

# FACULTY OF MECHANICAL ENGINEERING OF THE UNIVERSITY OF ŽILINA

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## INFORMATION ON STUDY OPTIONS

### Form and duration of study:

bachelor	- full-time	- 3 years
bachelor	- part-time	- 4 years
master	- full-time	- 2 years
master	- part-time	- 2 years
doctoral	- full-time	- 3 years
doctoral	- part-time	- 5 years

## ACCREDITED STUDY PROGRAMMES FOR THE ACADEMIC YEAR 2014/2015

### BACHELOR STUDY

**Transport Machines and Equipment  
Vehicles and Engines  
Environmental Technique  
Mechanical Engineering Technologies  
Industrial Engineering**

### MASTER STUDY (for bachelor study graduates)

**Applied Mechanics  
Vehicle Maintenance  
Design of Machinery and Equipment  
Railway Vehicles  
Combustion Engines, Aircraft Engines  
Environmental Technique  
Materials Engineering  
Mechanical Engineering Technologies  
Automated Production Systems  
Industrial Engineering**

### DOCTORAL STUDY (for master study graduates)

**Applied Mechanics  
Energetic Machines and Equipment  
Mechanical Engineering Technologies and Materials  
Automated Production Systems  
Machine Parts and Machinery  
Industrial Engineering  
Limit States of Materials  
Materials  
Railway Vehicles**

Detailed information on study programmes (curriculum, syllabus) is available at <http://vzdelavanie.uniza.sk/vzdelavanie/plany.php>.

Expected number of admitted students to the 1<sup>st</sup> year:

Bachelor study			Master study		
Study programme	Planned number of admitted students		Study programme	Planned number of admitted students	
	full-time	part-time		full-time	part-time
Transport Machines and Equipment	100	-	Applied Mechanics	30	-
Vehicles and Engines	100	-	Vehicle Maintenance	30	-
Environmental Technique	100	-	Design of Machinery and Equipment	30	-
Engineering Technologies	100	70	Railway Vehicles	30	-
Industrial Engineering	100	-	Combustion Engines, Aircraft Engines	30	-
			Environmental Technique	30	-
			Materials Engineering	30	-
			Mechanical Engineering Technologies	40	30
			Automated Production Systems	30	-
			Industrial Engineering	40	-

**Language requirements** – written and oral command of Slovak or Czech language; expected basic knowledge of at least one world language (English, German, Spanish, and French).

**Health capability** – the faculty does not require medical certificate of health capability for university study and accepts the application without a medical certificate.

#### ADMISSION CONDITIONS AND FORM OF ADMISSION PROCEDURE FOR BACHELOR STUDY

The admission procedure at the Faculty of Mechanical Engineering of the University of Žilina will take place in the form of a selection procedure. Within the selection procedure, the results achieved during secondary school study (year-end and leaving examination), participation in mathematical and physical Olympiads in the district or higher round will be evaluated, while the type of attended secondary school is considered. No entrance examinations take place.

**Applicants meeting the following criteria will be admitted without admission procedure:**

- graduates from grammar schools with Mathematics taught in all years of the study with average mark from Mathematics in the year-end certificates of maximum 2.5,
- graduates from secondary vocational schools (mechanical engineering, electrical engineering, transport, construction, chemical) with Mathematics taught in all years of the study with average mark from Mathematics in the year-end certificates of maximum 2.0.

**Open Day:** 20<sup>th</sup> November, 2013 and 11<sup>th</sup> February, 2014

**Deadline for filing the application:** by 30<sup>th</sup> April, 2014

**Admission procedure term:** 12<sup>th</sup> June, 2014

#### ADMISSION CONDITIONS AND FORM OF ADMISSION PROCEDURE FOR MASTER STUDY

The admission procedure will take place in the form of a selection procedure in order to make sure that applicants with necessary abilities and prerequisites are admitted to the study. Within the selection procedure, the study results achieved during bachelor study, results of the state examination and the completed bachelor study programme in the field of study are assessed. No entrance examinations take place.

**Deadline for filing the application: by 30<sup>th</sup> April, 2014**

**Admission procedure term: 26<sup>th</sup> June, 2014**

**Fee for admission procedure (bachelor, master):** € 20.00 to be paid to the following address:

Žilinská univerzita v Žilina (University of Žilina), Univerzitná 1, 010 26 Žilina

bank: State Treasury

Account number: 7000269861/8180,

Account number in IBAN: **SK34 8180 0000 0070 0026 9861**

constant symbol: 0308

variable symbol: 10231 – bachelor study

10232 – master study

10233 – doctoral study

and document on payment to be sent to the address of the faculty together with the application!

If the applicant wishes to participate in the admission procedure at several faculties of University of Žilina, the application must be sent separately to each faculty with payment of the respective fee.

**Note: Even in case of electronic application it is necessary to print and sign the application, enclose the required attachments and the document on fee payment - after that it must be sent by post to the above mentioned address by the determined deadlines!**

**An incomplete application for study and/or application for study sent after the determined deadlines will not be accepted!**

**In case of non-participation or unsuccessfulness at the entrance examination, the faculty does not return the administrative fee for admission procedure!**

**Tuition fees:** pursuant to the Higher-Education Act. Information on the amount of tuition for the respective academic year will be published by University of Žilina in the defined terms on the websites.

**Student accommodation:** accommodation facility of the University of Žilina, according to the accommodation

capacity with taking into consideration the distance between permanent address and seat of the university.

**Accommodation charges:** € 42.00 - € 51.00/monthly.

**Catering:** canteen of the University of Žilina.

**Fee for meal:** from € 1.62/meal

#### **Admission of foreign students:**

Foreign applicants for study are admitted based on the respective interstate agreements or they study at their own costs (tuition payment). The tuition for foreign students is determined by a directive and published for the respective academic year on the university website. Tuition is not paid by EU citizens, foreigners with permanent residence in an EU member state and citizens of countries specified in Section 92 par. 9 of the Higher-Education Act. Applicants with no active knowledge of Slovak or Czech language must successfully attend language preparation (with possibility to attend it also at the University of Žilina). Applicants from the Czech Republic may use the form valid in the Czech Republic to file the application for study.

#### **Coordinator for working with students with specific needs:**

doc. Ing. Martin Krajčovič, PhD. tel.: 041/513 2718, e-mail: martin.krajcovic@fstroj.uniza.sk

# GRADUATE EMPLOYMENT

## Bachelor study programmes

### **1. Transport Machines and Equipment (field of study 5.2.3 Transport Machines and Equipment)**

Graduate from the study programme **Transport Machines and Equipment** gains in the first part of vocational education knowledge of theoretical subjects such as Mathematics, Physics, Mechanics of Liquids, Thermomechanics, and Flexibility and Rigidity, which together with the mechanics of solid body and construction and technology oriented subjects form the theoretical and professional base for study within the study programme Transport Machines and Equipment. Following this basis, in the second part of vocation study the graduate gains knowledge of applied sciences focused mainly on calculations, construction, operation and maintenance of transport machines and equipments. Based on the mandatorily optional subjects, the student may specialised in the field of machine and equipment construction, in the field of transport machines and manipulation equipments, field of machine and equipment recovery, or applied mechanics. Apart from that, the graduate will handle working with modern CAD systems for construction support and modelling with routine, as well as with systems for calculation, analysis and simulation of the technical system parts and their mechanisms. Students will prove their specific knowledge in solving the semester and final project. The study programme is completed by a final examination and defence of the final thesis. Within the study the students gain theoretical and methodological basis and practical experience and skills that are necessary to solve a wide spectre of problems related to design, projecting, construction and operation of different machines and equipments. The study graduate will operate successfully in practice in the field of designing, projecting, constructing, operation and maintenance of technical systems with main focus of transport machines and equipments. The related study programmes of the second level (Master) are **Design of Machinery and Equipment, Vehicle Maintenance** and **Applied Mechanics**.

### **2. VEHICLES AND ENGINES (field of study 5.2.4 Motor Vehicles, Rail Vehicles, Ships and Aeroplanes)**

Graduates from the bachelor study programme **Vehicles and Engines** in the field of study "motor vehicles, rail vehicles, ships and aeroplanes" are able to analyse problems and options that occur in different practical areas related to the field of transport means and their important subsystems. They gain basic knowledge of the subjects of general technical education, have a general overview of mechanical engineering production and its management, professional knowledge in the field of transport means, combustion engines, hydraulic and pneumatic machines and equipments, knowledge of quality assessment and testing of transport means and regarding the method of complying with legislative requirements imposed on the production and operation of transport means and their subsystems. The graduate is able to design and provide construction solution of the transport mean parts and their subsystems also with using modern CA-X technologies. The graduate is able to work in the operation of transport means, mainly of road vehicles, rail vehicles, combustion engines, hydraulic and pneumatic machines and equipments, upon their diagnostics, maintenance and repairs. Master study in the study programmes **Railway Vehicles** and **Combustion Engines, Aircraft Engines** is built on the bachelor study programme **Vehicles and Engines**.

### **3. ENVIRONMENTAL TECHNIQUE (field of study 5.2.6 Energy Machines and Equipment)**

The study programme **Environmental Technique** focuses on providing suitable environment for people from the aspect of thermal comfort and quality of air. During the study significant attention is paid to the issue of decreasing the thermal intensity of technologies in the industry, agriculture and transport, to economical exploitation of thermal energy in the communal sphere, to utilisation of alternative energy sources and to decreasing environmental burden from the ecological point of view. With its contents the study programme Environmental Technology includes the field of projecting and operation of heating, ventilation, air-conditioning and gas systems. During the study the students learn about new and modern trends in the given areas. At the same time they also gain a professional base and practical experience necessary for solving a wide spectre of problems related to design of energy technologies of low energy and intelligent buildings. The students get to know also energy management of operating energy equipments in the industrial and communal sphere. An inseparable part of the study is also the field of exploiting alternative energy sources (solar, wind and geothermal energy, biomass energy, heat pumps, etc.). Based on the optional subjects, the students may specialise in the field of heating, air-conditioning and ventilation or in gas industry. Students will prove their specific knowledge in solving the individually assigned semester and final projects. The study programme is completed by a final examination and defence of the

final thesis. The graduates from the study will operate successfully in practice in the required professions in projecting and operation of heating, ventilation and gas systems, as well as in the areas where reduction of energy intensity of thermal technological processes, more economical exploitation of thermal energy (in the industry and in residential buildings) are solved and in real applications of alternative energy sources. Master study in the study program **Environmental Technique** is built on the bachelor study programme **Environmental Technique**.

#### **4. MECHANICAL ENGINEERING TECHNOLOGIES (field of study 5.2.1 Mechanical Engineering)**

The professional profile of the **Mechanical Engineering Technologies** study programme graduate is characterised by theoretical but mainly practical knowledge of mechanical engineering technologies, production facilities, quality, economics and production control. The study graduate acquires theoretical but mainly practical knowledge of the most widespread technologies of mechanical engineering production and its control, gains habits and skills in construction and technological activities with using modern technological tools. Graduates also have basic knowledge in the field of production, testing, technological processing, selection, exploitation and degradation of properties of the main types of technical materials. They are prepared mainly to operate in industrial companies in the field of technical material production, their technological processing into semi-finished goods and products, as well as in the field of quality check, purchase, sale, service and maintenance. The graduates may find wide spectre of employment in the operation of industrial mechanical engineering companies, in railway and city public transport, in all areas of mechanical engineering, in applications of mechatronic systems in practice and in other organisations of manufacturing, operational or repair character. The graduates have adequate knowledge in the field of electronics, mechatronics, drives, computer technology and programming. They have sufficient practical experience and skills in laboratory work, adequately master specific terms in foreign language, know the basics of economic methods necessary for operation of the existing systems and have basic knowledge of law, psychology and management quality in mechanical engineering. Master study in the study programmes **Mechanical Engineering Technologies, Materials Engineering** and **Automated Production Systems** is based on the bachelor study programme Mechanical Engineering.

#### **5. INDUSTRIAL ENGINEERING (field of study 5.2.52 Industrial Engineering)**

During the study the bachelor gains knowledge mainly in the field of technical and natural sciences, company management, production and information technologies, company logistics, organisation of support and service operations and their economic dependence. During the study he/she is oriented mainly to organisation and management of processes at the level of basic production units (workshops) that the structure of the study programme and the contents of the individual subjects conform to. The graduate from the bachelor study gains theoretical knowledge necessary for efficient control of production units and their processes. During the study the graduate acquires skills in exploiting program applications and is prepared to apply basic methods of industrial engineering in practice. The Industrial Engineering and Management bachelor study programme graduate will find employment as a managerial and coordination employee mainly in basic production units and in departments of industrial engineering, further in selected departments of middle management level of industrial companies. He/she is prepared to work as a technician of quality, productivity, support designer of production systems, production management, employee of technical production preparation, industrial engineer, employee of the production planning and control department, employee of the logistics department, employee of the quality management department, employee of the maintenance department, employee of the human resources department, etc. The master study programme **Industrial Engineering** is built on the bachelor study programme **Industrial Engineering**.

## **Master study programmes**

### **1. AUTOMATED PRODUCTION SYSTEMS (field of study 5.2.1 Mechanical Engineering)**

The study programme Automated Production Systems is focused on the issue of automation and computer aid in production technologies. Attention is paid mainly to flexible production systems in mechanical engineering, computer aid of pre-production stages (applications of CA-X systems), projecting in automated mechanical engineering production, digitally controlled production facilities and robots, robot technology, application of microelectronics and computer technique in production technologies and production systems and creation of control systems for automated machine equipments. The students have the possibility to work with modern CNC machines and robots directly in the department laboratories.

The graduate from the study programme is able to systematically and comprehensively solve material, technologies and organisational issues in the production technologies and production systems with using automated tools, as well as computer aid in pre-production, production and post-production stages of spare part implementation based on the methods of mathematic modelling, simulation and optimisation. The abilities are integrated with knowledge of economic character. Graduates from the study programme find employment in construction and technological offices, in designing of automated production workplaces based on CNC machines, robots and CA technologies, in the fields of designing constructions and production of forms for the technology of plastic injection, and also in designing control systems based on PC, PLC and microcomputers. The doctoral study programme **Automated Production Systems** follows the master study programme **Automated Production Systems**.

### **2. VEHICLE MAINTENANCE (field of study 5.2.2 Maintenance of Machines and Equipments)**

The graduate is capable of holding the profession - Maintenance Engineer. The Maintenance Engineer – has command of the methodics and procedures of commissioning and operation of transport means (in general technical systems). He/she has knowledge of their construction and service, masters methods of analysis and evaluation of reliability, sophisticated procedures in creating complex maintenance systems, methodics and procedures of designing and implementing maintenance information systems at the managerial level. (Computer Maintenance Management Systems – CMMS, ERP). The graduate has knowledge and practical skills in operation and maintenance control in complex care for machines and equipments in all areas of mechanical engineering. The graduate will mainly find employment in designing complex maintenance systems, in management, organising and technical preparation of transport means maintenance, in management, organising and technical preparation of service activities related to the operation of transport means, in the field of managing services and business related to machines and equipments, as well as a private entrepreneur (engineering) in the field of maintenance, service and sale of machines. The doctoral study programme **Railway Vehicles** is based on the master study programme **Vehicle Maintenance**.

### **3. COMBUSTION ENGINES, AIRCRAFT ENGINES (field of study 5.2.6 Energy Machines and Equipment)**

The graduate from the study programme is capable of creative and construction activity, seeking, sorting out information and use it upon designing new conceptual and construction solutions, performing different tests and measurements and evaluating the measured data. All these activities will be performed with the aid of computer technique in the context of requirements for environment protection and ergonomic solution. The graduate is ready for working in development, construction, operational, manufacturing, repairing and business companies, companies of vehicle, aircraft and stationary combustion engines, in test laboratories of combustion engines, etc. They will also operate successfully in repair plant and plants that have mobile energy facilities (automobiles, ground, road and building machines, rail vehicles), or use stationary combustion engine as a source of energy (cogeneration units, substitute energy sources, etc.). The doctoral study programme **Energetic Machines and Equipment** is based on the master study programme **Combustion Engines, Aircraft Engines**.

### **4. RAILWAY VEHICLES (field of study 5.2.4 Motor Vehicles, Rail Vehicles, Ships and Aeroplanes)**

The graduates from the study programme are able to analyse, design, construct, operate and maintain extensive technical systems of transport means mainly in the field of rail vehicles. During the study emphasis is put on the graduate to obtain in-depth knowledge of basic theoretical mechanical engineering disciplines (mainly applied Mathematics, Mechanics, Materials, Computer Simulations), as well as in theory, construction, projecting of rail vehicles, their testing, operation and maintenance. Graduates are able to work in projects involving identification of the problem, analysis, design and implementation of extensive

solutions together with testing and necessary documentation with exploitation of modern CA-X technologies. They are able to find employment in research, development and construction of transport means, mainly of rail vehicles, and also in their operation, diagnostics, maintenance and repairs. The graduates will operate successfully mainly in research, development and construction workplaces of producers of rail vehicles and track machines, in companies focused on their maintenance, repair, modernisation and reconstructing, and in technical and control elements of organisations providing for railway transport (railway companies). The doctoral study programme **Railway Vehicles** is based on the master study programme **Railway Vehicles**.

## **5. MECHANICAL ENGINEERING TECHNOLOGIES** **(field of study 5.2.1 Mechanical Engineering)**

The graduates have theoretical and experimental knowledge, practical experience in technological processes, foundry industry, mechanical moulding, welding, machining and assembly, heat treatment, physical metallurgy and limit states of construction materials. They will adopt the way of projecting production processes and systems, designing technological procedures, metrological provision of mechanical engineering production, quality check of products, basics of construction and functional interchangeability of production machines and equipments. They gain knowledge of mechanisation and automation of production processes. All these activities are performed with the aid of CA-X technologies, methods of mathematic modelling, simulation methods.

The graduate will find employment in mechanical engineering organisations and operations, in the departments of main technologies, in projection and construction of machines and tools, in the field of management, marketing, and check, technological development and research, in production preparation, etc. The doctoral study programme **Mechanical Engineering Technologies and Materials** is built on the master study programme **Mechanical Engineering Technologies**.

## **6. APPLIED MECHANICS** **(field of study 5.1.7 Applied Mechanics)**

The graduate from the study programme **Applied Mechanics** creatively exploits the methods of calculation, simulation and verification of model solutions upon designing mechanical systems. Main emphasis is put on preparedness and ability to independently develop, elaborate and practically use engineering methods in solving technical problems in the field of linear and non-linear response of constructions. The graduate is able to perform static, kinematic and dynamic analysis of mechanisms and constructions, to assess lifetime and reliability of the investigated objects. The graduate is capable of analysing heat stress, solving technical tasks of flow, thermodynamics, heat and material transfer. He/she masters computing aids of mechanics, such as the finite element method or the marginal element method and is able to apply them for the solution of engineering tasks. In their work they use software aided engineering tools such as: CAD systems: AutoCAD, Pro/Engineer, Catia, Ideas, etc.; Finite element method software: ADINA, ANSYS, MSC MARC, software for the simulation of mechanical systems: ADAMS. and others. He/she has adequate knowledge of information technologies and command of the basics of programming languages C, FORTRAN and MATLAB in the environment of MS Windows and Linux operation systems. The graduates will find employment in the field of designing, evaluating and innovation of constructions of machines, technological facilities and buildings. The doctoral study programme **Applied Mechanics** is based on the master study programme **Applied Mechanics**.

## **7. DESIGN OF MACHINERY AND EQUIPMENT** **(field of study 5.2.3 Transport Machines and Equipment)**

The study programme **Design of Machinery and Equipment** (DME) is intended for a wide spectre of students with interest mainly in the construction specialisation. Its concept covers individual areas of the product life cycle. It concentrates on design, construction, verification, engineering calculations, simulations and production of prototypes. The study provides the future engineers with necessary knowledge and competences to be used in several field of mechanical engineering, automobile and electrical engineering industry. The contents of the study programme are not narrowly focused only on one industrial field but offer the possibility to adopt the basic theoretical knowledge and application principles necessary for solving a wide spectre of technical problems and tasks in practice.

Within the study the students have the option to adopt standard construction procedures, as well as progressive methods and technologies of technical system designing such as: virtual design – Digital Mock Up, Computer Aided Design and Computer Aided Engineering, Rapid Prototyping, digitalisation and Reverse Engineering, tribology and technical diagnostics.

The study within DME assumes successful completion of bachelor study of mechanical engineering or mechatronic specialisation. The basic requirement is knowledge of the theoretical basis involving Mathematics, Physics, Mechanics, Material Sciences, Basics of Constructing, parts and mechanisms of machines, flexibility and rigidity.

During the study, the graduates of the DME study programme enhance their knowledge of applied sciences focused on design, constructing and calculations of machines, equipments and their components. Students have the possibility to further specialise their professional focus based on selection from a wide spectre of offered optional subjects. Knowledge of constructing, construction materials, construction methodics, innovations, calculation and simulation methods for structural and dynamic analysis and optimisation of construction parts and nodes, based mainly on the finite element method, currently form a necessary base for successful operation of constructors and designers of machines and machinery equipment on the European labour market. The knowledge and abilities of graduates from this study programme also includes handling of modern methods of computer modelling and simulations, computer projecting and construction, as well as experimental methods in the field. Apart from that it also involves routine-like handling of working with systems for 2D and 3D constructing and modelling, such as AutoDESK INVENTOR, Pro/ENGINEER, CATIA and with systems for analysis, simulation and optimisation, with focus mainly on systems ANSYS and ADAMS, or Opti Struct. They learn to practically use technologies for Rapid Prototyping and Reverse Engineering for the field of machine and equipment development and innovation. The students learn to apply the most modern methods based on exploiting and studying of bionic principles with the support of TRIZ Methods in innovations of technical systems. The study graduates will find employment mainly in the field of research and development, in the field of designing, projecting and constructing machines and equipments based on sophisticated methods and procedures. The master study programme **Design of Machinery and Equipment** is followed by the doctoral study in the study programme **Machine Parts and Machinery**.

## **8. MATERIALS ENGINEERING** **(field of study 5.2.26 Materials)**

Graduates from the second level study programme **Materials Engineering** are complexly prepared to operate in the field of research, development and production of technical materials, their technological processing into semi-finished goods and products, as well as in the field of quality check and operational diagnostics. The graduate has thorough knowledge of the mutual relations between chemical composition, structure and technically important material properties. The spectre and depth of knowledge and skills, acquired by study in the master study programme provide the prerequisites for fast adaptability of the graduate in practice and his/her operation in a wide area of industrial sectors.

Graduates from the second level of university study of materials are able to analyse and design extensive technical solutions requiring in-depth knowledge of materials, manage teams of employees in this field, independently solve even large projects and assume responsibility for complex solutions.

The master study may be followed by third level university study in two study programmes: **Materials and Limit States of Materials**.

## **9. INDUSTRIAL ENGINEERING** **(field of study 5.2.52 Industrial Engineering)**

The engineer is able to get engaged in the solution of technical-organisation and development areas in a qualified way, dominantly at the middle management level of a manufacturing company. He/she is prepared to solve complex tasks in the field of logistics and management of supplier chains, in-house logistics and optimisation of inventories and material flows, implementation of all-company information systems, planning and control of production, quality management, design of production processes and systems, management of innovations, introducing methods of industrial engineering in individual company departments, computer modelling of company processes, project management, application of operational research methods, etc. The graduate from the master study programme Industrial Engineering will find employment mainly in positions of middle management of a manufacturing organisation and in departments of industrial engineering. He/she is prepared to hold positions at the company such as system engineer, quality engineer, productivity engineer, designer of production systems, production engineer, employee of technical preparation of production, industrial engineer, head of production planning and control, head of logistics department, head of maintenance department, employee of human resources department, and others. He/she has preconditions provided to hold positions also at the top management level. The master study programme **Industrial Engineering** may be followed by doctoral study programme **Industrial Engineering**.

## **10. ENVIRONMENTAL TECHNIQUE** **(field of study 5.2.6 Energy Machines and Equipment)**

The graduate gains knowledge of constructions, projecting and testing of technical facilities for adjustment of the environmental condition. These are equipments for adjustment of micro climate and cleanliness of the atmosphere in the internal environment, mainly ventilation, air-conditioning and heating systems, including the systems for the supply of thermal energy and natural gas. Within the study, the students gain theoretical and methodological expert basis and practical experience necessary for solving a wide spectre of problems related to designing, projecting and operation of heating, ventilation and gas systems,



construction and operation of heat sources, pumps and compressors, cogeneration units and other facilities that are applied in the heating, ventilation and gas systems, as well as construction of machines and equipments for exploitation of alternative energy sources (solar, wind, and geothermal energy, biomass energy and waste, etc.). The doctoral study programme **Environmental Technique** is built on the master study programme **Energetic Machines and Equipments**.