

# Mechanical Engineering

## 1 cycle

### Professional Higher Education study programme

#### 1 General description of the programme

This degree programme provides a thorough grounding in mechanical engineering principles and their applications, together with the skills needed to solve real mechanical engineering problems.

The Higher Education Professional Degree programme of "Mechanical Engineering" is a 3-year undergraduate programme consisting of 180 ECTS points. The study program consists of four fields: "Energy, process and environmental engineering", "Engineering design", "Production Engineering" and "Maintenance of machines and devices". This allows students to professional specialization in the second and third year of study. The students can also continue their studies on Master and PhD study programmes, which are also offered at our faculty.

Renewed professional study programme Mechanical Engineering is in line with the Bologna guidelines reform of higher education, as defined in the Law on Higher Education in the Republic of Slovenia. The study programme is modernly designed and based on the latest findings in the field of mechanical engineering and modern technologies. Its design was inspired by some study programmes of established European professional colleges, such as the Fachhochschule Aachen and Fachhochschule Darmstadt in the Federal Republic of Germany, and MCI Innsbruck in Austria.

The learning contents cover - in addition to sound theoretical foundations - also all the professional knowledge and skills that are scientifically founded and tested in the practice, and necessary for high productivity and high quality engineering work in the modern engineering industry. Particular emphasis is placed on the synthesis of theoretical and practical knowledge to solve complex problems in the field of mechanical engineering, and through this improve the development of new products with high added value and modernization of production technologies. Graduates of undergraduate higher professional study programme will be able to practically apply the acquired knowledge to solve complex professional problems.

During the first year, students listen core courses of the program, which include basic knowledge of mathematics, physics, mechanics, thermodynamics and materials, as well as acquire basic knowledge of engineering information technology, mechanical technology and machine elements. During the second year, the students acquire basic knowledge of mechanical engineering technology in the field of engineering designing; energy, process and environmental engineering and manufacturing technologies and systems. In the summer semester, they upgrade their knowledge in the chosen study field with the compulsory subjects of the field; while still acquire a general knowledge of control engineering and foreign language. During the third year, the students continue their acquisition of knowledge in the chosen study field, whereby the student with the consent of the mentor develop a specific program by choosing elective subjects; while still acquiring a general knowledge of technical cybernetics and management in production.

During the summer semester students acquired 480 hours (18 ECTS) of practical training in the industry, gaining substantial professional experience in solving real engineering problems.

The program includes systematic efforts to promote the personal development of students so that students during the study obtain the basics of effective higher education studies, teamwork, professional research and writing, and professional resources found in databases, and resources

The study programme is intended to provide industry with a new breed of industrial engineering experts with theoretical and methodological knowledge for solving problems in planning, management and implementation of complex professional tasks in a wide field of mechanical engineering and at various workplaces. Students have a possibility to obtain high-quality knowledge during study, and in addition, also skills and expertise in the field of mechanical engineering. Due to individual work with the students, it is possible to transfer professional values and building of the positive self-image of the students. This in addition to knowledge, contributes significantly to the work success of our graduates. Graduates of this study programme are able to manage the procedures and processes in the field of mechanical engineering. They are able to responsibly design, construct, manufacture and maintain products, machines and plant, taking into account the professional excellence, social utility, ethical responsibility, attachment to professional ethics and criteria for environmental integrity of their creations. The programme enables that the graduate obtains a broad knowledge by integrating theoretical concepts with professional and applied skills, and by the development of skills for transferring and applying theoretical knowledge in practice for creative solutions and professional work problems.

Students have a great potential for finding employment immediately after completing the Higher Education Professional Degree in Mechanical Engineering, some are recruited even before defending a diploma work. The study programme is mainly based on the needs of the economy both in our region and beyond. Students during their professional practice in companies become acquainted with the problems in companies, where they are engaged in the practice. Even diploma works are very often designed so that the student within the diploma work addresses the specific practical problems. Obtained professional knowledge and skills also provides the students with very good employment prospects for the public sector. The need for these personnel is reflected in public administration, municipal inspectorates, education and science, technical institutes, etc

## 2 Short description of the study modules

The Higher Education Professional Degree programme of Mechanical Engineering consists of four study modules:

- "Power, process and environmental engineering "  
This module focuses on the theoretical and applied knowledge necessary for the planning, development, optimization and regulation of power and mass transport processes, thermal and hydraulic machinery and devices. Its activities also include complete machine installation and systems typical of classical mechanical engineering, process engineering, food engineering, pharmaceutical industry and all fields of environmental engineering, and different waste management and control systems.

- "Engineering design"  
This module is appropriate for students who are interested in design and engineering. The major focus of the module is to expose students to design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. This module gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based learning. Used in combination with a teaming approach, learning challenges students to continually hone their interpersonal skills, creative abilities and understanding of the design process.
- "Production Engineering"  
This module is designed to provide students with an overview of a wide variety of manufacturing processes involved in industrial activities. While most of the manufacturing processes are to be introduced during courses, more emphasis will be given on those processes which are more common in industry, namely material removal processes, casting, and forming. In addition to introducing the various manufacturing process, common production machines equipped with modern automation systems, robotics, material handling, inspection processes and process control, ... will be covered in order to provide the students with a better understanding of the production engineer profile.
- "Maintenance of machinery and equipment "\*  
Maintenance engineers are responsible for the continuous running of equipment and machinery. They use computerised systems to oversee routine maintenance and organise repairs. They are also involved in control and monitoring devices and occasionally in the manufacture of items that will help in maintenance. Maintenance engineering plays a vital role in the efficiency, development and progress of manufacturing and processing industries. Designing maintenance strategies, procedures and methods, diagnosing breakdown problems, controlling maintenance tools, stores and equipment, dealing with emergencies, unplanned problems and repairs, ... are typical, special work activities, you will learn in this study module.

\* Note: this study module will not be available in the academic year 2021/2022

### 3 General learning outcomes and competencies of the students

Students who complete Higher Education Professional Degree in Mechanical Engineering possess the knowledge and skills giving them very different employment opportunities: in the design and construction bureaus to create, design and construct a wide range of products, installations and structures, supported by the latest software and tools, in centres for computer modelling and analysis of complex physical laws in the process of product design, manufacture, as well as employment in organizations that are engaged in designing, developing and monitoring devices and systems for energy production, in companies for exploring, developing and introducing the environmentally friendly energy sources; in businesses where they design, manufacture or control the complex process plants, in companies where design, deploy and control the modern production technology, in companies for the development, deployment and control of mechanized, automated and robotic manufacturing processes; in maintenance departments, divisions integrated management quality and wherever the work process in any way connected with the wider field of mechanical engineering, etc. Due to their specific technical-engineering skills, graduates are highly sought in private and public sector, especially for work in various supervisory and inspection bodies of public administration, the insurance industry as appraisers claims in the banking industry as evaluators of risk levels, etc.

#### 4 The main subject-specific learning outcomes and competencies of the students

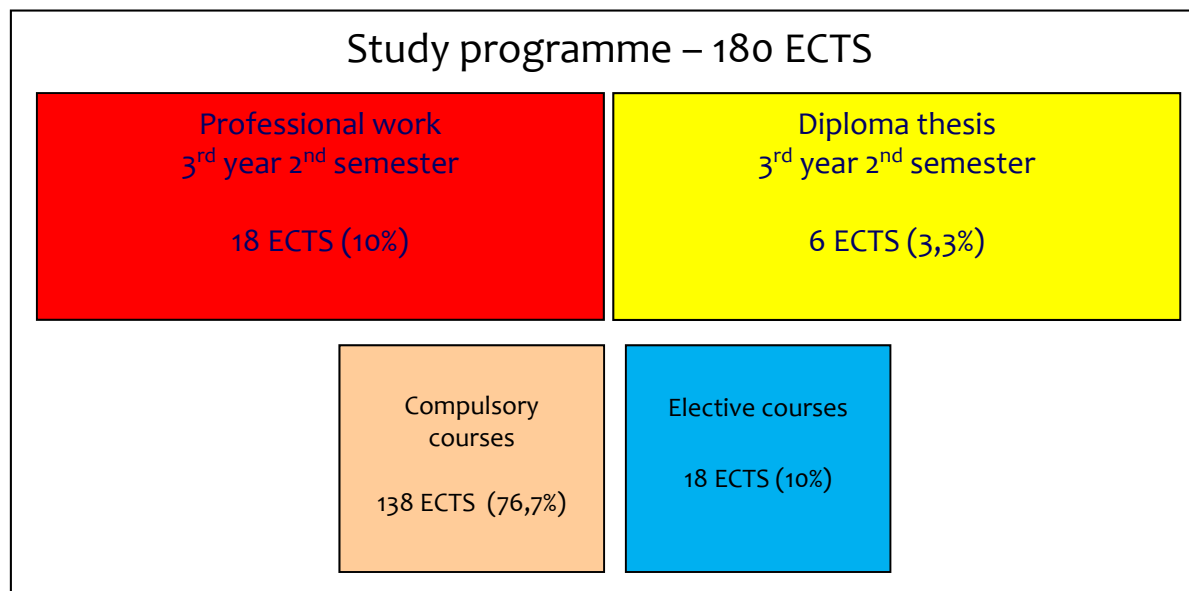
The main subject-specific competencies that can be obtained by Higher Education Professional Degree study programme in Mechanical Engineering are:

- the ability to use modern computing, information and communications technologies and systems in the field of expertise,
- ability to design and construct the mechanical components, assemblies, devices, machines and components,
- the use and development of computer aided design,
- the use and development of methods and tools for modelling, optimization and simulation, of processes, machinery, equipment, manufacturing processes, products and manufacturing plants,
- ability to design and develop machines, devices and systems for energy, process and environmental engineering,
- ability to design, develop and use of modern production technologies, automation of the production and new production concepts,
- ability to manage information, material and energy flows during the conception, design, construction, manufacture, assembly, disassembly and maintenance of the products,
- the ability to manage existing processes and technologies, analysing, judging and evaluating and updating them,
- ability to organize and manage the production process,
- the ability to provide the adequate product quality through the implementation of appropriate measurement and quality control,
- the ability to provide measures for flawless operation, maintenance and environmental compatibility of products throughout their lifetime,
- ability to interdisciplinary understand of activities in production systems,
- ability for continuously developing skills and expertise in the application of knowledge in a particular field of expertise,
- knowledge and understanding of the history of development of mechanical engineering and its disciplines

## 5 General curriculum

The 3-year undergraduate Professional Higher Education study programme of Mechanical Engineering is divided into the following parts:

Part	Part of study		ECTS credits
1	Joint courses	1 <sup>st</sup> year 2 semesters	60
2	Joint courses	2 <sup>nd</sup> year 1st semester	30
2	Module courses	2 <sup>nd</sup> year 2 <sup>nd</sup> semester	30
3	Module courses	3 <sup>rd</sup> year 2 semesters	60
<b>Total:</b>		<b>3 years</b>	<b>180</b>



## 6 Detailed curriculum

### 1st YEAR

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
MATHEMATICS FOR ENGINEERS 1	1	winter	30	0	50	0	-	-	80	70	150	5
STATICS AND STRENGTH	1	winter	25	0	40	0	-	-	65	85	150	5
PHYSICS IN ENGINEERING	1	winter	15	0	5	25	-	-	45	45	90	3
ENGINEERING MATERIALS	1	winter	40	0	12	25	-	-	77	103	180	6
TECHNICAL DOCUMENTATION	1	winter	40	5	25	-	-	5	75	75	150	5
ENGINEERING INFORMATICS	1	winter	12	0	5	0	-	20	37	53	90	3
FUNDAMENTALS OF ELECTRICAL ENGINEERING AND INDUSTRIAL ELECTRONICS	1	winter	15	0	12	10	-	-	37	53	90	3
MATHEMATICS FOR ENGINEERS 2	1	summer	30	0	35	0	-	-	65	55	120	4
KINEMATICS AND DYNAMICS	1	summer	25	0	25	0	-	-	50	70	120	4
ENGINEERING MEASUREMENTS	1	summer	40	0	0	40	-	-	80	100	180	6
MACHINE ELEMENTS	1	summer	50	0	40	10	-	2	102	138	240	8

MANUFACTURING TECHNOLOGIES	1	summer	25	0	10	15	-	-	50	70	120	4
TECHNICAL THERMODYNAMICS	1	summer	25	0	25	0	-	-	50	70	120	4
<b>Total hours 1st year:</b>			<b>372</b>	<b>5</b>	<b>284</b>	<b>125</b>	<b>0</b>	<b>27</b>	<b>813</b>	<b>987</b>	<b>1800</b>	<b>60</b>

### 2nd YEAR – Compulsory subjects of all fields

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
TECHNOLOGICAL SYSTEMS	2	winter	40	5	12	35	-	-	92	118	210	7
TECHNICAL FLUID MECHANICS AND HEAT TRANSFER	2	winter	40	0	40	12	-	-	92	118	210	7
DESIGN METHODOLOGY	2	winter	40	0	25	12	-	-	77	103	180	6
INTRODUCTION TO POWERPLANT TECHNOLOGY	2	winter	25	0	12	12	-	-	49	71	120	4
FUNDAMENTALS OF PROCESS ENGINEERING AND ENVIRONMENTAL PROTECTION	2	winter	18	0	14	3	-	-	35	55	90	3
COMPUTER-AIDED ENGINEERING	2	winter	12	5	0	0	-	20	37	53	90	3
INDUSTRIAL ENGINEERING	2	summer	22	0	3	12	-	-	37	53	90	3
OPEN-LOOP CONTROL TECHNIQS	2	summer	12	5	10	12	-	-	39	51	90	3
FOREIGN LANGUAGE (ENGLISH)	2	summer	25	5	10	0	-	-	40	50	90	3

<b>Total hours:</b>	<b>234</b>	<b>20</b>	<b>126</b>	<b>98</b>	<b>0</b>	<b>20</b>	<b>498</b>	<b>672</b>	<b>1170</b>	<b>39</b>
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**2nd YEAR - Compulsory subjects of field Energy, Process and Environmental Engineering**

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
PROCESS ENGINEERING	2	summer	30		30	10	-	-	70	110	180	6
HEAT ENGINES	2	summer	25	5	25	10	-	-	65	85	150	5
HYDRAULIC MACHINES	2	summer	25	0	17	20	-	-	62	88	150	5
COOLING TECHNIQS	2	summer	30	0	25	10	-	-	65	85	150	5
<b>Total hours:</b>			<b>110</b>	<b>5</b>	<b>97</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>262</b>	<b>368</b>	<b>630</b>	<b>21</b>

**2nd YEAR - Compulsory subjects of field Engineering Design**

ENGINEERING STRUCTURES	2	summer	25	15	25	7	-	-	72	108	180	6
MACHINE DESIGN	2	summer	25	7	15	15	-	-	62	88	150	5
COMPUTER-AIDED PRODUCTS' MODELLING	2	summer	20	10	0	0	-	35	65	85	150	5
GEAR DRIVES	2	summer	30	5	20	7	-	3	65	85	150	5
<b>Total hours:</b>			<b>100</b>	<b>37</b>	<b>60</b>	<b>29</b>	<b>-</b>	<b>38</b>	<b>264</b>	<b>366</b>	<b>630</b>	<b>21</b>



**2nd YEAR - Compulsory subjects of field Production Engineering**

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
MACHINING TECHNOLOGY	2	summer	35	20	0	20	-	-	75	105	180	6
CAM PROCESSES	2	summer	30	17	0	30	-	-	77	103	180	6
MACHINE TOOLS	2	summer	40	0	12	25	-	-	77	103	180	6
PRODUCTION MEASUREMENTS	2	summer	20	0	0	15	-	-	35	55	90	3
<b>Total hours:</b>			<b>125</b>	<b>37</b>	<b>12</b>	<b>90</b>	<b>0</b>	<b>0</b>	<b>264</b>	<b>366</b>	<b>630</b>	<b>21</b>

**2nd YEAR - Compulsory subjects of field Maintenance of Machines and Devices**

METHODS AND STRATEGIES OF MAINTENANCE	2	summer	30	10	0	0	0	-	40	140	180	6
COMPUTER AIDED MAINTENANCE	2	summer	20	10	15	20	-	-	65	85	150	5
WORK AND ENVIRONMENT PROTECTION	2	summer	25	25	15	0	-	-	65	85	150	5
TRIBOLOGY	2	summer	25	0	12	25	-	-	62	88	150	5
<b>Total hours:</b>			<b>100</b>	<b>45</b>	<b>42</b>	<b>45</b>	<b>0</b>	<b>0</b>	<b>232</b>	<b>398</b>	<b>630</b>	<b>21</b>

### 3rd YEAR - field Energy, Process and Environmental Engineering

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
HEAT SYSTEMS AND DEVICES	3	winter	25	12	40	0	-	-	77	103	180	6
COMBUSTION AND COMBUSTION DEVICES	3	winter	25	24	25	0	-	-	74	106	180	6
INTERNAL COMBUSTION ENGINES	3	winter	30	24	10	10	-	-	74	106	180	6
Elective subject	3	winter	-	-	-	-	-	-	-	-	360	12
Elective subject	3	summer	-	-	-	-	-	-	-	-	180	6
PROFESSIONAL WORK IN INDUSTRY	3	summer	-	-	-	-	-	-	0	480	480	18
DIPLOMA WORK	3	summer	-	-	-	-	-	-	15	165	180	6
<b>Total hours:</b>											<b>1740</b>	<b>60</b>

### 3rd YEAR - field Engineering Design

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
PRODUCT DEVELOPMENT	3	winter	35	5	12	25	-	-	77	103	180	6
WELDING TECHNIQUE	3	winter	40	0	0	40	-	-	80	100	180	6



PROFESSIONAL WORK IN INDUSTRY	3	summer	-	-	-	-	-	-	0	480	480	18	
DIPLOMA WORK	3	summer	-	-	-	-	-	-	15	165	180	6	
<b>Total hours:</b>												<b>1740</b>	<b>60</b>

### 3rd YEAR - field Maintenance of Machines and Devices

Subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
METHODS OF DIAGNOSTICS	3	winter	30	20	10	0	-	-	60	120	180	6
MAINTENANCE MANAGEMENT AND QUALITY ASSURANCE	3	winter	25	19	19	0	12	-	75	105	180	6
DESIGN FOR RELIABILITY AND MAINTAINABILITY	3	winter	25	12	17	0	-	20	74	106	180	6
Elective subject	3	winter	-	-	-	-	-	-	-	-	360	12
Elective subject	3	summer	-	-	-	-	-	-	-	-	180	6
PROFESSIONAL WORK IN INDUSTRY	3	summer	-	-	-	-	-	-	0	480	480	18
DIPLOMA WORK	3	summer	-	-	-	-	-	-	15	165	180	6

			SKUPAJ									1740	60
			<b>Total hours:</b>									<b>1740</b>	<b>60</b>

**Elective subjects**

**3rd YEAR - field Energy, Process and Environmental Engineering – winter semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
COMPUTER SIMULATIONS IN FLUID MECHANICS AND HEAT TRANSFER	3	winter	15	5	0	0	-	20	40	140	180	6
FUNDAMENTALS OF DRYING AND DRYING DEVICES	3	winter	15	5	20	0	-	-	40	140	180	6
HEATING, VENTILATION AND AIR CONDITIONING (HVAC)	3	winter	25	6	9	0	-	-	40	140	180	6
FUELS	3	winter	20	10	5	5	-	-	40	140	180	6
ENERGY AND ENVIRONMENT	3	winter	18	6	10	6	-	-	40	140	180	6
MAINTENANCE OF POWER AND PROCESS SYSTEMS	3	winter	25	6	9	0	-	-	40	140	180	6

**3rd YEAR - field Energy, Process and Environmental Engineering – summer semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
SENSIBLE USE OF ENERGY	3	summer	25	6	9	0	-	-	40	140	180	6
ENGINE EQUIPMENT AND DIAGNOSTIC	3	summer	20	10	0	5	-	5	40	140	180	6
ADVANCED WIND AND WATER ENERGY SYSTEMS	3	summer	20	5	5	10	-	-	40	140	180	6

**Elective subjects****3rd YEAR - Engineering Design – winter semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
TRIBOLOGY	3	winter	20	0	10	10	-	-	40	140	180	6
METHODS AND STRATEGIES OF MAINTENANCE	3	winter	30	10	0	0	-	-	40	140	180	6
COMPUTER SIMULATIONS IN ENGINEERING DESIGN	3	winter	17	3	0	0	-	20	40	140	180	6
SAFETY AND TECHNICAL REGULATIONS	3	winter	18	6	0	10	-	6	40	140	180	6
INDUSTRIAL ROBOTICS	3	winter	25	0	12	40	-	-	77	103	180	6
DIMENSIONING OF MACHINES AND DEVICES	3	winter	20	5	15	0	-	-	40	140	180	6

**3rd YEAR - field Engineering Design – summer semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
ASSEMBLY SYSTEMS	3	summer	30	5	0	5	-	-	40	140	180	6
MATERIALS MECHANICAL PROPERTIES DETERMINATION	3	summer	15	5	15	5	-	-	40	140	180	6
ECONOMY OF TECHNICAL SYSTEMS	3	summer	18	6	6	0	-	10	40	140	180	6
PRODUCT DESIGN BASICS	3	summer	20	5	0	7	-	8	40	140	180	6

**Elective subjects**

**3rd YEAR - Production Engineering – winter semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
FORMING TOOLS	3	winter	20	0	6	14	-	-	40	140	180	6
TOOLS AND CLAMPING DEVICES	3	winter	20	0	0	20	-	-	40	140	180	6
PRODUCT QUALITY ASSURANCE	3	winter	30	10	0	0	-	-	40	140	180	6
TECHNOLOGICAL CALCULATION OF COSTS	3	winter	20	10	10	0	-	-	40	140	180	6
ASSEMBLY	3	winter	22	3	0	15	-	-	40	140	180	6

HYDRAULICS AND PNEUMATICS	3	winter	20	5	5	10	-	-	40	140	180	6
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### 3rd YEAR - field Production Engineering – summer semester

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
FLEXIBLE MANUFACTURING SYSTEMS	3	summer	25	5	0	10	-	0	40	140	180	6
PRODUCTION MANAGEMENT	3	summer	22	3	0	15	-	-	40	140	180	6
MAINTENANCE OF MECHATRONICS SYSTEMS	3	summer	20	5	5	10	-	-	40	140	180	6

### General elective subjects

#### 3rd YEAR – General elective subjects – winter semester

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours
MOTION MECHANISMS	3	winter	25	12	40	0	-	-	77	103	180
FORMING OF MATERIALS	3	winter	20	5	5	10	-	-	40	140	180
SELECTED TOPICS IN MATHEMATICS	3	winter	20	0	20	0	-	-	40	140	180



SELECTED TOPICS IN PHYSICS	3	winter	20	5	10	5	-	-	40	140	180
SELECTED TOPICS IN MECHANICS	3	winter	20	0	20	0	-	-	40	140	180
ELECTRICAL EQUIPMENT	3	winter	20	5	5	10	-	-	40	140	180
SPORT	3	winter	1	0	0	0	39	-	40	140	180
ENGLISH LANGUAGE - BASICS *	3	winter	25	5	10	-	-	-	40	50	90
GERMAN LANGUAGE - BASICS **	3	winter	25	5	10	-	-	-	40	50	90
HEAT TREATMENT OF METALS	3	winter	20	0	0	20	-	-	40	140	180

\* Elective course cannot select students whose compulsory subject has been English.

\*\* Elective course cannot select students whose compulsory subject has been German.

**3rd YEAR – General elective subjects – summer semester**

Elective subject	Year	Semester	Lectures	Seminar	Tutorial work	Laboratory work	Field work	Computer work	Total contact hours	Individual Student work	Total hours	ECTS
PROJECT WORK	3	summer	-	15	-	-	-	-	15	165	180	6