Serbian-Bavarian Higher Education Day
September 23rd and 24th, 2019, University of Bamberg

University of Belgrade
Faculty of Mechanical Engineering:
Expertise fields and cooperation possibilities

Prof. Dr. Predrag Elek
Vice Dean for International Cooperation
The University has:
• 31 faculties
• 11 scientific research institutes
• 8 centers
• University Library with 3,500,000+ volumes

The faculties clustered into four groups:
• social sciences and humanities
• medical sciences
• natural sciences and mathematics
• technology and engineering sciences

University of Belgrade is one of the largest universities in the Balkans:
• over 95,000 students
• 6,100 members of teaching/research staff
• students can choose from around 430 different study programs
University of Belgrade
Faculty of Mechanical Engineering

Faculty of Mechanical Engineering at the University of Belgrade:

• the **oldest and largest** educational and scientific institution in the area of mechanical engineering in the Balkans
• Faculty staff > 200
• Students > 3,500
• Alumni > 22,000
• **significant resources** in terms of labs, research and IT equipment, modern classrooms, library, etc.
University of Belgrade
Faculty of Mechanical Engineering

System of studies
# University of Belgrade

## Faculty of Mechanical Engineering

<table>
<thead>
<tr>
<th>Bachelor Studies, 180 ECTS</th>
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<tbody>
<tr>
<td>Accreditation: max 720 enrolled</td>
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<tr>
<td>overall ≈ 2,700 students</td>
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<tr>
<th>Hours weekly</th>
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<td>Mathematics 1</td>
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<td>Thermodynamics</td>
<td>Fluid mechanics</td>
<td>Electrical engineering</td>
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<td>2</td>
<td>Mechanics 1</td>
<td>Basics of strength of constructions</td>
<td>Mechanics 2</td>
<td>Mechanics 3</td>
<td>Numerical methods</td>
<td>Control engineering</td>
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<td>Con constructive geometry and graphics</td>
<td>Engineering graphics</td>
<td>Machine elements 1</td>
<td>Machine elements 2</td>
<td>Manufacturing technology</td>
<td>Elective course 6.3.5</td>
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<td>Strength of materials</td>
<td>Engineering materials 1</td>
<td>Engineering materials 2</td>
<td>Elective course 4.4.5</td>
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<td>Basics of sociology and economics</td>
<td>Engineering materials 2</td>
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<td>English 2</td>
<td>Elective course 3.5.5</td>
<td>Mechanical engineering praxis</td>
<td>Elective course 5.5.5</td>
<td>Final course with a report (B.Sc. thesis) 6.5.5</td>
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<td>Final course with a report (B.Sc. thesis) 6.5.5</td>
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## Master Studies 120 ECTS

### Accreditation:
- max 416 students enrolled
- overall ≈ 1,100 students

### Courses:

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<th>Hours weekly</th>
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- Course codes: 1.5, 2.5, 3.5, 4.5
- Optional: Foreign language 4.2

- Master (M.Sc.) thesis 4.3
- Skill praxis M of elective module 4.1
University of Belgrade
Faculty of Mechanical Engineering

Doctoral Studies, 180 ECTS

<table>
<thead>
<tr>
<th>ECTS</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
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<tr>
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<td>Advanced course of mathematics 1.1.5</td>
<td>Advanced course of mechanics or fluid mechanics 2.1.5</td>
<td>Elective course 3.1.5</td>
<td>Research &amp; publication - IV 4.1.8</td>
<td>Ph.D. thesis text preparation 5.1.10</td>
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<td>Research &amp; publication - II 2.4.15</td>
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<td>Research &amp; publication of papers for Ph.D. thesis 5.2.20</td>
<td>Ph.D. thesis public defense preparation 6.2.20</td>
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University of Belgrade
Faculty of Mechanical Engineering

National accreditation
(CAQA, ENQA)

International accreditation
(ASIIN, EUR-ACE)
University of Belgrade
Faculty of Mechanical Engineering

Chairs/Departments
UB-FME is organized through 25 Departments (16 specialized and 9 general)

1. Production Engineering
2. Material Handling, Constructions and Logistics
3. Agricultural Engineering
4. Industrial Engineering
5. Mechanics
6. Theory of Mechanisms and Machines
7. Thermal Science Engineering
8. Thermal Power Engineering
9. Process and Environmental Protection Engineering
10. Thermomechanics
11. Hydropower Engineering
12. Mathematics
13. Aerospace Engineering
14. Control Engineering
15. Physics and Electrical Engineering
16. Fluid Mechanics
17. Weapon Systems
18. Naval Architecture
19. Internal Combustion Engines
20. Motor Vehicles
21. Railway Mechanical Engineering
22. General Machine Design
23. Engineering Materials
24. Strength of Structures
25. Biomedical Engineering
University of Belgrade
Faculty of Mechanical Engineering

Study Modules (Specialization fields)
UB-FME has 22 modules at Master studies

1. Aerospace Engineering
2. Biomedical Engineering
3. Control Engineering
4. Naval Architecture
5. Welding and Welded Structures
6. Design in Mechanical Engineering
7. Mechanical Engineering and IT
8. Railway Mechanical Engineering
9. Internal Combustion Engines
10. Engineering of Biotechnical Systems
11. Motor Vehicles
12. Industrial Engineering
13. Food Industry Engineering
14. Production Engineering
15. Mechanics
16. Process Engineering and Environmental Protection
17. Weapon Systems
18. Thermal Power Engineering
19. Material Handling, Constructions and Logistics
20. Hydropower Engineering
21. Thermal Science Engineering
22. Computational Engineering
Aerospace Engineering

- Applied aerodynamics
- Structural analysis
- Computational aerodynamics
- Flight dynamics
- Composite structures
- Aircraft control and systems
- Aircraft propulsion
- Aircraft design
- Avionics
- Helicopters
- Wind turbines
Biomedical Engineering

- Spectroscopy methods and techniques
- Biomedical instrumentation and equipment
- Biomaterials in medicine and dentistry
- Biomechanics of tissue and organs
- Introduction to nanotechnology
- Signal processing
- Nanotechnology
- Clinical engineering
- Nanomedical engineering
Control Engineering

- Computer control
- Automatic control
- Fuzzy control systems
- Nonlinear systems
- Object and process dynamics
- Design and control system technology
- Linear system design
- Dynamic Systems Simulation and Testing
- Industrial Automation
Naval Architecture

- Ship resistance
- Ship strength
- Ship propulsion
- Buoyancy and stability of ship
- Ship structures
- Ship maneuvering
- International maritime regulations
- Software application in ship design
- Ship design
- Seakeeping
- Marine Engines
- Ship turbines and boilers
University of Belgrade
Faculty of Mechanical Engineering

Welding and Welded Structures

- Engineering Materials
- Fuel, lubricants and industrial water
- Design of Welded Structures
- Welding Metallurgy
- Design and Construction
- Operational Strength
- Welding Technology
- Reliability of Structures
- Fracture Mechanics and Structural Integrity
Design in Mechanical Engineering

- Product aesthetic
- Axiomatic methods
- Ergonomic design
- Development of machine systems
- Methods for decision making
- Bionics in design
- Special methods in product development
- Design and ecology
Mechanical Engineering and Information Technology

- C/C++
- Algorithms and Data Structures
- Object-Oriented Paradigm
- The Data Exquisite in Mechanical Engineering
- Distributed Systems in Mechanical Engineering
- Computer Networks
- Information Integration of Business Functions
- Digital Systems Design
- Method of Optimization
- Programmable Control Systems
- Statistical Analysis in Mechanical Engineering
- Designing Software for Mechanical Engineering
Railway Mechanical Engineering

- Railway cars 1
- Theory of traction
- Locomotives
- Brakes of rail vehicles
- Railway vehicles maintenance
- Basics of rail vehicle dynamics
Internal Combustion Engines

- Engine working processes
- Engine fuelling and ignition systems
- Engine design
- IC engines mechatronics
- Supercharging of IC engines
- Engine design project
- Engine testing
- Ecology of mobile power sources
Engineering of Biotechnical Systems

- Technological processes in agro complex
- Tractors and self-propelled agricultural machines
- Fundamental transport phenomena and drying techniques
- Designing agricultural machines and equipment
- Special techniques and technology of drying
- Processing technology of agricultural products
- Geoinformation and remote control of biotechnic systems
- Managing food safety and quality
- Plant and process design and energy systems
- Plant design for food production and processing
Motor Vehicles

- Vehicle Design
- System Effectiveness
- Vehicle Propulsion Systems
- Automotive Frictional Systems
- Vehicle Mechatronics
- Vehicle Structures
- Vehicle Testing
- Vehicle Maintenance
- Forensic Engineering
- Intelligent vehicle systems
Industrial Engineering

- Production management
- Engineering Statistics
- Industrial Logistics
- Ergonomic Design
- Design of Organizations
- Operations Research
- Industrial Management
- Databases Systems
- Design of Logistic and Warehouse Systems
- Modern Quality Approaches
Food Industry Engineering

- Product aesthetics
- Refrigeration equipment
- Engineering condition monitoring
- Mechanisms and manipulators design
- Engineering economy
- Packaging machines
- Food processing machines
- Design of plants and process and energy systems
University of Belgrade
Faculty of Mechanical Engineering

Production Engineering

- Manufacturing automation
- Industrial robots
- Manufacturing systems design
- Computer integrated systems and technologies
- Production information systems
- New technologies
- Quality management
- Intelligent manufacturing systems
- Assembly systems
- Computer control and monitoring in manufacturing automation
- Computer simulation in manufacturing automation
- Coordinate measuring machines
- Decision-making methods
Mechanics

- Analytical mechanics
- Continuum mechanics
- Theory of elasticity
- Theory of finite elements
- Mechatronic robotics
- Multiphase flows
- Fluid mechanics
- Applied numerical fluid mechanics
Process Engineering and Environmental Protection

- Transport phenomena in process industry
- Mechanical and hydromechanical operations and equipment
- Heat transfer operations and equipment
- Energy in process engineering
- Concepts of environmental and workplace protection
- Chemical and biochemical operations and reactors
- Design, construction and exploitation of process plants
- Mass transfer operations and equipment
- Air pollution control
- Waste and wastewater management
Weapon Systems

- Physics of explosive processes
- Flight dynamics with aerodynamics of projectiles
- Rocket propulsion
- Fire control systems
- Interior ballistics
- Automatic weapons
- Projectile design
- Launching theory
- Artillery weapon design
- Guidance and control of projectiles
- Design of missiles and launchers
- Terminal ballistics
- Optical devices and optoelectronics
Thermal Power Engineering

- Steam turbines
- Energy steam boilers
- Thermal power plants
- Gas turbines
- Planning in energy engineering
- Design and exploitation of thermal power plants
- Steam generators
University of Belgrade
Faculty of Mechanical Engineering

Material Handling, Constructions and Logistics

- Computer Aided Design in Material Handling Practice
- Construction, Mining and Conveying Machinery Elements
- Conveying and Material Handling Machines
- Cranes Design
- Design of Construction and Mining Machines’ Subsystems
- Eco Design
- Facility Layout and Industrial Logistics
- Fundamentals of Mining and Construction Machines Dynamics
- Mining and Construction Machines
- Structural and Stress Analysis
- Transport and Logistic Systems Design
Hydropower Engineering

- Theory of turbomachinery
- Pumps
- Hydraulic turbines
- Design computations in turbomachinery
- Fans and turbo-compressors
- Hydropower plants and equipment
- Hydraulic torque converters
- Hydropower measurements
Thermal Science Engineering

- Steam boilers elements and equipment
- Refrigeration equipment
- Steam boiler processes
- Refrigeration systems
- Fundamentals of air conditioning
- Thermal power plants and heat plants
- Heat pumps
- Ventilating and air conditioning systems
University of Belgrade
Faculty of Mechanical Engineering

Computational Engineering

- Programming
- Scientific Computing
- Numerical Analysis
- Algorithms
- Software Engineering
- Parallel Numerics
- High Performance Computing
- Scientific Visualisation
University of Belgrade Formula Student Team – “Road Arrow”

- 2010 – Team founded
- 2012 – First Class I competition
- 2013 – 10th place in general standings
- 2014 – 15th place
- 2015 – 9th place
- 2016 – 14th place
- 2017 – 4th place (Cost report)
- 2018 – 5th place (Endurance test)
- 2019 – 9th place
Faculty of Mechanical Engineering Student Team – “Confluence Belgrade” (naval architecture)

- **Hydrocontest**
  - The major global student competition promoting the research in energy efficiency of ships
  - Students were challenged to design, build and pilot the most energy efficient ship

- **2016 – Team founded**

- **2017 – Saint-Tropez, France, 22 teams**
  - 2nd place (lightweight )
  - 3rd place (heavyweight)
  - 4th place (endurance)

- **2018 – Saint-Tropez, France, 28 teams**
  - 1st place (heavyweight )
  - 4th place (lightweight)
Faculty of Mechanical Engineering Student Team – “Aurora” (rocketry)

- The Airbus Sloshing Rocket Workshop 2019
  - a design competition organized by EUROAVIA and Airbus, a global leader in the aerospace field
  - ArianeGroup supports the competition during the evaluation of the submitted design
- Teams are required to design, build and fly a low-cost reusable rocket which is destabilized by the movement of water stored within an unpressurised tank
- 1\textsuperscript{st} after the first stage (evaluation of the detailed design)
- 4\textsuperscript{th} place in final stage (build and fly their design), Patras, Greece, July 2019
Careers

• Employability of Mechanical Engineering Graduates
  – UB-FME is well known for the success of its graduates in the employment market.

• Partnership with industry
  – In recent years, the Faculty has forged strong links with industry.

• University of Belgrade – Center for Career Development
  – Workshops related to interview techniques, psychometric testing, business communication, team-work, time management, ...
  – Job Fair for final year students and recent graduates.

• Entrepreneurship
  – Business Technology Incubator – founded by FME through cooperation with faculties of Civil, Electrical and Chemical Engineering and with the City of Belgrade
  – FME also set up Innovation Center – an economic development tool
  – New ventures designed to empower student entrepreneurs