and cast iron, chemical-heat treatment of steel, mechanical-heat treatment of steel

11. Classification of steels, carbon and alloyed steels; heat resistant steels, stainless steels and tool steels.

12. Nonferrous metals and their alloys, parameter of selected Cu, Al alloyes and other technically significant alloyes

13. Metal materials for production of basic parts of productive machines, power machines and traffic engineering

Termomechanics (Code: S_TEM) | Number of credits: 6

Course objectives

The filling of the subject builds on the subject of Physics and is the basis for many technical disciplines. Students will deepen their knowledge of Thermodynamics of gases, heat, and learn the basics of combustion. These findings are a sine qua non for the understanding of the nature of economic production, transformation and distribution of thermal energy. Allows you to correct management of technological processes and is essential for a number of normal thermal technical calculations. After graduation of the course, Student is able to apply knowledge from the subject of thermodynamics in solving problems in heat cycles and heat transfer.

Topics

1. Basic concepts. Microscopic and macroscopic view. Thermodynamic system, state, action; the status exchanges. Reversible and irreversible state changes. The quantity of the substance. The internal energy. The state values, the heat, the work. Empirical temperature. The zero and the first law of thermodynamics

2. Calorie equation of State and thermal. The different models: an ideal gas, the gas temperature. Unideal gases, solids, liquids, and models. Radiation

3. Material quantity dependent on temperature, expansivity, degree of expansion, compressibility. Heat and temperature parameters. Calorimetrs

4. A simple system. Isotermal, izobaric, izochoric, adiabatic and polytropic process, p-V diagram

5. Thermodynamic machines: engine, refrigerator, heat pump. Second law of thermodynamics, Thomson's and Carnot's formulations, the relationships between them. The Wording Of Carathéodory's

6. Carnot cycle, the efficiency of heat engines, entropy, thermodynamic temperature. The third law of thermodynamic.

7. The thermodynamic potentials: internal vacancies and the Gibbs energy, enthalpy. Their properties and applicability for a particular job

8. Real gases, the properties of liquids and vapours, tables, and charts properties 9. Phase vs. folder. Phase transitions, phase diagram. Claus and Claus-Clapeyron's equation. The mixture of gas and filling of steam; - thermodynamic properties of moist air, Mollie's diagram, h-s diagram processes with damp air

10. Heat conduction (conductor): Fourier's law; heat conduction compound wall; leadership with internal heat source

11. The flow of heat (convection) forced and natural (free), principles of dynamic similarity

12. Radiation (radiation): black body radiation law, the application in practice

13. Heat exchangers. Introduction to the modelling of thermal phenomena industrial practice

14. Fuel and combustion, combustion statics.