



Univerza v Novém městě
University of Novo mesto

HIGHER EDUCATION PROFESSIONAL STUDY PROGRAMME
1st CYCLE

TECHNOLOGIES AND SYSTEMS

implemented by University of Novo mesto
Faculty of Mechanical Engineering

KAZALO

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1 GENERAL INFORMATION ABOUT THE PROGRAMME

Table 1: Summary of general information about the programme

Study programme:	Technologies and Systems
Cycle:	1st cycle
Type:	higher education professional study programme
Duration:	3 years
ECTS amount:	180 ECTS
SOK (Slovenian classification framework)	level 7
EOK (European classification framework)	level 6
EOVK (European higher education classification framework)	first cycle
Klasius P-16:	0715 - Metallurgy, mechanical engineering, metall work
Research area (Frascati classification):	technical sciences
Accreditation:	NAKVIS, decision No. 2/137 – 2006

In the development of the higher education professional study programme at the first cycle *Technologies and Systems*, the following documents are consistently taken into account:

- Higher Education Act (Official Gazette of the RS, No. 32/12 – official consolidated text (40/12, 57/12, 109/12, 85/14, 75/16, 61/17 and 65/17),
- Act on Professional and Scientific Titles (Official Gazette of the RS, No. 61/06, 87/11 and 55/17),
- Criteria on Accreditation of Higher Education Institutions and Study Programmes (Official Gazette of the RS, No. 40/14),
- Criteria for Credit Assignment to Study Programmes According to ECTS (Official Gazette of the RS, No. 95/10).

2 FUNDAMENTAL OBJECTIVES AND COMPETENCES

2.1 Fundamental objectives of the study programme

The fundamental goal of the Technologies and Systems study programme is to train the graduate for successful integration into immediate work environment or further studies in the field of technical sciences.

The graduate will acquire the technical, technological, informational, organisational, economic, sociological, legal knowledge and methods of research and development work

necessary for entry into engineering practice or further study. The graduate will acquire the necessary knowledge to assess social, environmental and ethical responsibility in his work.

The graduate will acquire:

- general knowledge in natural sciences, especially in mathematics, physics and chemistry,
- general knowledge in the field of technical sciences,
- general knowledge in the field of technologies,
- general knowledge in the field of informatics and computing,
- general knowledge in the fields of economics, organisation and law,
- interdisciplinary knowledge necessary for solving modern problems in the field of production, environmental management, etc.
- fundamental expertise in the field of technologies,
- fundamental professional technical knowledge,
- fundamental expertise in informatics and computer science,
- fundamental expertise in the fields of economics, organisation, marketing and management,
- special knowledge that definitively shapes the graduate's personality.

In accordance with the needs of the economy and development strategy, the graduate will be qualified to plan, manage and lead production and business processes. With expertise in the fields of technologies, technological systems, process engineering, information systems, environmental management, management and leadership, human resources, maintenance and system diagnostics, he/she will pursue the goals of comprehensive quality and business excellence in the immediate work environment.

The programme emphasises training for project and teamwork. The curriculum therefore includes training in production management, the application of professional development trends, project management, marketing and sales, in addition to professional subjects.

Technical and technological know-how is increasingly important for the development and progress of the economy and it is intensified by the need to develop new technologies and new competitive products. The interdisciplinary combination of knowledge from the fields of production technologies, technical sciences, natural sciences, social sciences, business, administrative sciences and the knowledge of foreign languages, as well as the competence acquired through professional practice, shows the interdisciplinary nature of the engineering education and enable its integration into the technical sectors of the economy at home and abroad.

With the acquired knowledge and the appropriate attitude towards environmental protection contents, the graduates will contribute to the sustainable development of products, processes and to the updating of the professional image.

The *Technologies and Systems* programme includes knowledge in the fields of:

- technical sciences,
- production technologies,
- natural sciences,
- social sciences,
- business and administrative sciences,
- sustainable technologies and environmental management,
- communication in the mother tongue and foreign languages and
- knowledge acquired through practical training.

2.2 Professional competences

In creating the competencies for the *Technologies and Systems* study programme, we have based ourselves on the guidelines of the Tuning project, taking into account the assessments and opinions of businessmen and university teachers.

Students will acquire the following general and subject-specific competencies in the *Technologies and Systems* study programme.

General competences:

- the ability to grasp and analyse a problem, as well as foresee operational solutions in the technological sense or in the process of organisation and management;
- the ability to master standard development methods, procedures and processes;
- the ability to use acquired theoretical knowledge in practice;
- the ability to manage development and progress;
- autonomy in professional work in the field of technologies and systems;
- knowledge and understanding of social systems in the business environment;
- development of communication skills and abilities in the national and international business environment;
- use of a professional foreign language in oral and written form;
- willingness to cooperate and work in a team;
- understanding of the diversity and global and social impact of technologies on the environment;
- commitment to professional ethics.

Subject-specific competencies:

- the ability to understand and apply modern theories in the fields of technical, technological and natural sciences;
- the ability to understand technical problems mathematically and solve them with the help of mathematics;
- the ability to create, implement and manage mechanical, thermal and CNC technology projects;
- the ability to integrate knowledge in an interdisciplinary manner;
- the ability to solve specific work problems in the field of technologies and systems using standard professional methods and procedures;

- knowledge of the mechanical and chemical properties of materials, their use and processing methods;
- knowledge, planning, implementation and management of automation and robotics;
- development of professional skills and abilities in the field of technologies and systems;
- production, monitoring and management of technical documentation;
- the ability to continuously use information and communication technology in one's professional field;
- knowledge, application and monitoring of the comprehensive quality method for technologies, production and logistics;
- knowledge and understanding of the institutional work frameworks (legislation);
- competence in organising and managing a department or group;
- competence in communicating with interest groups (suppliers, customers, competition, experts from various fields, politicians, etc.);
- qualification for consulting work (transfer of knowledge);
- the ability to plan and conduct experiments and to properly select measurement detectors for measuring physical quantities in various technological processes;
- active critical monitoring of the development of new methods of using materials in the field of technologies and systems with an emphasis on ecology and sustainable development.

3 INFORMATION ABOUT THE INTERNATIONAL COMPARABILITY OF THE PROGRAMME

In designing a study on the international comparability of the higher education professional study programme *Technologies and Systems* with other related study programmes, in accordance with Article 49 of Higher Education Act (Official Gazette of the RS, No. 100/04) and Article 8 of Criteria on Accreditation of Higher Education Institutions and Study Programmes, (Official Gazette of the RS, No. 101/04) we considered the following criteria:

- comparability of concept, formal and content structure of the *Technologies and Systems* programme with foreign programmes,
- comparability of access opportunities and conditions for enrolment in the study programme,
- comparability of the duration of the study, advancements, completion of the study and acquired titles,
- comparability of methods and forms of study (system and organisation of the study process, the credit system, the use of modern information technologies, an independent study, tutoring, organisation of practical training),
- options for integrating the programme in international cooperation (mobility), or the common European Higher Education Area,
- differences between the proposed and foreign programmes according to the specific needs and conditions of the domestic economy and public services.

In order to analyse the international comparability of the *Technologies and Systems* study programme, we examined various related study programmes in the european

higher Education area. After careful consideration, we have selected those reviewed programmes that have a tradition and are implemented at faculties of a corresponding high level of difficulty and quality of study. Thus, for the international comparison of our draft study programme *Technologies and Systems*, we selected related study programmes from higher education institutions: Hochschule Wismar, Germany; Gdansk University of Technology, Poland; Oxford Brookes University, England; Fachhochschule Heilbronn, Germany; Fachhochschule Osnabrück, Germany and FSB Zagreb, which was the first to introduce studies according to new principles in the Balkans.

Additionally, we compared our programme with the programmes of the two Slovenian faculties (Faculty of Mechanical Engineering of the University of Ljubljana and Faculty of Mechanical Engineering of the University of Maribor).

Table 2: The list of higher education institutions and study programmes included in the comparison

Higher education institution	Study programme	City, country	Institution's website
Hochschule Wismar	Maschinenbau	Wismar, Germany	http://www.hs-wismar.de/
Gdansk University of Technology, Faculty of Mechanical engineering,	Mechanical Engineering	Gdansk, Poland	http://www.pg.gda.pl
Oxford Brookes University, School of Engineering	Mechanical Engineering	OXFORD, England	http://www.brookes.ac.uk/
Fachhochschule Heilbronn	Machinenbau	Heilbronn, Germany	http://www.fh-heilbronn.de/
Fachhochschule Osnabrück	Machinenbau	Osnabrück, Germany	http://www.ecs.fh-osnabrueck.de/

The analytical comparison of selected related study programmes and curriculum and the *Technologies and Systems* programme found that the programmes are not conceptually different.

Comparing the formal and substantive structure of the *Technologies and Systems* programme, we found that the difference is visible in the lists of elective subjects and is due to the needs and conditions of the domestic economy.

The enrollment conditions are not different.

We note that in terms of duration of study, the programme does not differ from the programmes included in the comparison.

Comparing the methods and forms of study, we note that the compared study programmes are based on an educational process in which the acquired theoretical expertise is applied in students' project and research work (in teams and individually), and that there are no significant differences between them.

Comparing the opportunities of the programme for international cooperation, we found that the programme is internationally comparable and enables international mobility and integration into the European higher education area.

4 INTERNATIONAL COOPERATION OF THE INSTITUTION

On 11 December 2013, the University of Novo mesto Faculty of Mechanical Engineering obtained the Erasmus Charter for Higher Education – ECHE (document number: 261608-EPP-1-2014-1-SI-EPPKA3-ECHE) for the period 2014 - 2020 by the executive agency EACEA (Education, Audiovisual and Culture Executive Agency). This allows the faculty to participate in the Erasmus+ programme and to conclude inter-institutional cooperation agreements with higher education institutions from other countries, which provides opportunities for international mobility of staff and students.

Some of the higher education teachers of the Faculty of Mechanical Engineering of the University of Novo mesto are involved in the pedagogical process at higher education institutions abroad as visiting professors. On the other hand, university teachers from foreign institutions (e.g. the University of Slavonski Brod, the University of Sever from Koprivnica, the University of Trieste, the Faculty of Technical Sciences of the University of Novi Sad) participate as guest lecturers in the study programmes of various study levels at our faculty.

The faculty also strengthens international cooperation with foreign higher education institutions through mutual commenting on final works of our and foreign partner institutions, the contents of which can form the basis for the development of joint projects in the future.

The faculty has signed agreements on cooperation in the field of teaching and scientific research with the following institutions at home and abroad:

- College of Slavonski Brod, Croatia
- Electrical institute Milan Vidmar, Ljubljana
- Faculty of engineering, University of Rijeka; Croatia
- Faculty of engineering, University of Trieste; Italy
- Faculty of Mechanical engineering – Skopje, University "St. Cyril and Methodius"; Republic of Macedonia
- Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb; Croatia
- Faculty of mechanical engineering, University of Niš, Serbia
- Faculty of technical sciences, University of Novi Sad; Serbia
- Gazela d.o.o. Krško
- Lindab IMP Klima, Inštitut Klima d.o.o., Godovič
- Institute of Mathematics, Physics and Mechanics, Ljubljana

- Institute of Welding Ljubljana
- Public institute of regional high education and higher education center, Celje
- Institute of Chemistry Ljubljana
- Development Centre Novo mesto
- School of engineering management, Union Nikola Tesla university, Belgrade, Serbia
- High School Črnomelj
- School centre Novo mesto
- School centre Velenje
- Technical collage in Bjelovar, Croatia
- Turbo Institute Institute for Turbine Machines d.d., Ljubljana
- University of Niš, Serbia
- University of Nova Gorica
- College for Manufacturing Engineering
- Faculty of Polymer Technology, Slovenj Gradec
- VT – Turbo d.o.o.
- Polytechnic College »Novi Beograd«

5 CURRICULUM OF THE STUDY PROGRAMME

The proposal for the higher education professional study programme *Technologies and Systems* is designed in accordance with the provisions of the Higher Education Act (Official Gazette of the RS, No. 100/04) and the Criteria on Accreditation of Higher Education Institutions and Study Programmes (Official Gazette of the RS, No. 101/04) and in accordance with the Criteria for Accreditation of Engineering Programmes (ABET, 2004).

Organisational chart and structure of the Technologies and Systems programme

The study programme lasts three years (six semesters), comprises 5144 hours and is evaluated with 180 credit points. The study programme consists of obligatory courses, an elective module, elective courses and professional practice in an immediate work environment. The entire programme includes 2,260 hours of organised forms of study work and 2,884 hours of individual forms of work.

Table 3: Organisational chart and structure of the Technologies and Systems programme

1 ST YEAR												
Semester	Common obligatory courses											No. units
1.	1	2	3	4	5							5
2.						6	7	8	9	10	11	6
2 ND YEAR												
Semester	Common obligatory courses									Profession al practice	No. units	
3.	1	2	3	4	5							5
4.						6	7	8	9	Profession al practice 1		5
3 RD YEAR												
Semester	Common obligatory courses		Module Course			Elective Course	Professional practice		Project Diploma thesis	No. units		
5.	1		3	4	5	6				5		
6.		2					Professional practice 2		Diplomska naloga	3		

First year

The first year represents the common basis of study. The first year includes lectures and tutorials of the 11 obligatory courses. It includes 1,727 hours of organized and individual forms of study worth 60 ECTS.

Second year

In the second year, the student acquires basic professional skills. The programme comprises 1792 hours (60 ECTS) and is carried out in 9 obligatory courses and professional practice in a direct work environment.

Third year

The third year comprises 1625 hours (60 ECTS) of organised and individual work. The obligatory part of the programme includes 2 courses. The elective part of the programme allows for an internal choice in the form of an elective module, which includes 3 courses and an external choice – 1 elective course and professional practice. The programme provides for a diploma thesis as the conclusion of the programme.

The decreasing number of units from the 1st to the 3rd year of study allows the student to focus on acquiring in-depth professional knowledge and on a more extensive use of knowledge in an immedaite work environment towards the end of the programme.

5.1 Credit evaluation of the study programme and individual learning units

The study programme *Technologies and Systems* is evaluated with ECTS in accordance with the Criteria for Credit Assignment to Study Programmes According to ECTS

(Official Gazette of the RS, No. 124/2004). The ECTS system enables students to collect and transfer credit points from one study programme to another, as well as to have credits earned at other institutes of higher education in Slovenia and abroad recognised. It ensures transparency and comparability of systems and study programmes, which is essential for student mobility and recognition of study obligations.

A credit point (ECTS) is a unit of measurement for evaluating the work a student does on average. One credit point is evaluated 25 to 30 hours of student workload, and the annual student workload can range from 1500 to 1800 hours. Parts of the study programme are evaluated according to the criteria: an individual subject with at least 3 ECTS, a module with at least 5 ECTS, a week of professional practise with 2 ECTS and the diploma thesis with 9 ECTS.

The ECTS Criteria encourage the introduction of teaching strategies that focus on the students: the starting point is a student's workload. The credit points are awarded to the student when he or she has fulfilled the prescribed study obligations. The student workload consists of: lectures, seminars, tutorials and other forms of organised study work (professional practice, laboratory exercises, research work, project-based work), individual study work (ongoing work, literature study, seminar, research and project work, as well as preparing for exams or other forms of examinations) and a diploma thesis or the final project assignment at completed specialisation programme (supplementary programme).

5.2 Curriculum and learning units

Table 4 shows the curriculum with the name of the study units, the credit evaluation of the entire programme and of individual study units, the annual or total number of hours of the student's study obligations, and the annual and total number of organised contact hours of the programme.

5.3 Learning units and their inclusion in the programme structure

The entire programme includes organised forms of study work and individual student work and comprises 5144 hours worth 180 ECTS. It lasts for three academic years. It consists of common/obligatory study subjects (22), elective courses (1) and elective modular courses (3). Prescribed learning units, which are organised forms of study work, are lectures, seminar exercises, laboratory exercises and practical training in the form of professional practice.

The student's individual study work includes work in progress, writing projects, seminar assignments and reports, studying literature, preparing for exams and writing a diploma thesis.

5.3.1 Elective modules of the programme

The programme contains elective modules. The module consists of three courses (18 ECTS) that represent wellrounded wholes of individual content areas. They represent an

upgrade and deepening of the fundamental knowledge of obligatory courses from the first and second year. The student chooses one of the modules according to his/her interests, the part-time student also according to the needs of the workplace.

5.3.2 Elective courses

Elective courses are offered in the third year. Elective courses can be used to earn 6 ECTS or 3.3 % of the obligatory study work. They allow for an individual design of the study programme according to the wishes of the individual student. The curriculum of the sixth semester offers optimal opportunities for external selection or international mobility of students.

5.3.3 Electiveness within the study programme

The learning units prescribed by the programme are implemented as organised forms of study work. The programme consists of 22 common obligatory, 3 modular and 1 elective courses. Professional training in an immediate work environment is carried out in the second and third years as professional practice. A Diploma thesis is also an obligatory part of the programme. The total compulsory part of the programme is 125 ECTS or 69.4%, and the elective part is 55 ECTS or 30.6%.

The elective part of the programme

The programme allows students to pursue their own study path with the option of choosing from the list of elective modules and elective courses at the faculty - internal choice and of choosing a part of the study programme outside of the home institution - external choice.

Within the internal choice, the student can choose a module that includes three study courses in the scope of 18 ECTS or 10% of the study programme.

In order to make it easier for students to complete part of the study programme outside their home institution, the majority of units that allow external choice are combined in the third year. External choice is available in the following units: elective course, professional practice and diploma thesis. It comprises 55 KT or 30.6%. Students can take elective units at the home faculty or at any higher education institution in Slovenia or abroad.

Table 4: The share of selectiveness in the programme structure

Year	Common obligatory part of the programme	ECTS	in %	Electiveness in the programme				Total	
				Internal choice	External choice	ECTS	in %	ECTS	in %
1.	Common courses	60	33,3	/	/	0	0,0	60	33,3
2.	Common courses	54	30,0	/	Professional practice	6	3,3	60	33,3
3.	Common courses	11	6,1	Module	/	18	10,0	60	33,3
					Elective courses	6	3,3		
				Professional practice		16	8,9		
				Diploma Thesis		9	5,0		
TOTAL:		125	69,4			55	30,5	180	100

5.4 The ratio of lectures, seminars, tutorials and other organised forms of study

In accordance with the ECTS criteria, the student's annual workload (ASW) includes organised study work in the form of lectures, tutorials, laboratory exercises, professional practice and individual study work (regular work, literature study, seminar assignments, project work, research work, preparation for exams or other forms of examination and preparation and defense of a diploma thesis).

Table 5: Share of lectures, seminars, tutorials and other organised forms of study

Year	Organized forms of study work						Professional practice		OSW		ISW		ASW	%
	Lectures		Lab. work		Tutorials		practice							
	hours	%	hours	%	hours	%	hours	%	hours	%	hours	%	hours	
1.	360	7,0	105	2,0	255	4,9	0	0,0	720	14,0	1007	19,6	1727	33,6
2.	375	7,3	125	2,4	145	2,8	120	2,3	765	14,9	1027	20,0	1792	34,8
3.	270	5,2	95	1,8	170	3,3	320	6,2	775	15,1	850	16,5	1625	31,6
Total	1005	19,5	325	6,2	570	11,0	440	8,5	2260	44,0	2884	56,0	5144	100

In three years, students are expected to complete 5144 hours, which is an average of 28.6 hours per 1 ECTS. Of these, 2,260 or 44.0% are organised study work in the form of lectures (19.5%), laboratory work (6.2%), tutorials (11.0%) and professional practice (8.5%).

Individual study work comprises 2884 hours or 56.0%.

5.5 Practical training within the programme, implementation and ECTS

Practical training is an extremely important part of the educational process and includes tutorials, laboratory work, project work, professional practice in an immediate work environment and a diploma thesis. It comprises 1750 hours or 34% of the total study

programme. The content and level of difficulty are matched to the level of theoretical general and professional knowledge achieved.

Table 6: Share of practical training in the programme

Year	The forms of practical training					ASW
	LW/T	PP	PW	Total	in %	
1.	360	/	/	360	7,0	1727
2.	270	140	135	545	10,6	1792
3.	265	340	290	895	17,4	1625
TOTAL	895	480	425	1800	35,0	5144
in %	17,4	9,3	8,3	35,0	/	100

Forms and methods of implementation of practical training

Tutorials. They take the form of group work, in which the participants solve a concretely posed problem using the knowledge and procedures acquired in the lectures and independent study. In accordance with the curriculum of each unit, the student individually or in a team prepares a written seminar assignment and presents it orally. The exercises are conducted in groups of 30 students.

Laboratory work. They represent the individual deepening and verification of the understanding of the knowledge acquired in the theoretical training, which is connected with the mastering of individual content-related professional groups with the help of solving specific tasks. They are carried out in laboratories in groups of 15 students.

Project work. It is completed by the student in the form of project research and problem tasks. Project work enables the acquisition of specialised knowledge and competence in the application of scientific methods in solving demanding professional and work problems. It develops the ability to communicate in the profession and in interdisciplinary teams, to exercise professional criticism and responsibility, to use one's own initiative and independence in decision-making and management, and contributes significantly to the graduate's profile building. The programme is completed with a diploma thesis.

Professional practice. In accordance with Article 33 of the Higher Education Act (Official Gazette of the RS, No. 100/04 - UPB 2), professional practice or practical education in an immediate work environment is an obligatory part of the first-cycle undergraduate study programme for obtaining higher professional education within the *Technologies and Systems* degree programme.

The purpose of the professional practical training is to transfer knowledge from a higher education institution to the industry and back, to adapt the study programme to the needs of the industry and to train future professionals in an immediate work environment.

The goal of professional practice is to apply the theoretical knowledge that the student acquires in the study process in an immediate work environment. The student is exposed

to what happens in the company and uses the theoretical knowledge to solve practical problems and develop professional skills.

The programme requires an eleven-week professional practice, three weeks of professional practice in the second year and eight weeks of professional practice in the third year.

Before leaving for the professional practice, students receive detailed information from the professional practice coordinator and the student department about the course of practice, the application process, obligations and rights on the job (Practice Agreement) and instructions for writing a diary and report on professional practice.

The student independently or in cooperation with the coordinator of professional practice at the faculty contacts the organisation where he/she will perform the professional practice. A tripartite contract (Professional Practice Agreement) is signed between the organisation, the institution and the student. The professional practice is carried out by a student under the guidance of a mentor who has at least a higher education level and professional experience in demanding and responsible positions. The mentor assigns tasks to the student based on the professional practice programme and guides, informs, supervises and evaluates the student. The faculty coordinator monitors the practice and advises the student as needed.

The student keeps a diary of the professional practice. Upon completion of the professional practice, he/she writes a report on it and submits it to the professional practice coordinator at the faculty. Based on the appropriateness of the content of the report and the submitted accompanying documentation, with which the organisation confirms the success of the professional practice, the organisation recognizes the practice as a successfully completed duty in accordance with the prescribed study programme.

Professional practice 1

Professional practice is part of the practical training and takes place in an immediate work environment. It takes place in the fourth semester of the second year. It lasts three weeks (120 working hours).

The professional practice programme enables the student to:

- get to know the specific work environment,
- get acquainted with the organisation and operation of the company,
- get acquainted with the company's production programme in detail,
- enter the work group and begin to learn about tools, devices, machines and technologies,
- perform various tasks in the professional field,
- become familiar with the maintenance of production facilities,
- become familiar with the management of technical documentation,
- under the guidance of the mentor, design and prepare a project for the management and leadership of production, taking into account the economic analysis of production costs,
- perform work selected by the employer, which does not exceed 1/3 of the time of the professional practice.

During the professional training, the student keeps a diary and writes a report on the professional practice, which is reviewed by the mentor in the company after completion. Subsequently, the student submits the report with all accompanying documents to the professional practice coordinator at the faculty, so that the latter can assess the success of the practice on the basis of the submitted information and recognise the practice as completed duty according to the study programme.

Professional practice 2

It is taken in the sixth semester of the third year. It includes eight weeks (320 hours) of professional training in an immediate work environment. This part of the practice allows the student to deepen his/her professional knowledge. Its content is aligned with the study programme and the chosen module. The student connects theoretical knowledge with direct work, thus transferring knowledge to the production environment.

During the professional practice, the student keeps a practical diary and writes a report on the professional practice, which is reviewed by the mentor in the company upon completion. The student then submits the report with all accompanying documentation to the professional practice coordinator at the faculty, so that the coordinator can evaluate the success of the practice based on the information submitted and recognise the practice as fulfilled for the purposes of the study programme. During the practical training, the student can also find a topic for the diploma thesis and design their own diploma thesis project under the guidance of the mentor

The professional practice 2 programme allows the student to:

- learn about the company's organisation and operations,
- get to know the company's production programme in detail,
- participate in the planning of development projects,
- participate in the planning of tools and devices for production,
- independently carry out organisational tasks in the company,
- independently analyse more demanding professional problems and proposes solutions,
- keep technical documentation,
- learn the methods of quality assurance,
- develop negotiation and decision-making skills at all professional and managerial levels,
- find a diploma topic and outline a diploma thesis project under the guidance of the mentor,
- perform work of the employer's choice not to exceed 1/3 of the time of professional practice,
- learn standard methods, procedures and processes of comprehensive quality.

Recognition of professional practice. A student who has at least one year of work experience in relevant positions can apply for recognition of professional practice. In deciding whether to grant recognition, the professional practice coordinator will consider the length of service and the type of work the student has performed.

Implementation of professional practice

The companies from the region have signed a cooperation agreement in which they guarantee to enable the implementation of professional practice under the guidance of mentors in their work environment (third point of the agreement). This is an important basis that can make it easier for students to find an organisation where they would like to do a professional practice.

During the professional practice, the student gets to know the concrete working environment, the organisation and the production programme of the company, as well as the maintenance of the production equipment, become familiar with the management of technical documentation, keep a practice diary, outline and create a project for the management and leadership of production under the guidance of a mentor, taking into account the economic analysis of production costs. Upon completion of the practice, he/she must submit a practice diary and a completed content report that includes the goals and purpose of the professional practice, the progress of the practice, and a description of the knowledge, skills and competencies acquired.

A student can also complete professional practice abroad. International student exchanges are organised and managed by the international exchange coordinator together with the professional practice coordinator.

5.6 Parts of the study programme – lifelong learning programmes

In accordance with the 36th Article of the Higher Education Act (the sixth paragraph) study programmes of the first and second cycle may be carried out in parts, which are specified in the programme. Parts of the study programme are completed by learning units of the specific subject area (module) and can be carried out as a partial study programme. Within the framework of the higher education professional study programme - 1st cycle *Technologies and Systems* are part of the study programmes. The basis is the module of the study programme, which is a group of courses rounded off in terms of content. In addition to the modular courses, the part of the study programme includes two elective courses and professional practice. The partial study programme concludes with a project seminar.

The study programme *Technologies and Systems* includes the following partial study programmes:

- *Process Engineering,*
- *Product Development,*
- *Technologies and Systems in Buildings,*
- *Production Engineering.*

The listed parts of the programme will be carried out according to the curriculum presented in the table below.

The individual parts of programme, which are part of the study programme *Technologies and Systems*, comprise 50 ECTS. They consist of three courses of the elective module (18 ECTS), two elective courses (12 ECTS), professional practice (16 ECTS) and a project seminar (4 ECTS).

The student fulfils the partial study programme that is part of the first-cycle higher education professional study programme *Technologies and Systems* if he/she fulfils all the regular obligations of the programme in the amount of 50 ECTS, for which he/she receives a certificate (in accordance with the 32a Article of the Higher Education Act - last bullet point), which is a public document.

5.6.1 Process Engineering

Process Engineering is a partial higher education 1st cycle study programme *Technologies and Systems*.

Curriculum of the partial study programme *Process Engineering*

Partial study programme *Process Engineering*, which is a part of the study programme *Technologies and Systems*, comprises 50 ECTS. It consists of three courses of the selected module Process Engineering (18 ECTS), two elective courses (12 ECTS), Professional practice (16 ECTS) and project seminar (4 ECTS).

The obligatory achievements of the students and the forms of assessment of the knowledge are described in the syllabus of the individual learning units.

The student fulfils the partial study programme *Process Engineering* which is part of the first-cycle higher education professional study programme, *Technologies and Systems*, if he/she completed all the compulsory courses of the study programme in the amount of 50 ECTS, for which they receive a certificate (in accordance with the 32a Article of the Higher Education Act - final bullet point), which is a public document.

5.6.2 Product Development

Product Development is a partial higher education 1st cycle study programme *Technologies and Systems*.

Curriculum of the partial study programme *Product Development*

Partial study programme *Product Development*, which is a part of the study programme *Technologies and Systems*, comprises 50 ECTS. It consists of three courses of the selected module Product Development (18 ECTS), two elective courses (12 ECTS), Professional practice (16 ECTS) and project seminar (4 ECTS).

The obligatory achievements of the students and the forms of assessment of the knowledge are described in the syllabus of the individual learning units.

The student fulfils the partial study programme *Product Development*, which is part of the first-cycle higher education professional study programme *Technologies and Systems*, if he/she completed all the compulsory courses of the study programme in the amount of 50 ECTS, for which they receive a certificate (in accordance with the 32a Article of the Higher Education Act - final bullet point), which is a public document.

5.6.3 Technologies and Systems in Buildings

Technologies and Systems in Buildings is a partial higher education 1st cycle study programme *Technologies and Systems*.

Curriculum of the partial study programme *Technologies and Systems in Buildings*

Partial study programme *Technologies and Systems in Buildings*, which is a part of the study programme *Technologies and Systems*, comprises 50 ECTS. It consists of three courses of the selected module Technologies and Systems in Buildings (18 ECTS), two elective courses (12 ECTS), Professional practice (16 ECTS) and project seminar (4 ECTS).

The obligatory achievements of the students and the forms of assessment of the knowledge are described in the syllabus of the individual learning units.

The student fulfils the partial study programme *Technologies and Systems in Buildings*, which is part of the first-cycle higher education professional study programme *Technologies and Systems*, if he/she completed all the compulsory courses of the study programme in the amount of 50 ECTS, for which they receive a certificate (in accordance with the 32a Article of the Higher Education Act - final bullet point), which is a public document.

5.6.4 *Production Engineering*

Production Engineering is a partial higher education 1st cycle study programme *Technologies and Systems*.

Curriculum of the partial study programme *Production Engineering*

Partial study programme *Production Engineering*, which is a part of the study programme *Technologies and Systems*, comprises 50 ECTS. It consists of three courses of the selected module Process Engineering (18 ECTS), two elective courses (12 ECTS), Professional practice (16 ECTS) and project seminar (4 ECTS).

The obligatory achievements of the students and the forms of assessment of the knowledge are described in the syllabus of the individual learning units.

The student fulfils the partial study programme *Production Engineering*, which is part of the first-cycle higher education professional study programme *Technologies and Systems*, if he/she completed all the compulsory courses of the study programme in the amount of 50 ECTS, for which they receive a certificate (in accordance with the 32a Article of the Higher Education Act - final bullet point), which is a public document.

6 ACCESS REQUIREMENTS AND CRITERIA FOR THE SELECTION OF CANDIDATES IN THE EVENT OF ENROLMENT RESTRICTIONS

Prerequisite for enrolment in the **first year** of higher educational study programme *Technologies and Systems* (on the basis of the 38th Article of the Higher Education Act) is:

- an accomplished matura examination
- an accomplished final examination certificate of the four-year secondary school or an equivalent programme in Slovenia

- an accomplished final exam before 1 June 1995 on any four-year secondary school programme.

Criteria for the selection of candidates in the event of enrolment restrictions:

Candidates are selected on the basis of:

- a) their overall achievement in the matura examination, or the final examination
60% of points,
- b) the overall achievement in the third and fourth year
40% of points.

Anyone who has completed an equivalent education abroad also meets the conditions for enrollment.

7 CRITERIA FOR RECOGNITION OF SKILLS AND COMPETENCES GAINED BEFORE ENROLMENT

The Faculty recognises knowledge and training that fully or partly correspond to the general or course-specific competences of the higher education professional study programme *Technologies and Systems*. Recognition is given for knowledge and training acquired formally, informally and through experiential learning. The number of credit points is approved on the basis of individual applications and the documentation submitted by the candidate.

The knowledge acquired in this manner can be recognised by the faculty based on the the following:

- certificates and other documents on knowledge acquired outside the educational sector (portfolio, documents on completed courses and other forms of continuing education);
- the assessment of products, services, publications and other copyrights of the candidates;
- the verification and assessment of knowledge acquired by the candidate through previous self-education or experience (the possibility of fulfilling academic obligations such as examinations and interim tests without attending lectures, tutorials and seminars);
- certain parts of the obligations (project assignments, programmes and tutorials) based on the knowledge demonstrated by copyright (projects, inventions, patents and publications);
- appropriate work experience.

Individual documented applications of candidates for the recognition of knowledge acquired prior to enrolment will be handled by the relevant committee in accordance with the procedures and rules for recognition of examinations and other academic obligations and for recognition of previously acquired knowledge. Students can request verification and assessment of knowledge if the knowledge was acquired through independent study or experience. The same criteria apply to the recognition of knowledge acquired abroad.

8 VERIFICATION AND ASSESSMENT OF KNOWLEDGE

In the process of teaching and learning, continuous assessment and evaluation is important. Assessment in individual courses aims to determine the achievement of the competencies and goals outlined and is aligned with the course structure and implementation methodology. Ongoing tasks and practical activities of the student, which are important for professional work and are closely related to the study programme are assessed, as well as the final product - the examination (written, oral, practical). The final assessment may consist of colloquiums or assessed shorter written products (e.g. project documentation, seminar, essay, diary, defense and presentation). Participation in research, projects, practical work and concrete products carried out or produced by the student will also be considered in the examination and assessment. Different approaches allow for a more comprehensive assessment of each student's progress in their programme.

The purpose of assessment is to:

- assess knowledge and skills, assess the product,
- encourage the student to acquire additional knowledge and skills through assessment,
- assess the general and specific competences of the individual, suggest necessary improvements at the personal level and at the level of the organisation in which he/she works or studies.

Assessment criteria are derived from the objectives of the study programme and cover important areas of personal, professional and academic success:

- knowledge and understanding of modern theories and key concepts in the field of technical, technological and natural sciences,
- solving concrete problems in the field of technologies and systems using standard methods and procedures,
- production, monitoring and management of technical documentation using information and communication technology,
- knowledge, planning and management of automation and robotization of the production process,
- analysis and evaluation: ability to communicate with interest groups, ability to deal with conflicting points of view, organisation and management of a group or department, consulting work, evaluation of personal achievements, evaluation of professional achievements,
- knowledge and application of total quality methods.

At the beginning of the academic year, the university teacher familiarises the students with the examination elements and the assessment criteria. Forms of knowledge verification and evaluation are: oral and written exams, colloquiums, tests, seminar assignments, research, project assignments, project report, oral presentations, products, portfolio, written report on professional training, peer assessment and project diploma thesis.

The fulfilment of the student's obligations is assessed in accordance with Rules on assessment and verification of knowledge with grades from 1 to 10. Practical training is evaluated as successful/unsuccessful.

Table 7: Grading scale

Grade		Grade according to ECTS Criteria		Description of knowledge
10	odlično	A	excellent	Outstanding performance with only minor errors
9	prav dobro	B	very good	Above-average standard but with some errors
8	prav dobro	C	good	Generally sound work with a number of notable errors
7	dobro	D	satisfactory	Fair but with significant shortcomings
6	zadostno	E	sufficient	Performance meets the minimum criteria
5-1	nezadostno	F	fail	Performance does not meet the minimum criteria

In the evaluation the teacher usually includes individual students or groups of students, encouraging critical evaluation of their own work, their contribution to the overall product, and evaluation of the work of their classmates.

Verification and assessment methods, as well as criteria for final grades, are explained in the individual course's syllabus. Every teacher informs the students of the course plan and study obligations or the proportions of individual components of the verification and assessment of knowledge and skills that contribute to the final grade of the course subject.

9 PROGRESSION REQUIREMENTS FOR THE PROGRAMME

A student can progress to the second year of study if he/she has mastered the knowledge prescribed in the programme and other obligations from the first year of study (lectures, tutorials, project seminar) and has collected at least 45 ECTS.

A student can progress to the third year of study if he/she has mastered the knowledge prescribed in the programme and other obligations from the first year of study, as well as knowledge and obligations from the second year of study (lectures, tutorials, seminars, professional practice) and has collected at least 105 ECTS.

A student can progress to next year even if he/she has not reached the required credit points, when he/she has legitimate reasons: motherhood, prolonged illness, urgent family and social circumstances, participation in top professional, cultural and sporting events. This is decided by the study commission.

Individual student who has not accomplished all obligations according to the study programme in order to progress in the next year, may repeat a year once during the study or change the study programme or major as a result of failure in the previous major or study programme. The third year cannot be repeated because the pre-graduation (absolvent) period is intended for completing the missing obligations.

By law, a student's status can be extended for a maximum of one year if:

- a student fails to enroll in the higher year for legitimate reasons,
- a student fails to complete his or her studies within 12 months after the end of the last semester for justified reasons,
- a student has a child during her studies.

Depending on academic achievements, the student can complete his/her studies in a shorter time than provided for in the study programme.

10 PROVISIONS ON TRANSFERS BETWEEN STUDY PROGRAMMES

Subject to the availability of places, a student can transfer to the 1st-cycle professional study programme *Technologies and Systems* in the following cases:

1. Transfer from another higher education professional study programme of the 1st cycle.

Transfer is possible from study programmes classified in the groups according to KLASIUS - SRV: 16203 (Higher professional education (first Bologna level)), or according to KLASIUS – P16: 0715 (Metallurgy, mechanical engineering and metall work), 0716 (Motor vehicles, ships and aircraft). At the time of transfer, the student is awarded credit points for an individual course successfully completed with an examination at another higher education programme if the course is at least 80 percent the same in content and scope as the course at the faculty. The year of enrollment depends on the recognition of credit points according to the above criteria.

2. Transfer from a 1st-cycle higher education programme to obtain a university education.

Transfer is possible from study programmes classified in the groups according to KLASIUS - SRV: 16204 (Higher university education (first Bologna level)), or according to KLASIUS – P16: 0715 (Metallurgy, mechanical engineering and metall work), 0716 (Motor vehicles, ships and aircraft). At the time of transfer, the student is awarded credit points for an individual coursesuccessfully completed with an examination at another higher education programme, if the course is at least 80 percent the same in content and scope as the course at the faculty. The year of enrollment depends on the recognition of credit points according to the above criteria.

3. Transfer from post-secondary study programmes (accepted before 1 January 1994).

Graduates of the mechanical engineering faculties of the universities of Ljubljana and Maribor can enroll in the third year of the *Technologies and Systems* programme without additional obligations. Candidates who have not completed related study programmes are enrolled on the condition that they pass

differential examinations of selected chapters of courses from the first and second year of the programme based on the actual differences between the two programmes. If the candidates have more than one year of relevant work experience, they will be awarded 22 ECTS for professional practice. They enrol in the third year of the *Technologies and Systems* programme.

4. **Transfer from the programs of higher professional schools** according to the Act on Professional and Vocational Education (Official Gazette of the RS, No. 12/96) and the Act on Higher Professional Education (Official Gazette of the RS, No. 86/04) is possible in the second year of the programme if the graduates complete the differential examinations, i.e. graduates:
- higher vocational schools of mechanical engineering without additional study obligations,
 - from other higher vocational schools, they must complete additional study obligations from the first year courses of the *Technologies and Systems* programme, based on the actual difference between the programmes.

The transition enables student mobility, the choice of different educational paths, and the flexibility and openness of the higher education system.

11 MODES OF STUDY

The faculty offers the professional study programme *Technologies and Systems* as a full-time and part-time programme. The pedagogical process takes place in the form of lectures and class and laboratory tutorials, which is also evident from the syllabus.

In the case of full-time study, one year is usually completed in one academic year, as far as this is provided for in the study programme.

Part-time study is as demanding as full-time study. A part-time student must fulfil all the obligations provided for full-time study. The organisation and implementation of part-time study is adapted to the needs of the student.

Remote study (e-learning) or a combined form of study: the nature of the field of study requires direct work with students. The decision of the Senate will exceptionally determine the form of distance learning for individual study units or parts of study units of the programme.

12 REQUIREMENTS FOR THE COMPLETION OF THE STUDY

The requirement for completing the studies is the successful completion of all study obligations prescribed in the programme, as well as the preparation and successful defense of the diploma thesis. The student completes his/her studies when he/she collects all 180 ECTS stipulated in the study programme.

If the student has enrolled in the second year (according to the Transition Criteria), he/she must fulfil at least 120 ECTS of obligations at the higher education institution, and if enrolled in the third year, at least 60 ECTS. Additional credit points are acquired

from other educational institutions, through mobility at home or abroad, or through recognition of knowledge and skills acquired prior to enrollment.

At the end of the programme, the student receives a diploma, which is a public document, and a supplement to the diploma.

13 REQUIREMENTS FOR COMPLETING THE PART OF THE STUDY PROGRAMME

The prerequisite for completion of the part of the study programme is that all the prescribed obligations in the amount of 50 ECTS have been completed. Upon completion, the candidate receives a certificate, which is a public document, and a supplement with the described competences and the completed content of the part of the programme.

14 PROFESSIONAL TITLE

After completing the studies, students are awarded the following professional title in accordance with the Professional and Academic Titles Act (Official Gazette of the RS, No. 61/06):

- for women – diplomirana inženirka strojništva (VS), abbreviated dipl. inž. str. (VS),
- for men – diplomirani inženir strojništva (VS), abbreviated dipl. inž. str. (VS).

In accordance with Article 32 of the Higher Education Act and the provisions of the Rules on the Diploma Supplement (Official Gazette of the RS No. 56/07, 39/12 and 38/16), the University of Novo mesto, Faculty of Mechanical Engineering will issue a Diploma supplement to the graduates of the first cycle higher education professional study programme *Technologies and Systems*.

University of Novo mesto:
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