University of Belgrade

Faculty of Mechanical Engineering

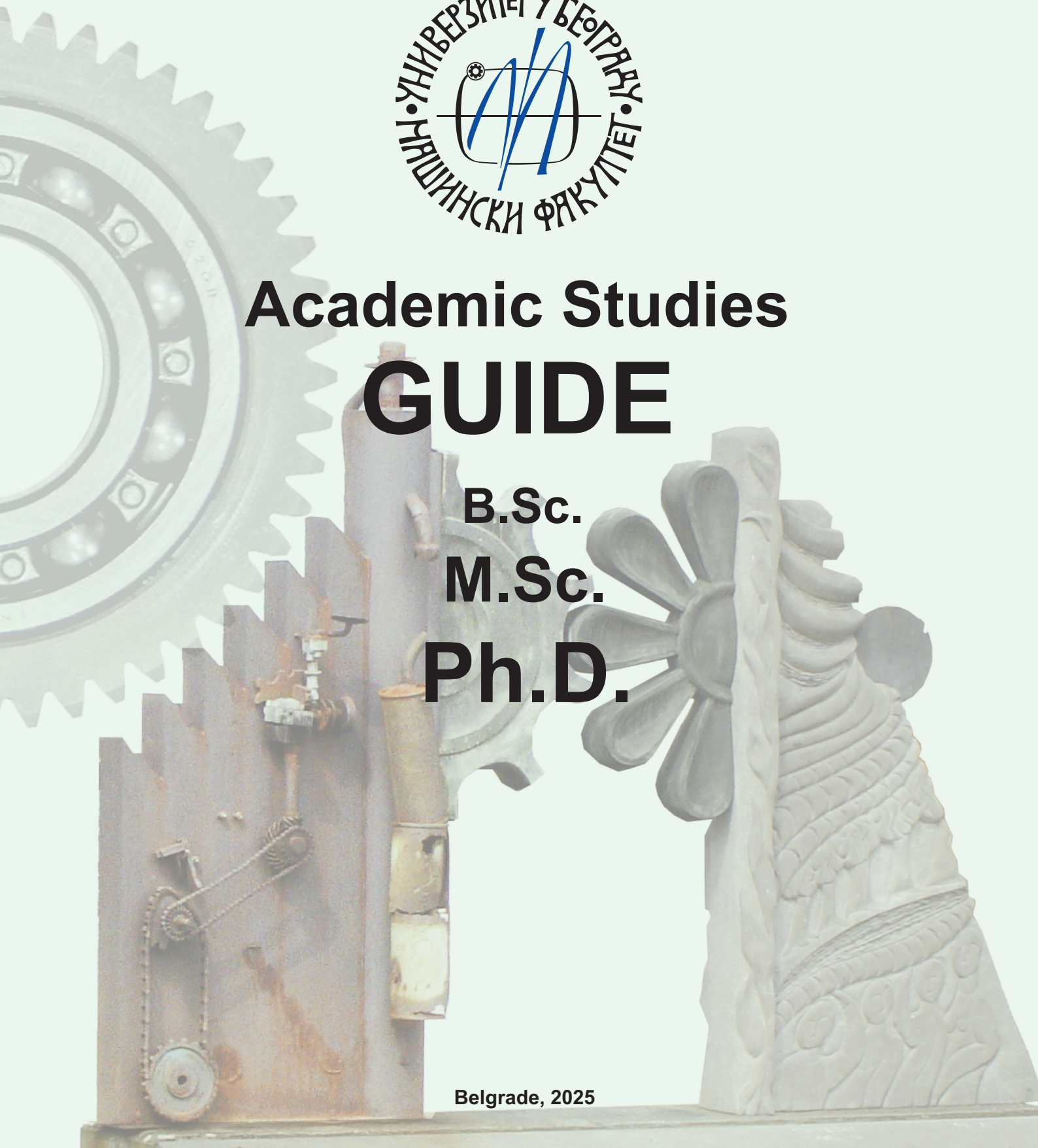
Academic Studies

GUIDE

B.Sc.

M.Sc.

Ph.D.



Belgrade, 2025

Certificate

Standard **ISO 9001:2015**

Certificate Registr. No. **01 100 1520589**

Certificate Holder:

Univerzitet u Beogradu – Mašinski fakultet
Kraljice Marije 16
11120 Beograd
Republic of Serbia

Scope: Higher education, scientific & research activities and the provision of engineering services.

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity: The certificate is valid from 2023-12-25 until 2026-12-24
First certification 2017

2024-03-19

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Република Србија
КОМИСИЈА ЗА АКРЕДИТАЦИЈУ
И ПРОВЕРУ КВАЛИТЕТА
Број: 612-00-01439/2007-04
Датум: 09.05.2008. године
Београд, Бул. Михајла Пупина 2

Комисија за акредитацију и проверу квалитета,
на својој XXXVII седници, одржаној 12. априла 2008. године,
утврдила је да су испуњени сви услови
прописани чланом 16. Закона о високом образовању
(„Сл. гласник РС", бр. 76 од 02. септембра 2005. године)
и на основу наведеног издаје

УВЕРЕЊЕ О АКРЕДИТАЦИЈИ

МАШИНСКОМ ФАКУЛТЕТУ
УНИВЕРЗИТЕТА У БЕОГРАДУ,
са седиштем у Београду, Краљице Марије 16.

М.П.

ПРЕДСЕДНИК
Проф. др Слободан Арсенијевић

University of Belgrade

Faculty of Mechanical Engineering

Academic Studies

GUIDE

B.Sc.
M.Sc.
Ph.D.

National Commission for Accreditation and Quality Assurance (CAQA, КАПК in Serbian, http://www.kapk.org/):
Certificates for Higher Education Institution and for all Study Programmes (BSc, MSc, PhD) –
Mechanical Engineering, in Serbian and in English, 2008-2030
Certificate for Study Programme of Bachelor Academic Studies – Information Technologies in
Mechanical Engineering, in Serbian, 2019-2026
Certificate for Study Programme of Master Academic Studies – Industry 4.0, in Serbian, 2019-2026

RINA (The Royal Institution of Naval Architects, United Kingdom, http://www.rina.org.uk/):
Accreditation Certificates of the MSc in Mechanical Engineering Programme –
Naval Architecture Module, 2009-2027

Belgrade, 2025

Academic Studies GUIDE

B.Sc.
M.Sc.
Ph.D.

School Year 2025/2026

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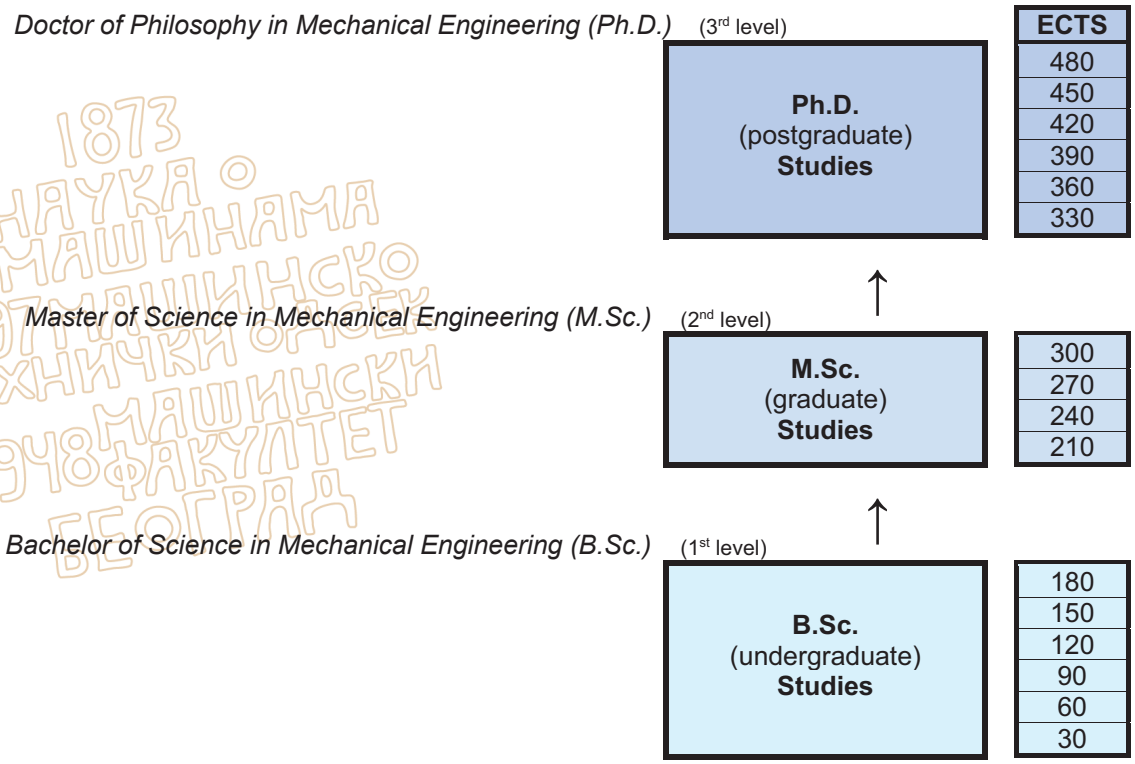
A new system of studies at the Faculty of Mechanical Engineering has been introduced since 1st October 2005:



ACADEMIC (university) studies

The title **Bachelor of Science** (B.Sc. from the Latin Baccalaureus Scientiæ) will be stated in the Diploma certificate of Bachelor studies (ECTS 180)**.** A Diploma Supplement will contain a list of courses the student has attended and passed exams in. Abbreviations: B.Sc.ME or BSc ME.

In the Diploma certificate of Bachelor Academic Studies – Information Technologies in Mechanical Engineering (ECTS 180), the acquired professional title of a **MECHANICAL ENGINEER (abbreviated as B.Sc.ME)** will be stated, while the Diploma supplement will state **Information Technologies**. In international terms, this title corresponds to the title of the Bachelor of Science (**B.Sc.** – in Latin Baccalaureus Scientiæ).

The title **Master of Science** (M.Sc. from the Latin Magister Scientiæ) will be stated in the Diploma certificate of Master studies (ECTS 120). A Diploma Supplement will contain a list of courses the student has attended and passed exams in, as well as the name of the obligatory specialization module from a certain department he/she has taken and completed. Abbreviations: M.Sc.ME or MSc ME.

In the Diploma certificate of Master Academic Studies – Industry 4.0 (ECTS 120), the acquired academic title of a **MASTER MECHANICAL ENGINEER – INFORMATION SCIENTIST (abbreviated as M.Sc.ME – IS)** will be stated.
In international terms, this title corresponds to the title of the Master of Science (**M.Sc.** – in Latin Magister Scientiæ).

The title **Doctor of Philosophy** (Ph.D. from the Latin Philosophiæ Doctor) will be stated in Diploma certificate of Doctoral studies. A Diploma Supplement will contain date of enrollment, specialization area, a list of courses the student has attended and passed exams in, the data on student's teaching experience, papers published and projects' participation, and finally, the date of Ph.D. thesis defense, thesis title, name of Supervisor, and names of Ph.D. committee members. Abbreviations: Ph.D.ME or PhD ME.

At all levels of study, the Diploma is accompanied by the Diploma supplement, which contains all the necessary pieces of information describing the studies of the person to whom the diploma is issued.

The rule for calculating the average grade

The average grade (AGR) is calculated according to the following formula, where the sum comprises all the courses that the student passed:

$$AGR = \frac{\sum(\text{The number of ECTS that the course is worth}) \times (\text{Grade obtained in a course})}{\sum(\text{The number of ECTS that the course is worth})}$$

University of Belgrade
Faculty of Mechanical Engineering

1st level of studies
B.Sc. (undergraduate) Academic Studies – Mechanical Engineering
ECTS 180

Hours weekly	1st year		2nd year		3rd year	
	1st semester	2nd semester	3rd semester	4th semester	5th semester	6th semester
1	1.1.5 Mathematics 1 6 ECTS	2.1.5 Mathematics 2 6 ECTS	3.1.5 Mathematics 3 6 ECTS	4.1.5 Thermodynamics B 6 ECTS	5.1.5 Fluid mechanics B 6 ECTS	6.1.5 Electrical engineering 6 ECTS
2						
3						
4						
5						
6	1.2.5 Mechanics 1 6 ECTS	2.2.5 Elective course 6 ECTS	3.2.5 Mechanics 2 6 ECTS	4.2.5 Mechanics 3 6 ECTS	5.2.5 Numerical methods 6 ECTS	6.2.5 Fundamentals of control engineering 6 ECTS
7						
8						
9						
10						
11	1.3.2 Constructive geometry and graphics 2 ECTS	2.3.5 Engineering graphics 6 ECTS	3.3.5 Machine elements 1 6 ECTS	4.3.5 Machine elements 2 6 ECTS	5.3.5 Manufacturing technology 6 ECTS	6.3.5 Elective course 6 ECTS
12						
13	1.3.3 Engineering management and economy 4 ECTS					
14						
15						
16	1.4.5 Physics and measurements 6 ECTS	2.4.2 Engineering materials 1 2 ECTS	3.4.5 Engineering materials 2 6 ECTS	4.4.5 Elective course 6 ECTS	5.4.5 Elective course 6 ECTS	6.4.5 Elective course 6 ECTS
17						
18		2.4.3 Strength of materials 4 ECTS				
19						
20						
21	1.5.2 English 1 2 ECTS	2.5.2 English 2 2 ECTS	3.5.5 Fundamentals of strength of structures 6 ECTS	4.5.4 Mechanical engineering and sustainable development 3 ECTS	5.5.5 Elective course 6 ECTS	6.5.5 B.Sc. work 6 ECTS
22						
23	1.5.3 Programming in C 4 ECTS	2.5.3 Computational tools 4 ECTS				
24						
25				4.5 Skill praxis B 3 ECTS		

Legend: white boxes – obligatory courses, coloured boxes – elective courses.

Skill praxis B lasts for 90 hours and it is worth 3 ECTS; **B.Sc. work** – as all other courses, however, knowledge check is done through the project or seminar work.

If the courses are held in blocks, a course with 3 teaching hours is worth 4 ECTS credits, and a course with 2 teaching hours is worth 2 ECTS credits. After the completion of classes, for the courses of the smaller block, special exam periods are organised in which only exams in these courses can be taken. The exams in the courses of the larger block can be taken for the first time in the final semester exam period (January, June).

It is mandatory for students to attend classes, as well as for the teachers to keep attendance records. Demonstration/testing of knowledge in classes is mandatory as a form of acquiring pre-exam points. In such a way, parts of the exam are taken during the semester, and only the remaining points are earned in the final exam. Students must take the final exam even if they do not want to receive the remaining points.

For reference, the courses are coded according to their position:

1. the first digit is the number of the semester (vertical, column);
2. the second digit is the ordinal number of the course in the semester (horizontal);
3. the third digit is the number of weekly hours.

Notes

Labels for accreditation purposes:
AGE - Academic-general education courses (15% = 4 courses + a smaller block)
TM - Theoretical and methodological courses (20% = 6 courses)
SV - Scientific and vocational courses (35% = 10 courses + a larger block)
VA - Vocational and applied courses (30% = 9 courses)
B.Sc. electiveness 20% = 6 courses (grey fields) + B.Sc. work

The maximum number of students enrolled into the study programme of Bachelor Academic Studies – Mechanical Engineering is **720**, and classes are held in groups of a maximum of **180 students for lectures**, **60 for general exercises and 20 students for laboratory exercises**.

Learning outcomes of the study programme
Bachelor of Science in Mechanical Engineering (B.Sc.)

University of Belgrade, Faculty of Mechanical Engineering (UB-FME) systematically and effectively plans, carries out, supervises, evaluates and upgrades the quality of its study programme in mechanical engineering at the Bachelor of Science (B.Sc.) level.
The B.Sc. (undergraduate) study programme in mechanical engineering lasts for three years of study with 180 ECTS and fully complies with the basic tasks and objectives in mechanical engineering.
Following the EUR-ACE framework standards and guidelines for engineering programmes[1], the objectives and learning outcomes of B.Sc. studies in mechanical engineering are as follows:

1. Knowledge and Understanding
    a. Broad and sound knowledge in mathematics, science and engineering, enabling to understand the complex phenomena peculiar to mechanical engineering. Bachelors will have the ability to demonstrate sound knowledge and understanding of the basics of fundamental and engineering sciences, such as:
        i. Mathematics, including differential and integral calculus, linear algebra, numerical methods, programming and computational tools;
        ii. Mechanics, solid and fluid, thermodynamics, as well as physics and measurements;
        iii. Material science and strength of materials, with machine elements and manufacturing technology;
        iv. Electrical and control engineering;
        v. Elements of general operation of common machines: engines, vehicles, pumps, fans, turbines, tractors, material handling machines, etc., for which courses are elective;
    b. Understanding broader multi-disciplinary context of engineering;
    c. Interpreting and critically assessing existing theories, models, methods and results, both qualitatively and quantitatively, within a broad engineering and physical science framework;
    d. Ability to work in a subject specific field of a company and be a specialist to some extent.
2. Engineering Analysis:
    a. Ability to identify, abstract, formulate, and solve engineering problems in their complexity with an orientation on the fundamentals;
    b. Ability to apply, analyse and assess products, processes and methods based on the system technology;
    c. Ability to choose, apply and develop suitable methods for analysing, modelling, simulating, and optimizing;
    d. Capacity for analysis and synthesis.
3. Engineering Design
    a. Ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
    b. Understanding the design methods and the ability to apply and further develop them.
4. Investigations and Assessment:
    a. Ability to design and conduct experiments, as well as to analyse and interpret data;
    b. Capability to use technical literature and other information sources, as well as to find information that is relevant using search engines, online libraries and repositories. Ability to effectively utilize modern information resources and technologies.
5. Engineering Practice
    a. Ability to combine theory and practice in solving engineering problems, as well as to apply knowledge in practice;
    b. Understanding the limits of applicable techniques and methods, making choices based on reasoned arguments, comparing techniques and methods, contrasting them with one another and evaluating the outcomes of those choices by comparing them with alternative solutions;
    c. Understanding the health, safety and legal issues and the impact of engineering solutions on the society and the environment, commitment to professional ethics, and acting responsibly and in line with the norms of engineering practice;
    d. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; awareness of the non-technical effects of engineering activities.

[1] https://www.enaee.eu/eur-ace-system/standards-and-guidelines/#standards-and-guidelines-for-accreditation-of-engineering-programmes

6. Transferable Skills:
    a. Ability to function as an individual and as a member of multidisciplinary teams;
    b. Ability to work independently;
    c. Ability to communicate effectively (orally – students apply the correct technical style and format appropriate for the audience, as well as in the written form – students use appropriate graphical standards in written and oral communication) with the engineering community and society, including general audience;
    d. Discussing ethical issues in research work with their peers in an informed and reasoned fashion;
    e. Knowledge of project management and business practices;
    f. Ability to use and evaluate tools for analysing a company in its environment;
    g. Capability to be prepared for decision making at mainly operational and tactical levels;
    h. A recognition of the need for and an ability to engage in life-long learning;
    i. Ability to work and communicate in the national and international context;
    j. Continue studies within this field towards an advanced degree, i.e. at the M.Sc. level, having developed the necessary personal autonomy and knowledge to do so.

Elective courses

1.	2.	3.	4.	5.	6.
	2.2				
					6.3
			4.4	5.4	6.4
				5.5	6.5

At the end of the first semester, as well as when enrolling in the 2nd and 3rd year of studies, students choose the courses for that particular year of studies which they want to attend and pass exams in. For each semester, as well as for each course position in the semester, there is a separate elective list. With that respect, the following conditions must be taken into account: A student can choose only one of the elective courses that are included in the list for the given position. When choosing a course, the student needs to check the attendance requirements for each individual course. Classes in an elective course will be held only if a minimum of 5 students enroll in the course. Students who have a higher average grade have the priority when choosing a particular course. Each department can offer a course that they believe students will be interested in. A student has the right to enroll in any module (specialization) at Master studies. A module represents a group of courses that are interconnected and must all be attended when that module is chosen. For some modules, there are recommended elective courses from the level of Bachelor academic studies.

The course **"Skill Praxis B"** (hereinafter: Skill Praxis) forms an integral part of the teaching process at the level of Bachelor academic studies at the Faculty of Mechanical Engineering, University of Belgrade and it is defined by the Rulebook on Skill Praxis. The student of Bachelor academic studies is referred to skill praxis in order to enrich theoretical and academic knowledge and gain practical knowledge and experience necessary for engaging in professional engineering activities.

Skill praxis may be performed with one or more legal entities, whose activity is in accordance with the study programme and with which the Faculty has signed a cooperation agreement. The student is referred to the skill praxis in the duration and periods defined by the study programme. The minimum number of hours of professional practice is 90 hours per year. Out of that, 80 hours or 10 days are envisaged for conducting skill praxis, while 10 hours are reserved for writing a report and defending it. Skill praxis is not included in the planned teaching load of the current academic year, but it does carry ECTS points. The Vice Dean for Teaching is in charge of planning the skill praxis, while the Skill Praxis Coordinator is in charge of its organization and implementation. During skill praxis, the student is obliged to keep a Skill Praxis Diary. This document should include the date and place of the conducted skill praxis, the duration of skill praxis and the work tasks encompassed by skill praxis. Upon completion of Skill Praxis B, the student is obliged to submit the Skill Praxis Diary and the Certificate of the completed skill praxis to the Skill Praxis Coordinator. During the skill praxis, the student is obliged to comply with the prescribed work and safety measures of the legal entity in which skill praxis is performed.

Lists of elective courses in the school year 2025/2026.

List of elective courses at the position 2.2 – 12 courses, (6 ECTS)

Aesthetic design; Computer control systems; Engineering communications; Fundamentals of aerotechnics; Fundamentals of motor vehicles; Human system anatomy and physiology (2 hours - 2 ECTS) + Fundamentals of biomedical engineering (3 hours - 4 ECTS); Introduction to industrial engineering; Introduction to weapon systems; Mechanical engineering in practice B; Railway systems; Steady state problems in heat transfer; Sustainable energy.

List of elective courses at the position 4.4 – 16 courses, (6 ECTS)

Aerodynamic constructions; Automotive engines design - introduction; Basic WEB projecting; Classical armament design; Computer graphics; Computer simulation and artificial intelligence; Experimental thermal science; Integrated automation; Introduction in process and environmental engineering; Introduction to energetics; Numerical and experimental analysis of stress and strain; Production process optimization; Renewable and secondary resources; Ship geometry; Statistics in biomedical measurements; Vehicle systems.

List of elective courses at the position 5.4 – 20 courses, (6 ECTS)

Aerodynamics (2 hours - 2 ECTS) + Computational methods in aeronautics (3 hours - 4 ECTS); Agricultur machinery and equipment 1; Automation systems programming; Combustion B; Flight mechanic; Fundamentals of heat and mass transfer; Fundamentals of projectiles propulsion; Fundamentals of solar systems; Fundamentals of technical innovation; Industrial compressors; Introduction to engineering simulations; Mechanical design of process equipment; Production and operations management 1; Production technology and metrology; Ship buoyancy and stability 1; Steam boilers basics; Theory of traction; Tribology; Vehicle dynamics; WEB projecting in mechanical engineering.

List of elective courses at the position 5.5 – 18 courses, (6 ECTS)

Applied thermodynamics; CAD/CAM systems; Flight mechanics of the projectile; Fundamentals of clinical engineering (2 hours - 2 ECTS) + Biomechanics of locomotor system (3 hours - 4 ECTS); Fundamentals of steel structures; Industrial engineering - design and practice; Industrial ergonomics; Information integration of business functions; Internal combustion engines; Introduction to pumps and fans; Machine elements 3; Machines and equipment for food processing and production; Processes and equipment in environmental engineering (2 hours - 2 ECTS) + Fundamentals of risk engineering and fire safety (3 hours - 4 ECTS); Renewable energy sources - biomass; Ship structures 1; Vehicle safety; Welding processes B; Windturbines.

List of elective courses at the position 6.3 – 20 courses, (6 ECTS)

Agricultur machinery and equipment 2; Aircraft propulsion and systems; Basic of refrigeration; Business-production information systems; Classical armament design; Electronics; Electronics and biomedical measurements; Elements of construction and mining machines; Fuel, lubricants and industrial water; Fundamentals of heat transfer; Fundamentals of rail vehicles; Fundamentals of turbomachinery; Hybrid electric propulsion systems; Machine tools; Mechanism design; Pipeline and fittings; Repair welding and surfacing; Shipbuilding technology; Software engineering; Vehicle performances.

List of elective courses at the position 6.4 – 20 courses, (6 ECTS)

Aircraft structural design; Combustion and sustainable development B; Database design; Digital systems; Drying and hygrothermal processes; FEM analysis; Fundamentals of measurement technique; Heating technique fundamentals; Hydraulics and pneumatics; Life cycle of railway vehicles; Machine design; Maintenance management; Material handling equipment; Medical engineering (2 hours - 2 ECTS) + Biophysics (3 hours - 4 ECTS); Missile weapons design; Operation and engine diagnostics; Ship systems (3 hours - 4 ECTS) + Ship equipment (2 hours - 2 ECTS); Theory of mechanical vibrations; Tools and fixtures; Vehicle design.

“B.Sc. work” at the position 6.5

B.Sc. work is an elective course that the student chooses from the list of compulsory or elective courses that he/she has passed during his/her studies or that he/she is currently taking. The course must be a course in the field of mechanical engineering. Classes in this course are carried out through the instructions for creating a project or a seminar paper, and taking the exam is performed exclusively through the defence of a printed final paper (a project or a seminar paper). The exam in the “B.Sc. work” (the defence of the paper) cannot be taken until all other exams have been passed.

University of Belgrade
Faculty of Mechanical Engineering

1st level of studies

B.Sc. (undergraduate) Academic Studies – Information Technologies in Mechanical Engineering
180 ECTS

Hours weekly	1st year		2nd year		3rd year	
	1st semester	2nd semester	3rd semester	4th semester	5th semester	6th semester
1	1.1 Programming 10 ECTS	2.1 Data structures 10 ECTS	3.1 Fundamentals of algorithms 5 ECTS	4.1 Introduction to operating systems 6 ECTS	5.1 Object-oriented paradigm 5 ECTS	6.1 Database systems 5 ECTS
2						
3						
4			3.2 Discrete mathematics 5 ECTS			
5						
6				4.2 Numerical analysis 6 ECTS	5.2 Elective course 5 ECTS	6.2 Elective course 5 ECTS
7						
8						
9	1.2 Algebra and linear algebra 8 ECTS	2.2 Calculus 8 ECTS	3.3 Elective course 5 ECTS			
10						6.3 Fundamentals of control engineering 5 ECTS
11				4.3 Basics of mechanics 3 6 ECTS	5.3 Fundamentals of thermodynamics and heat transfer 5 ECTS	
12						
13			3.4 Basics of mechanics 2 5 ECTS			
14						6.4 Manufacturing technology 5 ECTS
15	1.3 Elective course 4 ECTS	2.3 Basics of mechanics 1 3 ECTS			5.4 Fundamentals of fluid mechanics 5 ECTS	
16						
17			3.5 Basics of mechanic of materials 5 ECTS	4.4 Machine elements 6 ECTS		
18	1.4 Basics of computing systems 4 ECTS	2.4 Intro into the electrical engineering fundamentals 4 ECTS				6.5 Elective course 5 ECTS
19					5.5 Elective course 5 ECTS	
20						
21	1.5 English 1 2 ECTS	2.5 Software application in elementary physics 3 ECTS				
22			3.6 Mechanical materials 5 ECTS	4.5 Sustainable development 3 ECTS		6.6 Course of B.Sc. work 4 ECTS
23					5.6 Elective course 5 ECTS	
24	1.6 Elective course 2 ECTS	2.6 Engineering economy 2 ECTS				6.7 B.Sc. work 1 ECTS
25				4.6 Praxis 3 ECTS		

Starting from October 1st, 2019, a new nationally accredited study programme of Bachelor Academic Studies – Information Technologies in Mechanical Engineering has been implemented. The Diploma certificate of this study programme will contain the professional title of a **Bachelor of Science** (B.Sc. from the Latin Baccalaureus Scientiæ), and in the Diploma Supplement **Information Technology.** A Diploma Supplement will contain a list of courses the student has attended and passed exams in. Abbreviations: B.Sc.ME or BSc ME.

All the courses last for one semester. **B.Sc. work** is an elective course that the student chooses from the list of compulsory or elective courses that he/she has passed during his/her studies or that he/she is currently taking. The course must be a course in the field of mechanical engineering or computer sciences. Classes in this course are carried out through the instructions for creating a project or a seminar paper, and taking the exam is performed exclusively through the defence of a printed final paper (a project or a seminar paper). The exam in the "B.Sc. work" (the defence of the paper) cannot be taken until all other exams have been passed. For reference, the courses are coded according to their position:

1. the first digit is the number of the semester (vertical column);
2. the second digit is the ordinal number of the course in the semester (horizontal).

The maximum number of students enrolled in the study programme of Bachelor Academic Studies – Information Technologies in Mechanical Engineering is **60**, and classes are delivered in groups of up to **60 students for lectures**, **60 for auditory practice** and **20 for laboratory practice.** Attendance of lectures is obligatory for students, as well as the lecturer's record-keeping on it. It is mandatory to demonstrate/test knowledge in classes in order to earn points through the completion of pre-exam obligations. In such a way, parts of the exam are taken during the semester, and only the remaining points are earned in the final exam.

Students must take the final exam even if they do not wish to receive the remaining points in it. The Rulebook on Teaching at the Bachelor Academic Studies sets out in more detail the forms of teaching, informing students about the way of organizing all forms of teaching, the rules of studying, knowledge checks and assessment, as well as the other issues related to teaching.

Elective courses

At the beginning of each year, **the student chooses** the elective courses for that year of study that he or she wants to attend and pass. There is a separate list of courses for each semester, as well as for **each course position** in the semester. With this respect, the following conditions must be taken into account: a student can choose only one of the elective courses that are included in the list for the given position. When choosing a course, the student needs to check the attendance requirements for each individual course. Classes in an elective course will be held only if a minimum of 5 students enroll in the course. Students who have a higher average grade have the priority when choosing a particular course.

Lists of elective courses in the school year 2025/2026.

List of elective courses at the position 1.3 – 2 courses, (4 ECTS)

Engineering communication fundamentals; Fundamentals of computer modeling.

List of elective courses at the position 1.6 – 2 courses, (2 ECTS)

Engineering ethics and innovation; English 2.

List of elective courses at the position 3.3 – 2 courses, (5 ECTS)

Fundamentals of computer graphics; Theory of elasticity.

List of elective courses at the position 5.2 – 4 courses, (5 ECTS)

Computer modelling of physical processes; Databases design; Internet of things; Statistics - R.

List of elective courses at the position 5.5 – 4 courses, (5 ECTS)

Computational fluid dynamics; Numerical simulation of powertrain systems; Operations research; WEB projecting in mechanical engineering.

List of elective courses at the position 5.6 – 3 courses, (5 ECTS)

Fundamentals of propulsion systems mechatronics; Introduction to finite element method; Software engineering.

List of elective courses at the position 6.2 – 2 courses, (5 ECTS)

Basics of risk theory; Object-oriented programming.

List of elective courses at the position 6.5 – 4 courses, (5 ECTS)

Basics of deformation measurements and stress analysis; Computer-based measurements; Model based automotive software development; Robotics welding.

University of Belgrade
Faculty of Mechanical Engineering

2nd level of studies

M.Sc. (graduate) Academic Studies – Mechanical Engineering
ECTS 120

The study programme of Master (Graduate) academic studies is performed through 21 elective modules (specializations) within the same curriculum framework schematically presented below.

Hours weekly	1st year		2nd year	
	1st semester	2nd semester	3rd semester	4th semester
1	1.1.5 COURSE OF ELECTIVE MODULE	2.1.5 COURSE OF ELECTIVE MODULE	3.1.5 COURSE OF ELECTIVE MODULE	4.1 Skill praxis M
2				
3				
4				4.2.2 Optional: Foreign language
5				
6	1.2.5 COURSE OF ELECTIVE MODULE	2.2.5 COURSE OF ELECTIVE MODULE	3.2.5 COURSE OF ELECTIVE MODULE	4.3.11 Course of M.Sc. thesis
7				
8				
9				
10				
11	1.3.5 Mechanics M or Fluid mechanics M	2.3.5 COURSE OF ELECTIVE MODULE	3.3.5 COURSE OF ELECTIVE MODULE	
12				
13				
14				
15				
16	1.4.5 Mechatronics or Thermodynamics M	2.4.5 Elective course	3.4.5 Elective course	4.4.11 M.Sc. thesis
17				
18				
19				
20				
21	1.5.5 Elective course	2.5.5 Elective course	3.5.5 Elective course	
22				
23				
24				
25				

Legend: white boxes – obligatory courses, coloured boxes – elective courses; numeric code below the course title in this table consists of three digits: the first digit is the number of the semester, the second is the position of the course, and the third one is the number of weekly hours; the duration of each course is one semester with 5 hours per week, and each equals ECTS 6 (ECTS – European Credit Transfer System).

Skill praxis M lasts for 90 hours and it is worth 4 ECTS; Non-compulsory course in **Foreign language for specific purposes** – 30 hours, is worth ECTS 2;

- Master's thesis (M.Sc. thesis) is the final work at Master academic studies, which is carried out through the course of Master's thesis and Master's thesis.
- Master's thesis is written either in the compulsory courses or in the elective courses that students passed during Master academic studies.
- Within the course of Master's thesis (13 ECTS), the student conducts a study research work in the function of the Master's thesis.
- Master's thesis (13 ECTS) is student's independent work produced in written form, carried out with the help of instructions and consultations with the supervisor.
- Master's thesis must contain at least two of the following areas: the material on the studied and analysed topic, own numerical calculations, own experimental work and/or own design.

For accreditation requirements: M.Sc. electiveness 35% = 7 courses (coloured boxes).

All the explanations stated in the part regarding Bachelor Academic Studies – Mechanical Engineering apply here as well (block-classes and the average grade). The main differences include the following:

- **At Master Academic Studies, the student must select an elective module when enrolling.** The minimum number of students for the elective module is 5 (at the moment of enrolment, while there is no minimum in the 3rd semester), and the maximum is defined by the Call for enrolment.
- The maximum number of students that can be enrolled in Master Academic Studies is **416**, and classes are conducted in groups of **a maximum of 32** students for lectures, **16** for general exercises and **8** students for laboratory exercises.
- The student should complete and pass "Skill praxis M" before applying for taking the exam in the Course of Master's thesis and for Master's (M.Sc.) thesis.
- The criterion of at least 5 registered students is applied to elective courses in all semesters of Master studies in order for classes to be held.

The enrolment procedure is regulated by the Rulebook on Master Academic Studies. Students who completed Bachelor vocational studies do not have the right of direct enrolment in Master academic studies, instead, it is necessary for them to first complete Bachelor academic studies.

Learning outcomes of the study programme
Master of Science in Mechanical Engineering (M.Sc.)

University of Belgrade, Faculty of Mechanical Engineering (UB-FME) systematically and effectively plans, carries out, supervises, evaluates and upgrades the quality of its study programme in mechanical engineering at the Master of Science (M.Sc.) level.

The M.Sc. (graduate) study programme in mechanical engineering lasts for two years of study with 120 ECTS and fully complies with the basic tasks and objectives in mechanical engineering. Admission requirement is a B.Sc. degree in engineering. The study programme is structured into 21 study specializations with common basics.

Following the EUR-ACE framework standards and guidelines for engineering programmes[2], the objectives and learning outcomes of M.Sc. studies in mechanical engineering are as follows:

1. Knowledge and Understanding
    a. Extensive advanced knowledge in mathematics, science and engineering enabling to understand the complex phenomena peculiar to mechanical engineering with interdisciplinary expansion. Masters will have the ability to demonstrate in-depth knowledge and understanding of engineering sciences, such as:
        i. Advanced mathematics, ordinary differential equations, advanced numerical methods, programming, computational tools and software engineering;
        ii. Advanced mechanics, solid and fluid, as well as thermodynamics and heat transfer;
        iii. Mechatronics and automatic control engineering, electronics and measurements;
        iv. Advanced machine elements with design procedures of components and systems;
        v. Computer aided design and manufacturing, project management;
        vi. Details of operation and design of components, machines, systems and/or processes in the area of study specialization;
    b. Critical awareness of the latest findings in their discipline;
    c. Ability to work in a subject specific field of a company and be a specialist in the field.
2. Engineering Analysis
    a. Ability to scientifically analyse and solve unusual and/or incompletely defined engineering problems;
    b. Ability to abstract and formulate new complex problems in their discipline;
    c. Ability to apply innovative and develop new methods for problem solving;
    d. Capacity for analysis and synthesis.
3. Engineering Design
    a. Ability to develop concepts and solutions for fundamentally oriented and partially unusual problems considering other disciplines;
    b. Use of creativity to develop new and inventive products, processes and methods;
    c. Ability to work with complex, technologically impure or incomplete information.
4. Investigations and Assessment
    a. Capability to find and procure necessary information;
    b. Ability to design and conduct analytical and experimental investigation;
    c. Ability to critically assess data and draw conclusions;
    d. Ability to investigate and assess the application of new and emerging technologies in their discipline.
5. Engineering Practice
    a. Ability to combine theory and practice in solving engineering problems, as well as to apply knowledge in practice;
    b. Ability to classify and systematically combine knowledge of different fields and handle complexity;
    c. Ability to familiarize themselves speedily, methodically and systematically with the new and unknown;

[2]https://www.enaee.eu/eur-ace-system/standards-and-guidelines/#standards-and-guidelines-for-accreditation-of-engineering-programmes

d. Ability to assess applicable methods and their limits;
e. Ability to reflect on non-technical effects of engineering activities systematically and to integrate them into their actions in a responsible manner;
f. Understanding the health, safety and legal issues and the impact of engineering solutions on the society and the environment, commitment to professional ethics, and acting responsibly and in line with norms of engineering practice;
g. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context; awareness of the non-technical effects of engineering activities.

6. Transferable Skills
   a. Ability to function as an individual and as a member of multidisciplinary teams;
   b. Ability to work independently;
   c. Ability to function as a leader of a multidisciplinary team;
   d. Ability to communicate effectively (orally – students apply the correct technical style and format appropriate for the audience, as well as in the written form – students use appropriate graphical standards in written and oral communication) with the engineering community and society, including general audience;
   e. Discussing ethical issues in research work with their peers in an informed and reasoned fashion;
   f. Knowledge of project management and business practices;
   g. Ability to use and evaluate tools for analysing a company in its environment;
   h. Capability for decision making at mainly operational and tactical levels;
   i. A recognition of the need for and an ability to engage in life-long learning;
   j. Ability to work and communicate in the national and international context;
   k. Continuing studies within this field towards an advanced degree, i.e. at the Ph.D. level, having developed the necessary personal autonomy and knowledge to do so.

1.	2.	3.	4.
1.1.5	2.1.5	3.1.5	4.1
1.2.5	2.2.5	3.2.5	4.3
1.3.5	2.3.5	3.3.5	
1.4.5	2.4.5	3.4.5	4.4
1.5.5	2.5.5	3.5.5	

LISTS OF MODULES WITH OBLIGATORY AND ELECTIVE-COURSES

In the tables, in the positions 1.3.5 and 1.4.5, an asterisk (*) indicates a course which is recommended for the given module.

Biomedical Engineering		Naval Architecture	
1.1.5	Spectroscopy methods and techniques	1.1.5	Ship resistance
1.2.5	Biomedical instrumentation and equipment	1.2.5	Ship strength 1
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M
1.5.5	- Fractal mechanics - Probability and statistics - Electric machinery	1.5.5	- Ship structures 1M - Probability and statistics - Internal combustion engines fundamentals
2.1.5	Clinical engineering	2.1.5	Ship propulsion
2.2.3 2.2.2	Biomechanics of tissue and organs Introduction to nanotechnology	2.2.5	Ship buoyancy and stability 2
2.3.5	Signal processing	2.3.5	Ship structures 2
2.4.5	- Mechanics of robots - Mechatronics systems - Sensors and computer based measurements - Electronics	2.4.5	- Ship equipment M (2 ECTS) + Ship systems M (4 ECTS) - Theory of mechanical vibrations - Mechanical engineering measurements and sensors
2.5.5	- Biomaterials in medicine and dentistry - New generation of machine tools and robots - Mechanics of composite materials - Embedded systems and IoT in mechanical engineering	2.5.5	- Industrial automation - Quality assurance and quality control of welded joints - Mechanics of composite materials - Ship strength 2
3.1.5	Nanotechnology	3.1.5	Ship design
3.2.5	Early diagnostics	3.2.5	Seakeeping
3.3.5	Nanomedical engineering	3.3.3 3.3.2	Marine engines Application of methods and techniques of industrial engineering in shipbuilding
3.4.5	- Information technologies in medicine - Finite element method in structural analysis - Computational fluid dynamics (CFD) - Techno-economic analysis and project management	3.4.5	- Ship manoeuvring - Machine tools M - Computational fluid dynamics (CFD)
3.5.5	- Microfluidics and nanofluidics - Multiphase flow - Man - machine system design (4 ECTS) + Improving the quality of business processes - Lean 6 sigma (2 ECTS)	3.5.5	- Composite plates and beams - Pumps and fans - Software application in ship design
4.1	Skill praxis M - BMI	4.1	Skill praxis M - BRO
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Aerospace Engineering		Design in Mechanical Engineering	
1.1.5	Applied aerodynamics	1.1.5	Structure modelling with calculation
1.2.5	Computational aerodynamics	1.2.5	Innovative design of technical systems
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M
1.5.5	- Heat and mass transfer - Rocket motors - Computer networks - Helicopters	1.5.5	- Electric machinery - Construction, mining and conveying machinery elements - Practicum in engineering design basics
2.1.5	Structural analysis	2.1.3 2.1.2	Ergonomic design Bionics in design
2.2.5	Flight dynamics	2.2.5	Machine design and construction M
2.3.5	Composite structures	2.3.5	Decision-making methods
2.4.5	- High speed aerodynamics - Wind turbines 2 - Sensors and computer based measurements - Mechanical engineering measurements and sensors	2.4.5	- Additive manufacturing technologies - Electronics - Sensors and computer based measurements - Theory of mechanical vibrations
2.5.5	- Avionics - Mechanics of composite materials - Aircraft performance - Embedded systems and IoT in mechanical engineering	2.5.5	- Design of construction and mining machines subsystems - Mechanics of composite materials - High speed machine design
3.1.5	Aircraft control and systems	3.1.5	Software tools in design in mechanical engineering
3.2.5	Aircraft propulsion	3.2.5	Optimization methods
3.3.5	Aircraft design	3.3.5	Eco design
3.4.5	- Intelligent control systems - Aircraft maintenance - Technical regulations and standards - Project management & air regulation	3.4.5	- Computer graphics and virtual reality - Technical regulations and standards - Assembly technology - Hybrid technical systems
3.5.5	- Aeroelasticity - Missile navigation, guidance and control algorithms - Computer simulations of thermalhydraulic processes and CFD - Aircraft armament systems	3.5.5	- Intelligent buildings - Micro manufacturing and characterization - Tribological systems
4.1	Skill praxis M - VAZ	4.1	Skill praxis M - DUM
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Railway Mechanical Engineering		Welding and Welded Structures	
1.1.5	Rail vehicles 1	1.1.3 1.1.2	Engineering materials 3 Fuel, lubricants and industrial water 2
1.2.5	Theory of traction	1.2.5	Design of welded structures
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Electric machinery - Internal combustion engines fundamentals - Welding processes M - Pumps and fans	1.5.5	- Welding processes M - Heat and mass transfer - Transport of fluid through pipes
2.1.5	Locomotive 1	2.1.5	Welding metallurgy
2.2.5	Rail vehicles 2	2.2.5	Machine design and construction M
2.3.5	Brakes of rail vehicles	2.3.5	Fracture mechanics and structural integrity
2.4.5	- Service properties of welded joints - Theory of mechanical vibrations - Risk management in terotechnology - Mechanical engineering measurements and sensors	2.4.5	- Service properties of welded joints - Theory of mechanical vibrations - Processes and equipment for water treatment
2.5.5	- Quality assurance and quality control of welded joints - Mechanics of composite materials - High speed machine design	2.5.5	- Quality assurance and quality control of welded joints - Gas dynamics - Two-phase flows with phase transition
3.1.5	Locomotive 2	3.1.5	Design, construction and operation of processing systems
3.2.5	Railway vehicles maintenance	3.2.5	Optimization and reliability of constructions
3.3.5	Fundamentals of rail vehicle dynamics	3.3.5	Welding technology
3.4.5	- Urban and special rail vehicles - Technical regulations and standards - Techno-economic analysis and project management	3.4.5	- Technical regulations and standards - Techno-economic analysis and project management - Combustible, technical and medical gases
3.5.5	- Information technology projects evaluation - Pumps and fans - Tribological systems - Combustion appliances	3.5.5	- Tribological systems - Combustion appliances - Microfluidics and nanofluidics
4.1	Skill praxis M - ZEM	4.1	Skill praxis M - ZZK
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Engineering Graphics and Mechatronics		Industrial Engineering	
1.1.5	Constructive processing of curves and surfaces	1.1.5	Operations research
1.2.5	Constructive geometry and graphics	1.2.5	Engineering statistics
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M	1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Practicum in engineering design basics - Management information systems - Construction, mining and conveying machinery elements - Electric machinery	1.5.5	- Probability and statistics - Management information systems - Computer networks
2.1.5	Engineering condition monitoring	2.1.5	Industrial logistic
2.2.5	Fundaments of mechanism analysis and synthesis	2.2.5	Ergonomic designing
2.3.5	Applied mechatronics	2.3.5	Database systems
2.4.5	- Additive manufacturing technologies - Distributed systems in mechanical engineering - Mechatronics systems	2.4.5	- Sensors and computer based measurements - Risk management in terotechnology - Mechanical engineering measurements and sensors
2.5.5	- High speed machine design - Design of logistic and warehouse systems - Embedded systems and IoT in mechanical engineering	2.5.5	- Industrial automation - Computer simulation in manufacturing automation - Design of logistic and warehouse systems
3.1.5	Engineering graphics and simulations	3.1.5	Production management 2
3.2.5	Application of virtual and augmented reality in mechanical engineering	3.2.5	Organization design
3.3.5	The aesthetics of 3d modelling	3.3.5	Industrial management
3.4.5	- Food processing machines - Technical regulations and standards - Techno-economic analysis and project management - Assembly technology	3.4.5	- Economic analysis in process engineering (2 ECTS) + Maintenance in process industry (4 ECTS) - Renewable energy resources - small hydropower plants - Techno-economic analysis and project management
3.5.5	- Information technology projects evaluation - Man - machine system design (4 ECTS) + Improving the quality of business processes - Lean 6 sigma (2 ECTS) - Technical legislation (2 ECTS) + Draying and drayers (4 ECTS) - Plant design for food production and processing	3.5.5	- Microfluidics and nanofluidics - Computer control and monitoring in manufacturing automation - Man - machine system design (4 ECTS) + Improving the quality of business processes – Lean 6 sigma (2 ECTS)
4.1	Skill praxis M - IGM	4.1	Skill praxis M - IIE
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Mechanics		Mechanical Engineering & Information Technology	
1.1.5	Analytical mechanics	1.1.5	C/C++
1.2.5	Continuum mechanics	1.2.5	Object oriented paradigm
1.3.5	- Mechanics M* - Fluid mechanics M	1.3.5	- Mechanics M* - Fluid mechanics M*
1.4.5	- Mechatronics - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Probability and statistics - Pumps and fans - Transport of fluid through pipes	1.5.5	- Probability and statistics - Management information systems - Computer networks
2.1.5	Theory of elasticity	2.1.5	Algorithms and data structures
2.2.5	Fluid mechanics 1	2.2.5	Programmable control systems
2.3.5	Computational fluid mechanics	2.3.5	Data exquisite in mechanical engineering
2.4.5	- Sensors and computer based measurements - Theory of mechanical vibrations - Mechanical engineering measurements and sensors	2.4.5	- Distributed systems in mechanical engineering - Combustion M - Risk management in terotechnology
2.5.5	- Gas dynamics - Industrial automation - Mechanics of composite materials	2.5.5	- Avionics - Vehicles and environment - Mechanics of composite materials - Embedded systems and IoT in mechanical engineering
3.1.5	Mechatronic robotics	3.1.5	Engineering software design
3.2.5	Multiphase flow M	3.2.5	Optimization methods
3.3.5	Theory of finite element method	3.3.5	Numerical methods in continuum mechanics
3.4.5	- Intelligent control systems - Fundamentals of mining and construction machines dynamics - Food processing machines	3.4.5	- Information technologies in medicine - Computer graphics and virtual reality - Project management & air regulation - Hybrid technical systems
3.5.5	- Computer control and monitoring in manufacturing automation - Composite plates and beams - Microfluidics and nanofluidics	3.5.5	- Aeroelasticity - Information technology projects evaluation - Computer simulations of thermalhydraulic processes and CFD
4.1	Skill praxis M - MEH	4.1	Skill praxis M - MIT
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Motor Vehicles		Internal Combustion Engines	
1.1.5	Modelling of vehicle systems	1.1.5	Engine working processes
1.2.5	Vehicle layout, suspension and steering	1.2.5	Mixture formation and combustion in IC engines
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Probability and statistics - Electric machinery - Internal combustion engines fundamentals	1.5.5	- Probability and statistics - Electric machinery - Practicum in engineering design basics - Heat and mass transfer
2.1.5	Vehicle transmission systems	2.1.5	IC engine design 1
2.2.5	Friction based vehicle systems	2.2.5	Internal combustion engine mechatronics
2.3.5	Vehicle mechatronics	2.3.5	Supercharging of IC engines
2.4.5	- Electronics - Fundamentals of composite laminate structures - Theory of mechanical vibrations	2.4.5	- Electronics - Combustion M - Sensors and computer based measurements - Turbomachinery
2.5.5	- Vehicles and environment - Industrial automation - Computer simulation in manufacturing automation	2.5.5	- Vehicles and environment - Gas dynamics - Heat transfer - Thermal turbomachinery
3.1.5	Vehicle body structure	3.1.5	IC engine design 2
3.2.5	Vehicle testing	3.2.5	IC engine testing
3.3.5	Intelligent vehicle systems	3.3.2 3.3.3	Engine design project Ecology of mobile power sources
3.4.5	- System effectiveness - Fundamentals of mining and construction machines dynamics - Tribology	3.4.5	- Ecology of combustion - Selected topics in IC engines 1 - Computational fluid dynamics (CFD) - Tribology
3.5.5	- Pumps and fans - Systems engineering and mobility - Solar energy	3.5.5	- Selected topics in IC engines 2 - Heat exchangers - Tribological systems - Turbocompressors
4.1	Skill praxis M - MOV	4.1	Skill praxis M - MOT
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Agricultural and Food Engineering		Production Engineering	
1.1.5	Tractors and self-propelled agricultural machines	1.1.5	Manufacturing automation
1.2.5	Refrigeration in food technologies	1.2.5	Industrial robots
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M
1.5.5	- Construction, mining and conveying machinery elements - Management information systems - Internal combustion engines fundamentals - Microclimate management in agricultural and industrial facilities	1.5.5	- Sheet-metal processing tools - Probability and statistics - Electric machinery - Coordinate measuring machines
2.1.5	Design of agricultural machines and equipment	2.1.5	Manufacturing systems design
2.2.5	Design of mechanisms and manipulators in the food industry	2.2.5	Computer integrated manufacturing systems and technology
2.3.5	Drying process techniques and technologies	2.3.5	Production information systems
2.4.5	- Additive manufacturing technologies - Electronics - Theory of mechanical vibrations	2.4.5	- Additive manufacturing technologies - Mechatronics systems - Electronics - Theory of mechanical vibrations
2.5.5	- Biofuels in combustion processes - Vehicles and environment - Heat transfer - High speed machine design	2.5.5	- Computer simulation in manufacturing automation - New generation of machine tools and robots - Mechanics of composite materials - Design of logistic and warehouse systems
3.1.5	Software tools in design in mechanical engineering	3.1.5	New technologies
3.2.5	Geoinformation and remote control of biotechnic systems	3.2.5	Quality management
3.3.5	Design of plants and process and energy systems	3.3.5	Intelligent manufacturing systems
3.4.5	- Food processing machines - Technical regulations and standards - Techno-economic analysis and project management - Hybrid technical systems	3.4.5	- Machine tools M - Assembly technology - Technical regulations and standards - Techno-economic analysis and project management
3.5.5	- Computer simulations of thermalhydraulic processes and CFD - Plant design for food production and processing - Pumps and fans - Solar energy	3.5.5	- Computer control and monitoring in manufacturing automation - Micro manufacturing and characterization - Pumps and fans - Tribological systems
4.1	Skill praxis M - PPM	4.1	Skill praxis M - PRO
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

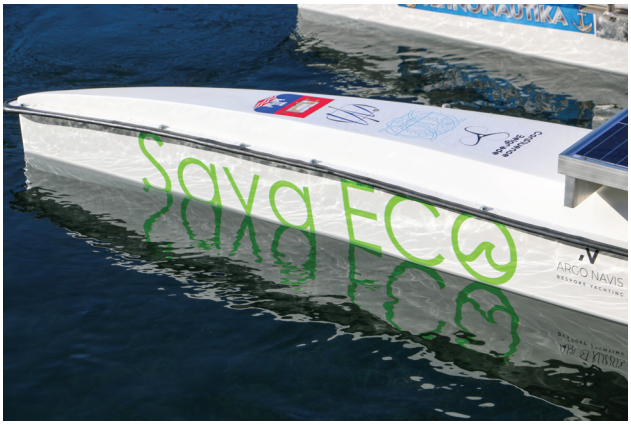
Process Engineering and Environment Protection		Control Engineering	
1.1.5	Transport phenomena in process industry	1.1.5	Computer control
1.2.5	Mechanical and hydromechanical operations an equipment	1.2.5	Automatic control
1.3.5	- Mechanics M - Fluid mechanics M*	1.3.5	- Mechanics M* - Fluid mechanics M*
1.4.5	- Mechatronics - Thermodynamics M*	1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Probability and statistics - Measurements and control in process industry - Transport of fluid through pipes	1.5.5	- Electric machinery - Pumps and fans - Central heating systems - Computer networks
2.1.5	Heat transfer operations and equipment	2.1.5	Dynamic systems modelling, identification and simulation
2.2.5	Biotechnology	2.2.5	Nonlinear systems 1
2.3.5	Chemical and biochemical operations and reactors	2.3.5	Synthesis of linear systems
2.4.5	- Electronics - Furnaces and boilers in industry - Processes and equipment for water treatment - Service properties of welded juoints	2.4.5	- Mechanics of robots - Electronics - Theory of mechanical vibrations - Mechanical engineering measurements and sensors
2.5.5	- Two-phase flows with phase transition - Gas dynamics - Principles of environmental and work space protection (2 ECTS) + Energy in process engineering (4 ECTS)	2.5.5	- Industrial automation - Computer simulation in manufacturing automation - New generation of machine tools and robots - Thermal turbomachinery
3.1.5	Design, construction and operation of processing systems	3.1.5	Fuzzy control systems
3.2.5	Mass transfer and equipment	3.2.5	Industrial process control
3.3.2 3.3.3	Air pollution control Waste and wastewater management	3.3.5	Nonlinear systems 2
3.4.5	- Combustible, technical and medical gases - Economic analysis in process engineering (2 ECTS) + Maintenance in process industry (4 ECTS) - Renewable energy resources - small hydropower plants	3.4.5	- Intelligent control systems - Techno-economic analysis and project management - Hybrid technical systems - Renewable energy resources - small hydropower plants
3.5.5	- Analysis and risk management in process industries - Design of fire protection systems - Multiphase flow - Technical legislation (2 ECTS) + Draying and drayers (4 ECTS)	3.5.5	- Intelligent buildings - Turbocompressors - Pumps and fans - Missile navigation, guidance and control algorithms
4.1	Skill praxis M - PTH	4.1	Skill praxis M - SAU
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Weapon Systems		Thermal Power Engineering	
1.1.5	Physics of explosive processes	1.1.5	Steam turbine 1
1.2.5	Flight dynamics and aerodynamic of projectiles	1.2.5	Power steam boilers 1
1.3.5	- Mechanics M* - Fluid mechanics M*	1.3.5	- Mechanics M - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M*	1.4.5	- Mechatronics - Thermodynamics M**
1.5.5	- Probability and statistics - Heat and mass transfer - Rocket motors - Electric machinery	1.5.5	- Nuclear reactors - Pumps and fans - Electric machinery - Heat and mass transfer
2.1.3 2.1.2	Missile propulsion Fire control systems	2.1.5	Steam turbine 2
2.2.3 2.2.2	Interior ballistics Automatic weapons	2.2.5	Thermal power plants 1
2.3.2 2.3.3	Missile guidance and control Projectile design	2.3.5	Gas turbines
2.4.5	- High speed aerodynamics - Electronics - Theory of mechanical vibrations - Sensors and computer based measurements	2.4.5	- Mechanical engineering measurements and sensors - Theory of mechanical vibrations - Pipelines - Combustion M
2.5.5	- Gas dynamics - Design of logistic and warehouse systems - Heat transfer - Avionics	2.5.5	- Power steam boilers 2 - Heat transfer - Gas dynamics
3.1.3	Artillery weapons design	3.1.5	Energy planning
3.2.5	Missile design and launchers	3.2.5	Thermal power plants 2
3.3.3 3.3.2	Terminal ballistics Optical devices and optoelectronics	3.3.5	Steam generators
3.4.5	- Hybrid technical systems - Intelligent control systems - Technical regulations and standards - Tribology	3.4.5	- Steam turbines 3 - Techno-economic analysis and project management - Computational fluid dynamics (CFD)
3.5.5	- Missile navigation, guidance and control algorithms - Aircraft armament systems - Aeroelasticity - Computer simulations of thermalhydraulic processes and CFD	3.5.5	- Turbocompressors - Solar energy - Tribological systems
4.1	Skill praxis M - SIN	4.1	Skill praxis M - TEN
4.3	Course of M.Sc. thesis	4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis	4.4	M.Sc. thesis

Material Handling, Constructions and Logistics	
1.1.5	Facility layout and industrial logistics
1.2.5	Computer aided design in material handling practice
1.3.5	- Mechanics M* - Fluid mechanics M
1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Electric machinery - Construction, mining and conveying machinery elements - Welding processes M
2.1.5	Structural and stress analysis
2.2.5	Transport and logistic systems design
2.3.5	Conveying and material handling machines
2.4.5	- Mechanics of robots - Service properties of welded joints - Theory of mechanical vibrations
2.5.5	- Vehicles and environment - Design of construction and mining machines subsystems - Computer simulation in manufacturing automation - Design of logistic and warehouse systems
3.1.5	Mining and construction machines
3.2.5	Cranes design
3.3.5	Eco design
3.4.5	- Fundamentals of mining and construction machines dynamics - Technical regulations and standards - Hybrid technical systems
3.5.5	- Plant design for food production and processing - Pumps and fans - Tribological systems
4.1	Skill praxis M - TKL
4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis

Thermal Science Engineering	
1.1.5	Steam boilers elements and equipment
1.2.5	Refrigeration equipment
1.3.5	- Mechanics M* - Fluid mechanics M
1.4.5	- Mechatronics - Thermodynamics M*
1.5.5	- Central heating systems - Heat and mass transfer - Pumps and fans
2.1.5	Steam boiler processing
2.2.5	Refrigeration systems
2.3.5	Air-conditioning fundamentals
2.4.5	- Pipelines - Combustion M - Mechanical engineering measurements and sensors
2.5.5	- Heat transfer - Thermal turbomachinery - Gas dynamics
3.1.5	Thermal power plants and heat plants
3.2.5	Heat pumps
3.3.5	Air conditioning systems
3.4.5	- Building energy certification - Energy efficiency in buildings M - Ecology of combustion
3.5.5	- Solar energy - Pumps and fans - Heat exchangers - Intelligent buildings
4.1	Skill praxis M - TTA
4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis

Hydropower Engineering	
1.1.5	Theory of turbomachinery
1.2.5	Pumps
1.3.5	- Mechanics M - Fluid mechanics M*
1.4.5	- Mechatronics* - Thermodynamics M*
1.5.5	- Transport of fluid through pipes - Central heating systems - Internal combustion engines fundamentals - Electric machinery
2.1.5	Hydraulic turbines
2.2.5	Design of pumps, fans and turbo compressors
2.3.5	Fans and turbo compressors
2.4.5	- Mechanical engineering measurements and sensors - Electronics - Wind turbines 2 - Theory of mechanical vibrations
2.5.5	- CFD modelling of turbo-machinery - Thermal turbomachinery - Industrial automation - Principles of environmental and work space protection (2 ECTS) + Energy in process engineering (4 ECTS)
3.1.5	Hydropower plants and equipment
3.2.5	Hydraulic power transmitters
3.3.5	Hydropower measurements
3.4.5	- Renewable energy resources - small hydropower plants - Machine tools M - Building energy certification - Computational fluid dynamics (CFD)
3.5.5	- Microfluidics and nanofluidics - Computer simulations of thermalhydraulic processes and CFD - Multiphase flow - Intelligent buildings
4.1	Skill praxis M - HEN
4.3	Course of M.Sc. thesis
4.4	M.Sc. thesis



1.	2.	3.	4.
1.3.5			
1.4.5	2.4.5	3.4.5	
1.5.5	2.5.5	3.5.5	

Lists of elective courses in the school year 2025/2026.

List of elective courses at the position 1.3 – 2 courses, (6 ECTS)

Fluid mechanics M; Mechanics M.

List of elective courses at the position 1.4 – 2 courses, (6 ECTS)

Mechatronics; Thermodynamics M.

List of elective courses at the position 1.5 – 21 courses, (6 ECTS)

Central heating systems; Computer networks; Construction, mining and conveying machinery elements; Coordinate measuring machines; Electric machinery; Fractal mechanics; Heat and mass transfer; Helicopters; Internal combustion engines fundamentals; Management information systems; Measurements and control in process industry; Microclimate management in agricultural and industrial facilities; Nuclear reactors; Practicum in engineering design basics; Probability and statistics; Pumps and fans; Rocket motors; Sheet-metal processing tools; Ship structures 1M; Transport of fluid through pipes; Welding processes M.

List of elective courses at the position 2.4 – 22 courses, (6 ECTS)

Additive manufacturing technologies; Combustion and sustainable development M; Combustion M; Distributed systems in mechanical engineering; Electronics; Environmental protection in thermal power engineering; Fundamentals of composite laminate structures; Furnaces and boilers in industry; High speed aerodynamics; Mechanical engineering measurements and sensors; Mechanics of robots; Mechatronics systems; Pipelines; Processes and equipment for water treatment; Risk management in terotechnology; Selected chapters from the theory of elasticity; Sensors and computer based measurements; Service properties of welded joints; Ship equipment M (2 hours - 2 ECTS) + Ship systems M (3 hours - 4 ECTS); Theory of mechanical vibrations; Turbomachinery; Wind turbines 2.

List of elective courses at the position 2.5 – 22 courses, (6 ECTS)

Aircraft performance; Avionics; Biofuels in combustion processes; Biomaterials in medicine and dentistry; CFD modelling of turbo-machinery; Computer simulation in manufacturing automation; Design of construction and mining machines subsystems; Design of logistic and warehouse systems; Embedded systems and IoT in mechanical engineering; Gas dynamics; Heat transfer; High speed machine design; Industrial automation; Mechanics of composite materials; New generation of machine tools and robots; Power steam boilers 2; Principles of environmental and work space protection (2 hours - 2 ECTS) + Energy in process engineering (3 hours - 4 ECTS); Quality assurance and quality control of welded joints; Ship strength 2; Thermal turbomachinery; Two-phase flows with phase transition; Vehicles and environment.

List of elective courses at the position 3.4 – 26 courses, (6 ECTS)

Aircraft maintenance; Assembly technology; Building energy certification; Combustible, technical and medical gases; Computational fluid dynamics (CFD); Computer graphics and virtual reality; Ecology of combustion; Economic analysis in process engineering (2 hours - 2 ECTS) + Maintenance in process industry (3 hours - 4 ECTS); Energy efficiency in buildings M; Finite element method in structural analysis; Food processing machines; Fundamentals of mining and construction machines dynamics; Hybrid technical systems; Information technologies in medicine; Intelligent control systems; Machine tools M; Project management & air regulation; Renewable energy resources - small hydropower plants; Selected topics in IC engines 1; Ship manoeuvring; Steam turbines 3; System effectiveness; Technical regulations and standards; Techno-economic analysis and project management; Tribology; Urban and special rail vehicles.

List of elective courses at the position 3.5 – 24 courses, (6 ECTS)

Aeroelasticity; Aircraft armament systems; Analysis and risk management in process industries (2 hours - 2 ECTS) + Design of fire protection systems (3 hours - 4 ECTS); Combustion appliances; Composite plates and beams; Computer control and monitoring in manufacturing automation; Computer simulations of thermalhydraulic processes and CFD; Draying and drayers (3 hours - 4 ECTS) + Technical legislation (2 hours - 2 ECTS); Heat exchangers; Improving the quality of business processes - Lean 6 sigma (2 hours - 2 ECTS) + Man - machine system design (3 hours - 4 ECTS); Information technology projects evaluation; Intelligent buildings; Micro manufacturing and characterization; Microfluidics and nanofluidics; Missile navigation, guidance and control algorithms; Multiphase flow; Plant design for food production and processing; Pumps and fans; Selected topics in IC engines 2; Software application in ship design; Solar energy; Systems engineering and mobility; Tribological systems; Turbocompressors.

University of Belgrade
Faculty of Mechanical Engineering and the Faculty of Mathematics

2nd level of studies
M.Sc. (graduate) Academic Studies – Industry 4.0
120 ECTS

Hours weekly	1st year		2nd year	
	1st semester	2nd semester	3rd semester	4th semester
1	1.1 Introduction to production systems	2.1 Designing business models in industry 4.0	3.1 Interfaces for interoperability in industry 4.0	4.1 Elective courses group M4
2				
3				
4				
5				
6	1.2 Contemporary management and network organizations	2.2 Machine learning of intelligent robotic systems	3.2 Elective courses group R1	4.2 Praxis, part 2
7				
8				
9				
10				
11	1.3 Statistics for automated data analysis	2.3 Cyber physical systems	3.3 Elective courses group M2	4.3 M.Sc. thesis – research work
12				
13				
14				
15				
16	1.4 Robotics and artificial intelligence	2.4 Elective courses group M1	3.4 Elective courses group M3	
17				
18				
19				
20				
21	1.5 Algorithms and data structures	2.5 Elective courses group R1	3.5 Praxis, part 1	4.4 M.Sc. thesis – defence
22				
23				
24				
25				

University of Belgrade – Faculty of Mechanical Engineering and University of Belgrade – Faculty of Mathematics jointly conduct a multidisciplinary **study programme of Master Academic Studies** called **Industry 4.0**, whereby the lead institution in the programme is the Faculty of Mechanical Engineering. The title **MASTER OF SCIENCE IN MECHANICAL ENGINEERING AND INFORMATICS** (M.Sc.) will be stated in the Diploma certificate of Master studies (120 ECTS). In international terms, this title corresponds to the title of the Master of Science (**M.Sc**. – in Latin, Magister Scientiæ). The study programme of Master Academic Studies Industry 4.0 is a **multidisciplinary** programme designed to educate a new generation of engineers who possess the knowledge, skills and competences necessary for the implementation of modern technologies brought about by the fourth industrial revolution – Industry 4.0.

All courses last for one semester.
For reference, the courses are coded according to their position:
1. the first digit is the number of the semester (vertical, column);
2. the second digit is the ordinal number of the course in the semester (horizontal).

Faculty of Mechanical Engineering
Faculty of Mathematics
Internship and Master thesis

Eligible for enrolment into the programme of Master Academic Studies - Industry 4.0 are the students who have completed the Bachelor Academic Studies at one of the faculties from the group of technical and technological sciences, natural sciences and mathematics or the group of information technology sciences. Students who completed Bachelor vocational studies do not have the right of direct enrolment in Master academic studies; instead, it is necessary for them to first complete Bachelor academic studies.

The maximum number of students for enrolling in Master Academic studies is **35**, and teaching is organized in groups of maximum 25 students for lectures, 15 for general exercises and up to 10 students for laboratory work.

"Master thesis" is written either in the compulsory course or in the elective course that students passed during Master academic studies – Industry 4.0. The Master thesis must contain at least two of the following fields: material on the topic studied and analysed, self-performed numerical calculation, self-done laboratory work, and/or self-performed mechanical design. Thesis defence cannot be conducted until all the exams have been passed. The curriculum stipulates that the Master thesis should be the result of practical research and closely related to internship; it is written under the joint supervision of the Master thesis supervisor and the mentor assigned by the company.

Two student internships provide an additional value to the programme. The first part of internship (Internship, part 1) is conducted throughout the entire semester, one day a week, for a total of 15 days, while the second part of the internship (Internship, Part 2) is conducted in the fourth semester with a total duration of 40 working days.

Elective courses

At the beginning of a school year, **a student has to choose** elective courses for that particular year of studies that he/she wants to attend and pass exams in. For each semester, as well as for **each position of a course** in a certain semester, there is a separate list of courses. With this respect, the following conditions must be taken into account: a student can choose only one of the elective courses that are included in the list for the given position. When choosing a course, the student needs to check the attendance requirements for each individual course. Classes in an elective course will be held only if a minimum of 5 students enroll in the course. Students who have a higher average grade have the priority when choosing a particular course.

Lists of elective courses in the school year 2025/2026.

List of elective courses at the position 2.4 – 3 courses, (6 ECTS)

Additive Manufacturing; Digital measuring systems; Supply chain management.

List of elective courses at the position 2.5 – 2 courses, (6 ECTS)

Data mining; Introduction to bioinformatics.

List of elective courses at the position 3.2 – 2 courses, (6 ECTS)

Computational intelligence; Machine learning.

List of elective courses at the position 3.3 – 3 courses, (6 ECTS)

Industrial internet of things and cyber security; Quality and risk management in industry 4.0; Virtual reality.

List of elective courses at the position 3.4 – 2 courses, (6 ECTS)

Data exquisite; Scheduling of manufacturing systems and processes.

List of elective courses at the position 4.1 – 3 courses, (6 ECTS)

Business intelligence and business analytics; Distributed systems in mechanical engineering; Flexible and reconfigurable manufacturing systems.

АЛУМНИ ФОНДАЦИЈА
МАШИНСКОГ ФАКУЛТЕТА

*After completing their studies, Bachelor mechanical engineers and Master mechanical engineers become part of the large family of alumni gathered and organised by **the Alumni Foundation of the Faculty of Mechanical Engineering in Belgrade**.*
The Alumni Foundation nurtures values, promotes success and advocates for the interests of its members, thus contributing to the development of the academic and professional community in the field of mechanical engineering.
By promoting science and education and affirming the reputation of the University of Belgrade – Faculty of Mechanical Engineering, the Foundation achieves broader social, national and humanitarian significance.
The Foundation strives to become the most significant promoter and the greatest support for excellence in education, research, innovation and entrepreneurship in the field of mechanical engineering in the region.
You can learn more about the work and organisation of our Alumni Foundation, as well as about all its activities, at http://alumni.mas.bg.ac.rs/

University of Belgrade
Faculty of Mechanical Engineering

3rd level of studies
Ph.D. (Doctoral) studies – Mechanical Engineering
ECTS 180

The study programme of Doctoral (Postgraduate) academic studies is performed within the curriculum framework schematically presented below.

<table>
<tr><th rowspan="2">ECTS</th><th colspan="2">1st year</th><th colspan="2">2nd year</th><th colspan="2">3rd year</th></tr>
<tr><th>1st semester</th><th>2nd semester</th><th>3rd semester</th><th>4th semester</th><th>5th semester</th><th>6th semester</th></tr>
<tr><td>5</td><td>Advanced course in mathematics
1.1.5</td><td>Selected topics in mechanics or Selected topics in fluid mechanics
2.1.5</td><td>Elective course
3.1.5</td><td rowspan="6">Elaboration of Ph.D. thesis proposal

4.1.30</td><td colspan="2" rowspan="6">Ph.D. thesis
5.60</td></tr>
<tr><td>5</td><td>Numerical methods
1.2.5</td><td>Elective course
2.2.5</td><td>Elective course
3.2.5</td></tr>
<tr><td>5</td><td>OMSR and communication
1.3.5</td><td>Elective course
2.3.5</td><td rowspan="3">Research & publication - III

3.3.20</td></tr>
<tr><td>5</td><td>Elective course
1.4.5</td><td rowspan="2">Research & publication - II

2.4.15</td></tr>
<tr><td>10</td><td>Research & publication - I
1.5.10</td></tr>
</table>

The conditions for enrolment in Doctoral studies are defined by the Rulebook on Doctoral Studies of the Faculty of Mechanical Engineering. The maximum number of students that can be enrolled in Doctoral studies is **50**.

In the table: white fields – compulsory courses, coloured fields – elective courses. The numerical code below the course name in this table represents: the first digit – the number of the semester; the second digit – the position of the course; the third digit – the number of ECTS points.

The study programme of Doctoral Studies – Mechanical Engineering is worth 180 ECTS points. Studies last for 3 (three) academic years. They consist of attending and passing 3 (three) compulsory and 6 (six) elective courses from the list of offered courses. Each course is one-semester, it is worth 5 ECTS points and comprises 50 hours of lectures with additional consultations and knowledge tests as agreed with the course teacher. A student can take a maximum of three courses held by one teacher.

The student must select a potential supervisor as soon as possible (form DS-1), in order to create a Financing Plan (form DS-2) and a Student Development Plan (form DS-3, which also includes elective courses). The student and the potential supervisor submit the signed forms DS-1, DS-2 and DS-3 no later than the end of the first semester of study in order to complete enrolment and obtain the student's book.

The student chooses all elective courses only in agreement with the potential supervisor. For a maximum of 2 (two) courses (a total of 10 ECTS points), there is a possibility of choosing courses that are not included in the list of elective courses at the Faculty, but are included in the lists of courses of other faculties within the University of Belgrade, with the consent of the President of the Committee for Doctoral Studies. Through compulsory and elective courses, the student acquires 45 ECTS points during the first 3 (three) semesters of study.

The remaining 30 ECTS points per semester are acquired through study and research work (work in the laboratory, research, mandatory publication of papers, as well as teaching suitable classes at the lower levels of study at the Faculty) in accordance with the Student Development Plan and under the guidance of a potential supervisor. Study and research work is carried out within the course in Research and publication I – III, whose contents and methods of evaluation are defined in the Book of Courses.

The courses in Research and Publication comprise:

- Laboratory research related to the general topic of the dissertation, stated in the plan of research. Being engaged in projects and other scientific and research activities that are within the scope of the field of development.
- Published papers in journals or proceedings of international conferences. One paper in the M21 category is worth 15 ECTS, M22 is worth 14 ECTS, M23 is worth 13 ECTS, M24 and M51 are worth 10 ECTS, M52 is worth 8 ECTS, M33 is worth 6 ECTS, M34 is worth 4 ECTS. The number of points for papers with multiple authors is divided by n-1, where n stands for the number of authors of the paper. The total number of points acquired on these grounds in all reports can be a maximum of 40, regardless of the number of papers. The report lists the paper with all bibliographic data, along with the assigned number of points.
- Classes held at the Bachelor and Master studies are worth one ECTS per class per week and per semester (2 classes per week during one semester are worth 2 ECTS). On these grounds, 30 ECTS can be acquired in all reports, regardless of the number of classes held. The name of the course with its position in the curriculum and the ID number in the Book of Courses, the number of classes held and the number of ECTS points are listed.

During Doctoral studies, the student must achieve the following results:
- in order to enrol in the second year of studies, the student must acquire a total of 48 ECTS points;
- by the end of the second year, the student must publish, or at least have one scientific paper related to the topic of the doctoral dissertation that has been accepted for publication, as well as defend the Project of the idea of the doctoral dissertation;
- in order to enroll in the third year of studies, the student must pass all courses, i.e. acquire 120 ECTS points.

In order to gain right to submit a request for the preparation of the dissertation, the student must acquire 120 ECTS points from the first two years of studies, including the defended Project of the idea of the doctoral dissertation.

In order to submit the doctoral dissertation to the supervisor for review (and subsequent defence), the candidate must have at least one published paper as the first author in a scientific journal of the category M21a, M21, M22 or M23 that is content-related to the topic of the doctoral dissertation.

In addition to these obligations, the PhD student is also required to engage in scientific and vocational projects that serve to educate him/her for the economic environment (application of the OMSR course) – the PhD student must also be a leader in the future expansion of his knowledge. The time that the doctoral student needs to spend in this kind of work is determined in agreement with the supervisor.

Compulsory courses

1.1 Advanced course in mathematics
- Partial differential equations
- Linear algebra

1.2 Numerical methods
1.3 Organization and methods of scientific research (OMNIR) and communication
2.1 Selected topics in fluid mechanics; Selected topics in mechanics

Lists of elective courses in the school year 2025/2026.

List of elective courses at the position 1.4 – 42 courses

Advanced course in clinical engineering; Aircraft flight mechanics; Aircraft systems and equipment integration; Airfoils and lifting surfaces of aircraft; Basic principles of fracture mechanics; Boundary layer theory; Computational modeling in mechanical engineering; Computer based measurements; Decision theory; Deformation measurements and stress analysis; Dynamics of viscous incompressible fluid flow; Ecodesign and sustainable logistics; Energy and environment; Epistemology of science and technique; Experimental data acquisition and processing; Explosive applications; Fuels and selected topics in combustion; Innovation management; Load distribution - analysis and synthesis - 2; Load distribution 1 - analysis and synthesis; Manufacturing management; Material science and engineering; Modeling of the drying process; Modelling of thermalhydraulic transients; Nanomechanical characterization of materials; Optimization of thermal power plants; Oscillations of mechanical systems; Principles of modeling in process engineering; Selected chapters in thermodynamics; Selected topics in aircraft composite structures; Selected topics in wind turbines; Ship dynamics; Structure testing methods; Surface engineering; Synthesis of mechanisms; Tensor calculus; Theory of elasticity; Theory of hydrodynamic stability; Thermodynamics chemical process; Turbulent flow measurements; Vehicle dynamics- selected chapters; Vehicle testing - special chapters.

List of elective courses at positions 2.2 – 45 courses

Adaptive structures; Advanced heat and mass transfer; Advanced linear systems; Aerodynamics and flight mechanics for autopilot and guidance system design; Analytical methods for engineering design; Anisotropic plates and shells; Biofluid mechanics – advanced course; Biologically inspired optimization algorithms; CAD/CAM systems and integration of product and manufacturing design; Composite materials mechanics; Contemporary biomedical engineering; Control and optimization of the power transmission of the locomotives; Dynamics of a system of rigid bodies; Energy efficiency in industry; Environmental engineering science; Finite element method; Flow phenomena in turbomachinery - design of blade cascade and impellers; Higher course of process phenomena; Integrated technical systems - actuators; Intelligent automation; Machine dynamics; Maintenance and quality management system; Mass, momentum and energy transport phenomena; Metallurgy of welded joints; Modern combustion appliances; Modern tendencies in ship structure analysis; Numerical simulation of IC engines processes - advanced approach; Numerical simulation of welding processes; Product development in mechanical engineering; Rationalization of energy consumption in households and industry; Regimes and energy efficiency of thermal power plants; Selected topics in machine elements - A; Selected topics in machine elements - B; Selected topics of strength of constructions; Selected topics of terminal ballistics; Selected topis in structural analysis of flying vehicles; Selected topics in aircraft armament systems; Ship-borne waves; Special algorithms of mechatronic; Special topics in applied aerodynamics; Statistic data processing of agricultur machinery; Structural analysis of material handling machines; Transport phenomena and analogies; Vehicle mechatronics - special chapters; Vehicle reliability.

List of elective courses at positions 2.3 – 40 courses

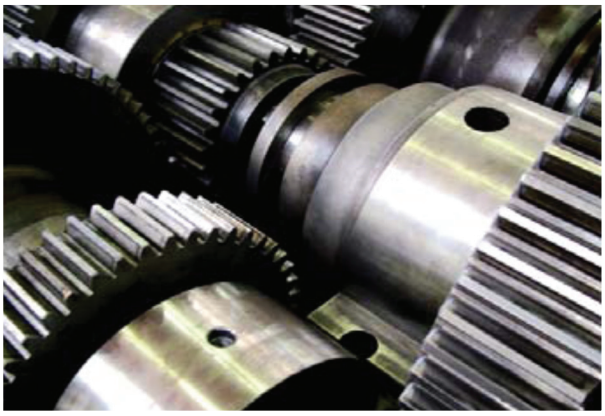
Advance techniques in IC engines – selected topics; Advanced course on the drying and moistening process; Advanced fuzzy control systems; Advanced thermal power cycles; Advanced thermodynamics (Non-equilibrium thermodynamics); Autonomous systems and machine learning; Combustion modeling; Computer modeling and structure calculation; Contemporary biomedical softwares; Cutting theory; Dynamics and strength of mining and construction machines; End-of-life vehicles; Environmental aspects of combustion; Fractional calculus with applications in engineering; Guided missiles navigational systems; Helicopter rotor aerodynamics; Information systems design; Lubrication theories; Man - machine interface; Mathematical methods in fluid mechanics; Methods in the design and construction of process equipment; Modelling, optimisation and forecasting in industrial engineering; Non-linear strength problems of rail vehicles; Operating systems in mechatronics; Propulsion of projectiles; Quality engineering techniques; Renewable energy sources; Selected topics in aeroelasticity; Selected topics in machine elements V; Selected topics on suppression of industrial risks, fire and explosions; Selected topics in computational aerodynamics; Special chapters from the flight dynamics of the aircraft; Specific topics in ship hydrodynamics; Stability of motion of a system; Structural integrity and life; Substitution of manual tasks in food industry; Technical legislation - Directives and standards; Thermodynamic analysis of processes and devices; Thin-walled structures; Vehicle logistics.

List of elective courses at positions 3.1 – 53 courses

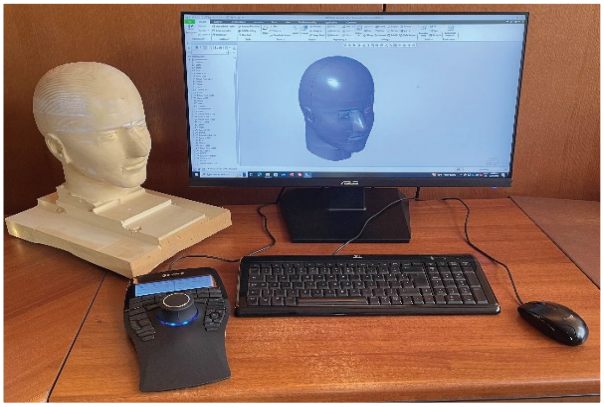
Advanced course of mechanical and hydromechanical operations and equipment; Advanced methods for maintenance of railway vehicles; Advanced techniques in IC engine testing; Aerodynamic shape optimization; Agricultur 4.0 - selected chapters; Aircraft production technology; Application of fracture mechanics to structural integrity; CFD in combustion; Coal dust preparation plants; Computability theory; Computational multi-fluid dynamics; Continuum mechanics; Corrosion of materials and protection; Digital processing of non-stationary signals; Dynamics of material handling and conveying machines; Energy efficiency in buildings; Energy efficiency of motor vehicles; Experimental aerodynamics; Failure diagnostic; Fatigue and life estimation of aeronautical stuctures; Forensic engineering - special chapters; Heat and mass transfer - numerical approach; Higher course of process energy and high-temperature devices and processes; Industrial robots modelling and simulations; Intelligent industrial robots; Inverse analysis in material characterization; Isogeometric analysis; Mechanics of ballistic systems; Mechatronic systems design; Methods for strength testing of pressure equipment; Methods of optimization mechanical systems; Microchannel fluid flow; Model and prototype testing of hydraulic machinery; Modeling and optimization of refrigeration systems; Modeling of solar thermal systems; Multiphase flows D; Nanosystems; Numerical methods in ship hydrodynamics; Optimal control of mechanical systems; Principles and concepts of industrial air pollution; Production planning and control systems; Risk management; Selected topics in aerospace propulsion; Selected topics in fluid structure interaction; Selected topics in logistics; Selected topics in machine design - A; Sliding and rolling bearings; Systems of artificial neural networks; Testing and optimization of machine tools; Thermoelasticity; Turbulent flows; Vehicles maintenance management; Wave induced dynamic loads on ship.

List of elective courses at positions 3.2– 53 courses

Advance in chemical process equipment; Advanced gasdynamics; Advanced intelligent control systems; Advanced robotics-selected chapters; Advanced systems in intelligent buildings; Advanced topics of missile guidance; Aerodynamics of thermal turbomachinery; Alternative vehicle drives; Behaviour and reliability of materials during exploitation; Biomass energy; CAI models; Cognitive robotics; Computational fracture mechanics; Digital forensics; Dynamic problems of rail vehicles; Especial chapters of theory of machines and mechanisms; Flow phenomena in turbomachinery – computational fluid dynamics; High speed crafts; Higher course of heat transfer operations and equipment; Higher course of mass transfer and equipment; IC engines dynamic problems; Impact mechanics; Integration of smart actuators and sensors; Magnetohydrodynamic flows; Measurement techniques in combustion; Mechanics of nonholonomic systems; Mechatronics systems and adaptronics; Modeling of turbulent flows; Modelling of composite material micromechanics; Modern concept of organization; Nanotechnology in medicine and stomatology; Non linear finite element methods; Numerical calculation of ship structures; Numerical structural analysis; Optimization and design of machinery and equipment for production and processing; Optimization of aerospace structures; Performance analysis of manufacturing systems; Planetary gear trains; Reliability and dinamics of power transmission units; Selected topics in aerodynamics; Selected topics in design and construction - B; Selected topics in material handling, constructions and logistics; Selected topics in missile design and launchers; Selected topics in operations research; Selected topics in projectile design; Selected topics of heat and mass transfer; Steam boilers hydrodynamic; Stochastic dynamics; Theory and simulation of the machining process; Thermal comfort and indoor environmental quality in buildings; Tribology of machine elements; Waste management and research; Water waves.






РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију
и обезбеђење квалитета у високом образовању
Број: 612-00-00168/4/2023-03
Датум: 17.10.2023. године
Булевар Михајла Пупина 2
Београд

На основу члана 23. став 9. тачка 1) Закона о високом образовању („Сл. гласник РС", бр. 88/17, 73/18, 27/18 – др. закон, 67/19, 6/20 - др. закони, 11/21 – аутентично тумачење, 67/21 - др. закон и 67/21) и Решења Комисије за акредитацију број 612-00-00168/3/2023-03 од 17.10.2023. године, Национално тело за акредитацију и обезбеђење квалитета у високом образовању издаје

У В Е Р Е Њ Е

о акредитацији студијског програма

Основних академских студија (ОАС) „Машинско инжењерство" за који је Захтев за акредитацију поднела високошколска установа **Машински факултет, Универзитет у Београду**, са седиштем у Београду, у улици Краљице Марије бр. 16, ПИБ: 100209517, Матични број: 07032501.

Имајући у виду да је Установа испунила све стандарде за акредитацију студијског програма прописане Правилником о стандардима и поступку за акредитацију студијских програма („Сл. гласник РС" бр. 13/19, 1/21, 19/21), студијски програм **основних академских студија (ОАС) „Машинско инжењерство"** је акредитован у оквиру образовно-научног поља техничко-технолошких наука и научне области: **Машинско инжењерство**, за упис **720 (седамсто двадесет) студената** у прву годину у седишту Установе, са називом дипломе **Инжењер машинства**, за извођење наставе на српском и енглеском језику.

Достављено:

- Високошколској установи
- Архиви НАТ-а

В. Д. ДИРЕКТОРА
Проф. др Ана Шијачки

РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију
и обезбеђење квалитета у високом образовању
Број: 612-00-00170/4/2023-03
Датум: 17.10.2023. године
Булевар Михајла Пупина 2
Београд

На основу члана 23. став 9. тачка 1) Закона о високом образовању („Сл. гласник РС", бр. 88/17, 73/18, 27/18 – др. закон, 67/19, 6/20 - др. закони, 11/21 – аутентично тумачење, 67/21 - др. закон и 67/21) и Решења Комисије за акредитацију број 612-00-00170/3/2023-03 од 17.10.2023. године, Национално тело за акредитацију и обезбеђење квалитета у високом образовању издаје

У В Е Р Е Њ Е

о акредитацији студијског програма

Мастер академских студија (МАС) „Машинско инжењерство" за који је Захтев за акредитацију поднела високошколска установа **Машински факултет, Универзитет у Београду**, са седиштем у Београду, у улици Краљице Марије бр. 16, ПИБ: 100209517, Матични број: 07032501.

Имајући у виду да је Установа испунила све стандарде за акредитацију студијског програма прописане Правилником о стандардима и поступку за акредитацију студијских програма („Сл. гласник РС" бр. 13/19, 1/21, 19/21), студијски програм **мастер академских студија (МАС) „Машинско инжењерство"** је акредитован у оквиру образовно-научног поља техничко-технолошких наука и научне области: **Машинско инжењерство**, за упис **416 (четристо шеснаест) студената** у прву годину у седишту Установе, са називом дипломе **Мастер инжењер машинства**, за извођење наставе на српском и енглеском језику.

Достављено:

- Високошколској установи
- Архиви НАТ-а

В. Д. ДИРЕКТОРА
Проф. др Ана Шијачки

РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију
и обезбеђење квалитета у високом образовању
Број: 612-00-00169/4/2023-03
Датум: 17.10.2023. године
Булевар Михајла Пупина 2
Београд

На основу члана 23. став 9. тачка 1) Закона о високом образовању („Сл. гласник РС", бр. 88/17, 73/18, 27/18 – др. закон, 67/19, 6/20 - др. закони, 11/21 – аутентично тумачење, 67/21 - др. закон и 67/21) и Решења Комисије за акредитацију број 612-00-00169/3/2023-03 од 17.10.2023. године, Национално тело за акредитацију и обезбеђење квалитета у високом образовању издаје

У В Е Р Е Њ Е

о акредитацији студијског програма

Докторских академских студија (ДАС) „Машинско инжењерство" за који је Захтев за акредитацију поднела високошколска установа **Машински факултет, Универзитет у Београду**, са седиштем у Београду, у улици Краљице Марије бр. 16, ПИБ: 100209517, Матични број: 07032501.

Имајући у виду да је Установа испунила све стандарде за акредитацију студијског програма прописане Правилником о стандардима и поступку за акредитацију студијских програма („Сл. гласник РС" бр. 13/19, 1/21, 19/21), студијски програм **докторских академских студија (ДАС) „Машинско инжењерство"** је акредитован у оквиру образовно-научног поља техничко-технолошких наука и научне области: **Машинско инжењерство**, за упис **50 (педесет) студената** у прву годину у седишту Установе, са називом дипломе **Доктор наука – машинско инжењерство**, за извођење наставе на српском и енглеском језику.

Достављено:

- Високошколској установи
- Архиви НАТ-а

В. Д. ДИРЕКТОРА
Проф. др Ана Шијачки

РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију
и обезбеђење квалитета у високом образовању
Број: 612-00-00164/4/2023-03
Датум: 17.10.2023. године
Булевар Михајла Пупина 2
Београд

На основу члана 23. став 9. тачка 1. Закона о високом образовању („Сл. гласник РС", бр. 88/17, 73/18, 27/18 – др. закон, 67/19, 6/20 - др. закони, 11/21 – аутентично тумачење, 67/21 - др. закон и 67/21) и Решења Комисије за акредитацију број 612-00-00164/3/2023-03 од 17.10.2023. године, Национално тело за акредитацију и обезбеђење квалитета у високом образовању издаје

У В Е Р Е Њ Е

о акредитацији високошколске установе

Машински факултет, Универзитет у Београду, са седиштем у Београду, у улици Краљице Марије бр. 16, ПИБ: 100209517, Матични број: 07032501, испуњава прописане стандарде за акредитацију високошколске установе.

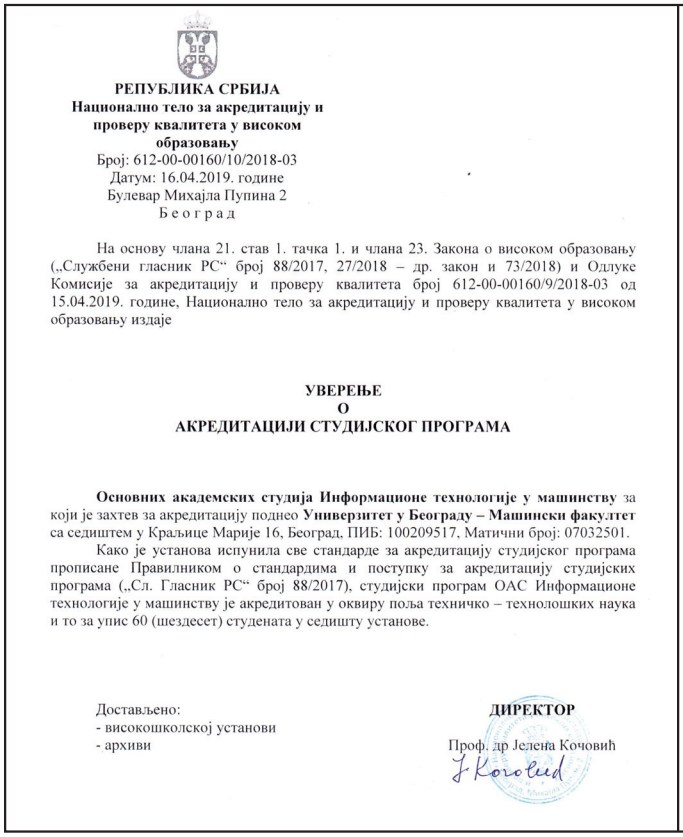
Имајући у виду да је Установа испунила све стандарде за акредитацију високошколских установа прописане Правилником о стандардима и поступку за акредитацију високошколских установа („Службени гласник РС" број 13/19), високошколска установа **Машински факултет, Универзитет у Београду** је акредитована.

Достављено:

- Високошколској установи
- Архиви НАТ-а

В. Д. ДИРЕКТОРА
Проф. др Ана Шијачки

National Accreditation Certificates 2023-2030



РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију и проверу квалитета у високом образовању
Број: 612-00-00160/10/2018-03
Датум: 16.04.2019. године
Булевар Михајла Пупина 2
Београд

На основу члана 21. став 1. тачка 1. и члана 23. Закона о високом образовању („Службени гласник РС“ број 88/2017, 27/2018 – др. закон и 73/2018) и Одлуке Комисије за акредитацију и проверу квалитета број 612-00-00160/9/2018-03 од 15.04.2019. године, Национално тело за акредитацију и проверу квалитета у високом образовању издаје

УВЕРЕЊЕ
О
АКРЕДИТАЦИЈИ СТУДИЈСКОГ ПРОГРАМА

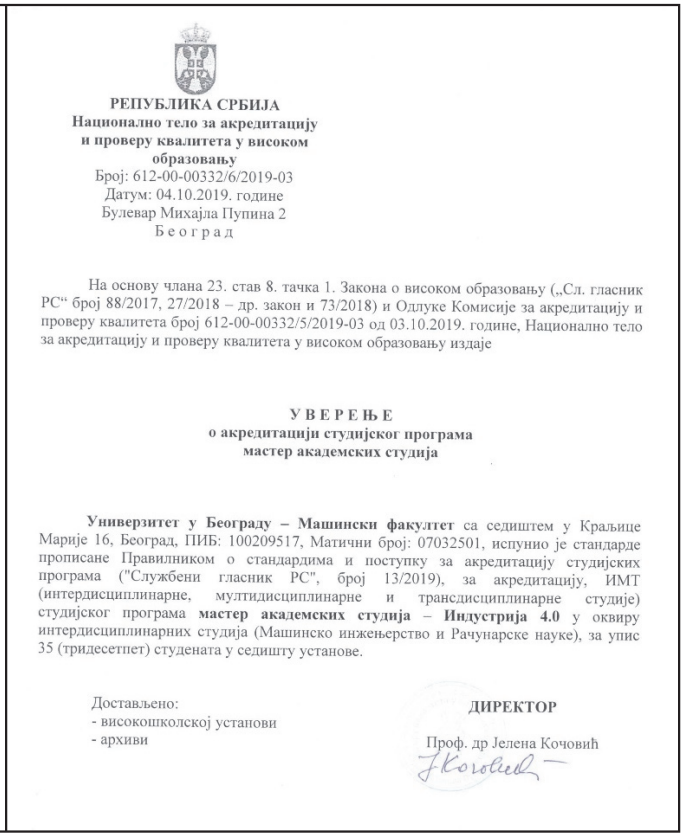
Основних академских студија Информационе технологије у машинству за који је захтев за акредитацију поднео **Универзитет у Београду – Машински факултет** са седиштем у Краљице Марије 16, Београд, ПИБ: 100209517, Матични број: 07032501.

Како је установа испунила све стандарде за акредитацију студијског програма прописане Правилником о стандардима и поступку за акредитацију студијских програма („Сл. Гласник РС“ број 88/2017), студијски програм ОАС Информационе технологије у машинству је акредитован у оквиру поља техничко – технолошких наука и то за упис 60 (шездесет) студената у седишту установе.

Достављено:
- високошколској установи
- архиви

ДИРЕКТОР
Проф. др Јелена Кочовић

National Accreditation Certificate for the Study Programme of Bachelor Academic Studies – Information Technologies in Mechanical Engineering 2019-2026



РЕПУБЛИКА СРБИЈА
Национално тело за акредитацију и проверу квалитета у високом образовању
Број: 612-00-00332/6/2019-03
Датум: 04.10.2019. године
Булевар Михајла Пупина 2
Београд

На основу члана 23. став 8. тачка 1. Закона о високом образовању („Сл. гласник РС“ број 88/2017, 27/2018 – др. закон и 73/2018) и Одлуке Комисије за акредитацију и проверу квалитета број 612-00-00332/5/2019-03 од 03.10.2019. године, Национално тело за акредитацију и проверу квалитета у високом образовању издаје

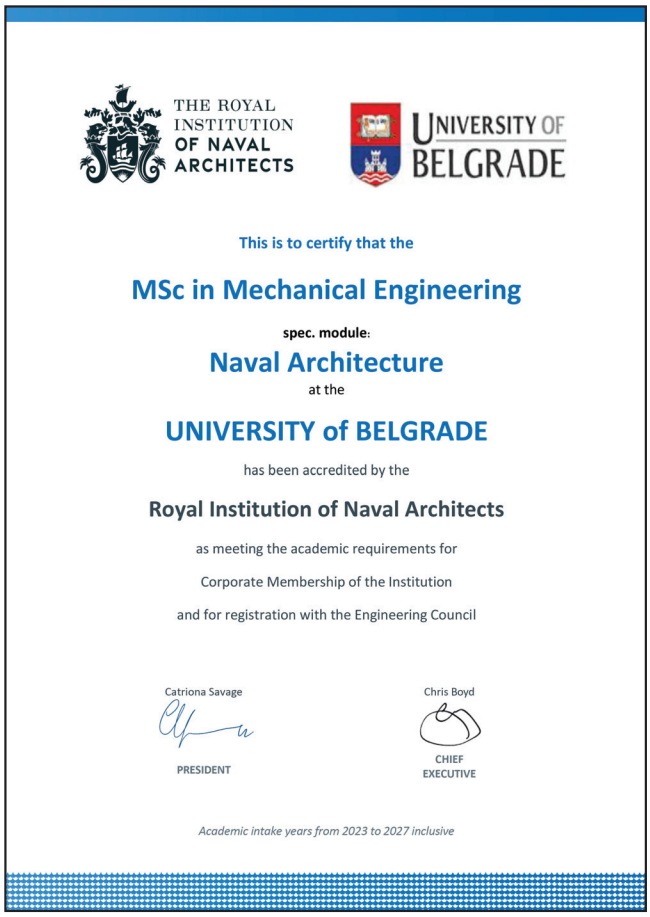
У В Е Р Е Њ Е
о акредитацији студијског програма мастер академских студија

Универзитет у Београду – Машински факултет са седиштем у Краљице Марије 16, Београд, ПИБ: 100209517, Матични број: 07032501, испунио је стандарде прописане Правилником о стандардима и поступку за акредитацију студијских програма ("Службени гласник РС", број 13/2019), за акредитацију, ИМТ (интердисциплинарне, мултидисциплинарне и трансдисциплинарне студије) студијског програма **мастер академских студија – Индустрија 4.0** у оквиру интердисциплинарних студија (Машинско инжењерство и Рачунарске науке), за упис 35 (тридесетпет) студената у седишту установе.

Достављено:
- високошколској установи
- архиви

ДИРЕКТОР
Проф. др Јелена Кочовић

National Accreditation Certificate for the Study Programme of Master Academic Studies – Industry 4.0 2019-2026



THE ROYAL INSTITUTION OF NAVAL ARCHITECTS

UNIVERSITY OF BELGRADE

This is to certify that the

MSc in Mechanical Engineering

spec. module:

Naval Architecture

at the

UNIVERSITY of BELGRADE

has been accredited by the

Royal Institution of Naval Architects

as meeting the academic requirements for

Corporate Membership of the Institution

and for registration with the Engineering Council

Catriona Savage
PRESIDENT

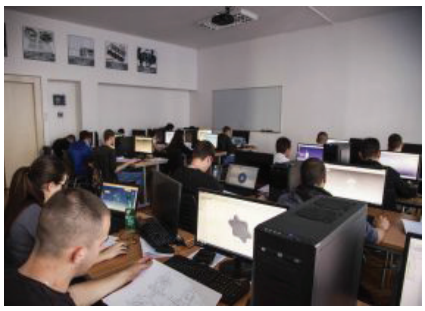
Chris Boyd
CHIEF EXECUTIVE

Academic intake years from 2023 to 2027 inclusive

RINA Accreditation 2023-2027

Students' life at Faculty of Mechanical Engineering

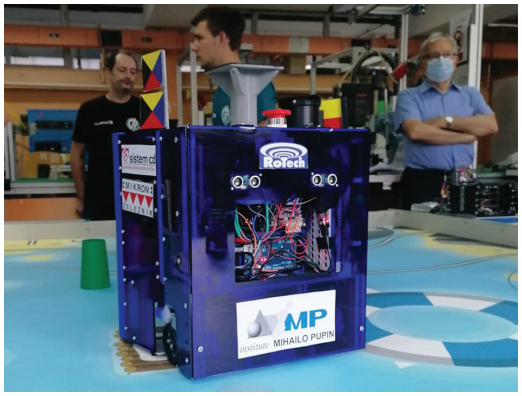
Admission Ceremony



Students attending a lecture

Traditional internet chess match Uni-Belgrade vs.
Uni-Texas Dallas - TransAtlantic Cup "Svetozar Gligoric"

Regional mechanical engineering students gathering "Mašinijada"



Faculty of Mechanical Engineering
Student Team – "Robotoid"

University of Belgrade Formula Student Team – "Road Arrow"

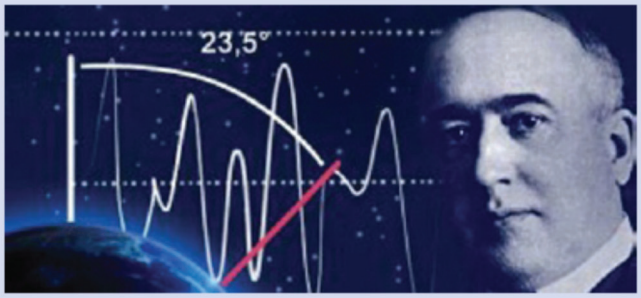
Faculty of Mechanical Engineering
Student Team – "Confluence Belgrade"

Faculty of Mechanical Engineering Student Team – "Beoavia"

Best students Award

Promotion Ceremony of Doctors of Philosophy in Mechanical Engineering (Ph.D.)
in Rectorate`s Ceremonial Room

Famous Serbian Scientists and Innovators



Milutin Milanković, Serbian civil engineer, doctor of technical sciences and university professor, best known for his theory of ice ages, relating variations of the Earth's orbit and long-term climate change, now known as Milankovitch cycles.
Born in 1879 in Dalj in a Serbian merchant family in former Austro-Hungary. Died in 1958 in Belgrade.
At age of 25, defended his doctoral thesis at TU Vienna and proudly became the first Serbian Doctor of Technical Sciences. Worked for an engineering company in Vienna, using his knowledge to design structures. Obtained several patents relating to methods of building with reinforced concrete.

In 1909, became university professor heading the 'Chair of Applied Mathematics' at the University of Belgrade. Lectured on rational mechanics, celestial mechanics and theoretical physics, doing in parallel his scientific research.

http://en.wikipedia.org/wiki/Milutin_Milankovi%C4%87

Monuments of Nikola Tesla

Belgrade

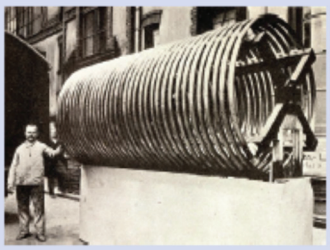
Niagara Falls

$1\ T = 1\ Wb/m^2$

Tesla Roadster

Mihajlo Pupin, Serbian-American physicist and inventor, was born in village Idvor in former Austria-Hungary empire (today part of Serbia) in 1858. Michael Pupin immigrated to the United States in 1874, graduated from Columbia University in physics in 1883, and obtained his Ph.D. at the University of Berlin in 1889. Pupin taught at Columbia University for more than 40 years, 30 of them as a professor of electromechanics. Died in 1935 in New York.

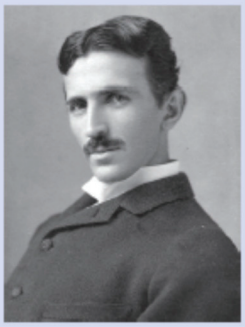
Michael Idvorski (after his birthplace) Pupin improved the quality of long-distance telephone and telegraph transmission by inserting coils in the long lines at intervals; he discovered that matter struck by X-rays is stimulated to radiate other X-rays (secondary radiation) and invented an electrical resonator. Michael Pupin received 34 patents for his inventions, and he won the Pulitzer Prize in 1924 for his autobiography, "From Immigrant to Inventor".



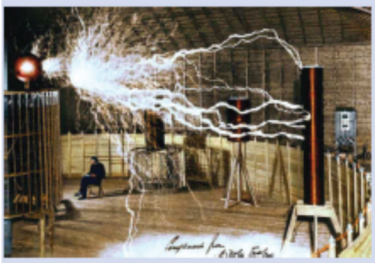
Pupin was a founding member of National Advisory Committee for Aeronautics (NACA) on March 3, 1915, which later became NASA.

http://en.wikipedia.org/wiki/Mihajlo_Pupin

Nikola Tesla, Serbian-American inventor was born in 1856 in village Smiljan in former Austria-Hungary empire. He was the son of a Serbian Orthodox clergyman. Tesla studied engineering at the Austrian Polytechnic School, then worked as an electrical engineer in Budapest and later emigrated to the United States in 1884 to work at the Edison Machine Works. He died in New York City on Christmas Day January 7, 1943.



During his lifetime, Tesla invented fluorescent lighting, the Tesla induction motor, the Tesla coil, and developed the alternating current (AC) electrical supply system that included a motor and transformer, and 3-phase electricity.



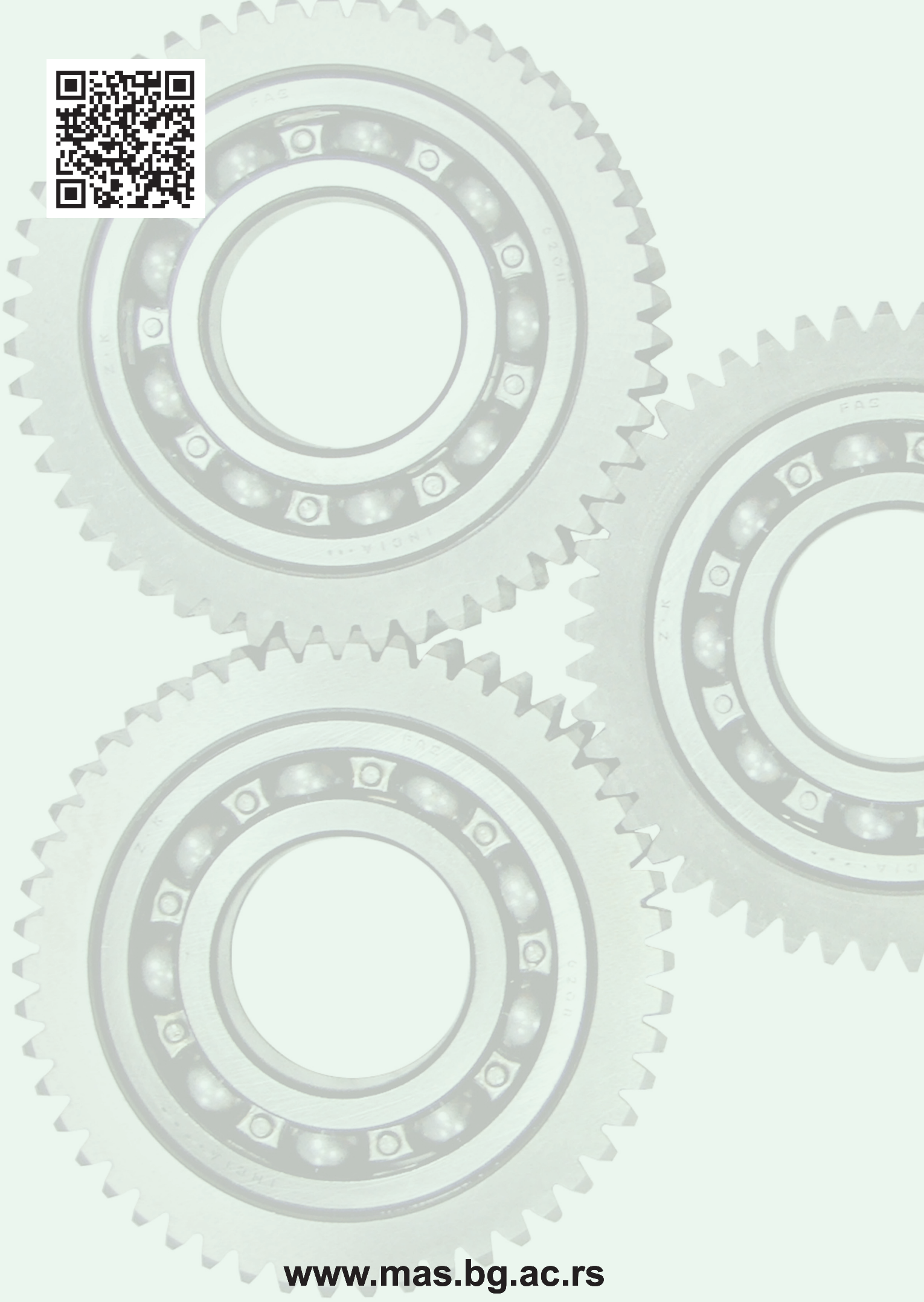
Tesla is now credited with inventing modern radio as well; since the Supreme Court overturned Guglielmo Marconi's patent in 1943 in favor of Nikola Tesla's earlier patents. The Tesla coil, invented in 1891, is still used in radio and television sets and other electronic equipment.

In 1960, in honor of Tesla, the General Conference on Weights and Measures for the International System of Units dedicated the name "Tesla" to the SI unit measure for magnetic field strength.

http://en.wikipedia.org/wiki/Nikola_tesla

Belgrade airport named Nikola Tesla

www.mas.bg.ac.rs



www.mas.bg.ac.rs