

1st Semester

Course code	Title	Description	Type	Credits (ECTS)
3M11OP01	Mathematics for engineering	Introduction to vector algebra and its applications. Introduction to functions of one variable: limit, continuity, differentiability and integral.	M	7
3M21OM01	Technical mechanics	Learning equilibrium state of a point, rigid bodies, internal forces, friction, and geometrical characteristics of different areas, study of stress-strain state, elementary types of stresses, dimensioning and design of mechanical elements.	M	6
3M22OM01	Materials and joining techniques	Introduction to materials science of metals and non-metals. Thermal treatment. Mechanical, technological and non-destructive testing of materials. Casting and sinter metallurgy. Corrosion protection of metals. Introduction to welding and the various techniques based on electric arc, thermo-chemical sources, electrical resistance and other sources.	M	6
3M23IND01	Graphical communication	Fundamentals of descriptive geometry and projection drawing. Projection of geometrical solids. Cutting geometrical solids with planes. Intersections of geometrical solids. Sectional views and sections. Technical drawings and dimensioning.	M	6
3M31IND01	Industrial design 1	History of industrial design. Design elements: line, colour, tone, texture, direction, shape and space. Design principles: contrast, rhythm, harmony, balance, gradation, proportion, and composition. Principles of aesthetics. Fundamentals of photography. Freehand drawing of 3D objects and compositions.	M	5

2nd semester

Course code	Title	Description	Type	Credits (ECTS)
3M11OP02	Discrete mathematics	Introduction to linear algebra, combinatory, interpolation and approximation.	M	5
3M12OP01	Computers and applicative software	Introduction to computer systems and some applicative software.	M	6

3M21OM02	Mechanics of machinery	Learning different types of point and body movements, kinetostatics of mechanisms, vibrating systems with one degree of freedom, testing and balancing.	M	5
3M24OM02	Hydraulics and hydraulic machines	Basic principles of fluid statics and dynamics. Their application in the turbo machinery theory. Analysis of the basic types of pumps, hydraulic turbines and displacement machines.	M	5
3M31IND02	Industrial design 2	Graphic design. Software products for graphic design. Materials for industrial design – characteristics, design and manufacturing principles, application. Basic principles of anthropometry and ergonomic and their application in product's designing. Design methodology. CAD/CAM systems for 3D modelling of products.	M	5
3M33PS01	Industrial practical training	Practical work of students in companies for manufacturing of different types of products.	M	4

3rd semester

Course code	Title	Description	Type	Credits (ECTS)
4M13OP01	Electrotechnics and electronics	Fundamentals of electrotechnics and electronics	M	5
	English language	Foreign language	M	4
3M23IND02	Machine elements	Material property definition. Loading, stresses and safety factor. Selection and calculation of elements for general use: screws and fasteners, shafts, bearings, springs, couplings, pipes and valves. Types of mechanical transmissions: frictional and gearing – direct and indirect, function, application. Basic methods for selection and calculation.	M	5
3M31IND03	New product development	The role of the new technologies. Global market. Company strategy. Product development teams. Creative methods. Product status. Determining of product price. Possibilities for profit. Voice of customers. Quality function development. New product specification. Transforming of customer requirements into products. Scheduling. Implementation.	M	5

		Rapid prototyping.		
3M31IND04	Engineering design process	Understanding customer requirements. Defining product characteristics. House of quality. Product functional structure. Axiomatic design. Concept generation and evaluation. Systematic design. Material selection. Modelling and analysis. FEA. Detailed design. Design for manufacture and assembly. Design for safety. Design for recycling. Analysis of physical prototypes.	M	5
3M31IND05	CAD Techniques	Characteristics of CAD-systems. Data structures for geometric modelling. Solid modelling. Parametric modelling. Parametric sketches. Parametric parts. Surface modelling. Advanced modelling techniques. Materials and visualization. Feature definition and recognition. Variables, tables and part variants. Sheet metal parts. Associative drawings. Building of assembly structure. Assembly representation. Part modelling in the assembly environment. Assembly drawings and BOM. Assembly analysis in CAD systems. Project management in CAD.	M	6

4th semester

Course code	Title	Description	Type	Credits (ECTS)
3M25OM02	Termotechnical machines and devices	Basic elements of thermal machines and devices for transmission of energy (turbines, engines). Equipment for direct application of thermal energy (systems for heating and air conditioning, systems for cooling and drying). Working fluids. Thermal balances and thermal processes.	M	5
3M26OM02	Machining and manufacturing systems	Manufacturing systems and processes. Manufacturing technologies for material removing machining and plastic deformation machining. Unconventional procedures of machining. Technical-technological characteristics of conventional and NC machines. Types and characteristics of machining tools.	M	5
3M31IND06	Engineering design with plastics	Characteristics of polymers. Physical and mechanical properties. Strength of plastic materials. Production processes for moulding of plastic parts. Tolerances and shrinking. Creep. Surface characteristics. Dimensioning of	M	5

		plastic parts. A draft, ribs, bosses. FEA of plastic parts. Mould design and modelling. Assembly techniques. Welding and adhesives. Press fitting. Screws and metal inserts in plastics. Design for assembly of plastic parts. Design of snap fits, living hinges bushings. Case studies in product design with plastics.		
3M31IND07	Design for safety	Introduction to concepts, principles and methods for safety provide; protection procedures according to current norms, standards and EU regulations. Characteristics of movement, loading and conditions of exploitation. Classification, basic theory and construction of equipments for protection and safety. Basic characteristics and differences of safety equipment. Contact and non-contact safety equipment.	M	5
3M32IND01	Finite element analysis	Fundamentals of finite elements method and fields of application. Practical use of contemporary software products that apply this method. Connections between solid modellers and software products that apply finite elements method.	E	5
3M32IND02	Modelling of metal structures	The basic characteristics of metal structures, classification. Introduction to materials, elements, details and joints of the metal structures. Computer modelling, details and 3D graphical presentations of metal structures. Aesthetics of details and shapes of structures. Software products for 3D modelling.	E	5
3M32IND03	Eco-Design	Environmental impact of products and production processes. Product life-cycle analysis. MET points. Recyclable materials. Hazardous materials. EU waste legislative. Producer responsibility. Voluntary programs. Recycling processes. Recycling infrastructure. Reuse and remanufacturing. Manual vs. mechanical disassembly. Recycled materials. Design for environment. Material and energy consumption. Design for recycling. Guidelines for material selection. Design of connections. 'Smart' materials. Ecodesign software. Analysis of eco-friendly products. Ecodesign project.	E	5
3M32IND04	Alternative joining methods	Introduction with different joining methods of elements made from different materials. Working out and realization of the joining technology by soldering, brazing and adhesive bonding. Introduction with new specialized welding methods in particular fields. Introduction with different joining methods of elements made from different materials. Working out and	E	5

		realization of the joining technology by soldering, brazing and adhesive bonding. Introduction with new specialized welding methods in particular fields.		
--	--	---	--	--

* two of the listed elective courses are studied

5th semester

Course code	Title	Description	Type	Credits (ECTS)
3M31IND08	Virtual models and dynamic simulations	Fundamentals and purpose of modelling of real mechanical systems. Modelling methods and different types of models. Introduction into the process of building virtual mechanical models: parts (rigid and elastic bodies), element for connecting parts (joints, joint primitives, spring-clamper elements) assigning forces, moments and virtual models using multi-body dynamics codes. Analysis of the simulation results and optimization of the mechanical design.	M	8
3M32IND05	Vehicle design	Basic parameters of vehicle's design. Proportions and dimensions of the vehicles. Shapes and details. 3D modelling of shapes. Application of ergonomic principles in the designing process. Aesthetics of the details and appearance. Contemporary software products for vehicle design.	E	5
3M32IND06	Motor vehicles	Classification and standardisation of the motor vehicles. Mass and geometric characteristics of the vehicles. Forces in the vehicle motion phase. Propulsion dynamics, driveability, steering, breaking and fuel economy of motor vehicles. Construction of transmission elements, steering, suspension, breaking systems and others.	E	5
3M32IND07	Design of product exterior and packaging	Human factors in design. Quality. Consumer groups. Consumer products and their characteristics. Product exterior styling. Changeable product masks. Functional features of the product exterior. Exterior as support structure. Packaging design as combination of art and function. Self-service and packaging development. Packaging materials. Cardboard packaging	E	5

		forms. Plastic and glass containers. Packaging recycling. Project in design and modelling of product exterior and packaging.		
3M32IND08	Design of machines and appliances	Modern tendencies in designing of machines and appliances. Mutual connection of function and shape. Application of ergonomic principles in the designing process. Application of principles of safety. Psychological effects of colour, materials and textures. Contemporary software products for 3D design.	E	5
3M32IND09	Design of transportation devices	Studying of basic characteristics of machines of internal transport. Application of standards, safety rules and ergonomics.	E	5
3M33PS02	Industrial practical training	Practical work of students in companies for manufacturing of different types of products.	M	4
3M34PS02	Interdisciplinary project (Diploma thesis)	Students work on their final project selecting one of the themes in the offered list.	M	3

* three of the listed elective courses are studied

6th semester

3M31IND09	Animation and presentation	3D geometric modelling. Exporting of solid models into software products for animation and presentation. Application of the animation software for animating of 3D models with addition of material and colour, definition of background, lighting and rendering. Software for product's presentation with multimedia connection of animations and simulations.	M	8
3M26OM01	Small business management	Introduction to opportunities, procedures and possibilities of starting own business. Focus on idea generation for business start-up.	E	5
3M32IND11	Technical documentation	Standards and principles for technical documentation preparing. Types of drawings and auxiliary documents. Views, sectional views and sections in machine drawings. Definition of the dimensioning style. Designation of surface characteristics. Assembly drawings. Making details. Presentation scale and printing. Contemporary software products. Templates for technical drawings.	E	5

3M32IND12	Web-Design	Computer networks and services. Internet addresses and services. Software products for WEB design. Formatting of text, pictures, tables, frames, animations. Basics of JAVA. WEB pages registration.	E	5
3M32IND13	Design for manufacture and assembly	Design for Manufacture and Assembly Design attributes important for process selection. Compatibility of materials and manufacturing processes. Design for manufacturing guidelines. Selection of processes. Design for different production processes. Representation of product functionality with geometric tolerances. Selection of datum faces. Assembly processes. Minimal theoretic number of parts. Design for assembly guidelines. Case studies of design for manufacture and assembly.	E	5
3M33PS02	Industrial practical training	Placement of students in the local production companies for practical work.	M	4
3M34PS02	Interdisciplinary project (Diploma thesis)	Students work on their final project selecting one of the themes in the offered list.	M	3