

Serbian-Bavarian Higher Education Day  
September 23<sup>rd</sup> and 24<sup>th</sup>, 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:

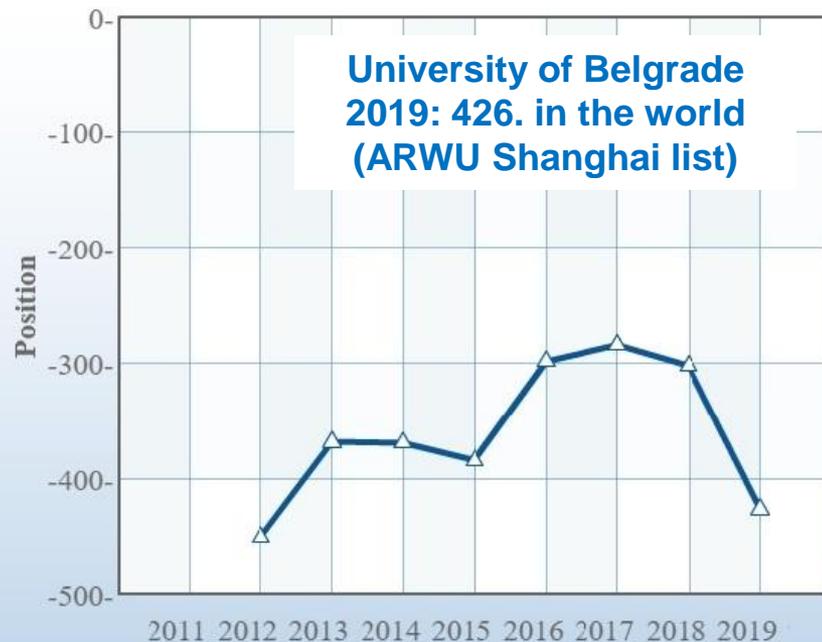
- 31 faculties
- 11 scientific research institutes
- 8 centers
- University Library with 3,500,000+ volumes

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

Ph.D. in ME		Ph.D. STUDIES	8	16	480	
Licenced Engineer				15	450	
M.Sc. Spec. Engineer	Professional Exam	Ph.D. STUDIES	7	14	420	
				13	390	
M.Sc. in ME	Specialisation Studies		6	12	360	
				11	330	
B.Sc. in ME	M.Sc. STUDIES		Ph.D. STUDIES	5	10	300
					9	270
				4	8	240
					7	210
B.Sc. in ME	B.Sc. STUDIES	Ph.D. STUDIES	3	6	180	
				5	150	
			2	4	120	
				3	90	
			1	2	60	
				1	30	
ACADEMIC STUDIES			Year	Sem	ECTS	



# University of Belgrade

## Faculty of Mechanical Engineering

**Bachelor  
Studies,  
180 ECTS**

**Accreditation:  
max 720  
enrolled**

**overall  $\approx$  2,700  
students**

Hours week- ly	1 <sup>st</sup> year		2 <sup>nd</sup> year		3 <sup>rd</sup> year	
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
1	Mathematics 1	Mathematics 2	Mathematics 3	Thermodynamics B	Fluid mechanics B	Electrical engineering
2						
3						
4						
5						
6	Mechanics 1	Basics of strength of constructions	Mechanics 2	Mechanics 3	Numerical methods	Control engineering
7						
8						
9						
10						
11	Constructive geometry and graphics	Engineering graphics	Machine elements 1	Machine elements 2	Manufacturing technology	Elective course 6.3.5
12						
13	Strength of materials					
14						
15						
16	Physics and measurements	Engineering materials 1	Engineering materials 2	Elective course 4.4.5	Elective course 5.4.5	Elective course 6.4.5
17						
18		Basics of sociology and economics				
19						
20						
21	English 1	English 2	Elective course 3.5.5	Mechanical engineering praxis	Elective course 5.5.5	Final course with a report (B.Sc. thesis) 6.5.5
22						
23	Programming	Computational tools				
24						
25						
				Elective Skill praxis B 4.8		



# University of Belgrade

## Faculty of Mechanical Engineering

Hours weekly	1 <sup>st</sup> year		2 <sup>nd</sup> year	
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
1	COURSE OF ELECTIVE MODULE 1.1.5	COURSE OF ELECTIVE MODULE 2.1.5	COURSE OF ELECTIVE MODULE 3.1.5	Skill praxis M of elective module 4.1
2				
3				
4				
5				
6	COURSE OF ELECTIVE MODULE 1.2.5	COURSE OF ELECTIVE MODULE 2.2.5	COURSE OF ELECTIVE MODULE 3.2.5	Optional: Foreign language 4.2
7				
8				
9				
10	Mechanics M or Fluid mechanics M 1.3.5	COURSE OF ELECTIVE MODULE 2.3.5	COURSE OF ELECTIVE MODULE 3.3.5	
11				
12				
13	Thermodynamics M or Mechatronics 1.4.5	Elective course 2.4.5	Elective course 3.4.5	
14				
15				
16				
17	Elective course 1.5.5	Elective course 2.5.5	Elective course 3.5.5	Master (M.Sc.) thesis 4.3
18				
19				
20				
21				
22				
23				
24				
25				

**Master Studies**  
**120 ECTS**

**Accreditation:**  
**max 416 students**  
**enrolled**

**overall ≈ 1,100 students**



# University of Belgrade

## Faculty of Mechanical Engineering

**Doctoral Studies, 180 ECTS**

**Accreditation: max 50 students enrolled overall ≈ 350 students**

ECTS	1 <sup>st</sup> year		2 <sup>nd</sup> year		3 <sup>rd</sup> year	
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>
5	Advanced course of mathematics 1.1.5	Advanced course of mechanics or fluid mechanics 2.1.5	Elective course 3.1.5	Research & publication - IV 4.1.8	Ph.D. thesis text preparation 5.1.10	Ph.D. thesis text preparation 6.1.10
5	Numerical methods 1.2.5	Elective course 2.2.5	Elective course 3.2.5			
5	OMSR and communication 1.3.5	Elective course 2.3.5	Research & publication - III 3.3.20	The project of Ph.D. thesis proposal 4.2.22	Research & publication of papers for Ph.D. thesis 5.2.20	Ph.D. thesis public defense preparation 6.2.20
5	Elective course 1.4.5	Research & publication - II 2.4.15				
10	Research & publication - I 1.5.10					



# University of Belgrade Faculty of Mechanical Engineering

National accreditation  
(CAQA, ENQA)

International accreditation  
(ASIIN, EUR-ACE)

РЕПУБЛИКА СРБИЈА  
КОМИСИЈА ЗА АКРЕДИТАЦИЈУ И  
ПРОВЕРУ КВАЛИТЕТА  
Број: 612-06-01260/2012-04  
08.03.2013. године  
Београд

У В Е Р Е Њ Е  
О АКРЕДИТАЦИЈИ ВИСОКОШКОЛСКЕ УСТАНОВЕ

МАШИНСКИ ФАКУЛТЕТ са седиштем у  
100209517, Матични број: 07032501, испунио  
услове установе, прописане Правилником о  
високошколских установа и студентских  
универзитетских установа и студентских  
универзитетских установа у складу са  
Законима о високошколској установи  
(16, 112/08),  
Законима о високошколској установи  
(15, 100/07, 97/08, 44/10).

ПРЕДСЕДНИК  
Проф. др. Вепо Вујаћ

РЕПУБЛИКА СРБИЈА  
КОМИСИЈА ЗА АКРЕДИТАЦИЈУ И  
ПРОВЕРУ КВАЛИТЕТА  
Број: 612-06-01260/2012-04  
08.03.2013. године  
Београд

У В Е Р Е Њ Е  
О АКРЕДИТАЦИЈИ СТУДИЈСКОГ ПРОГРАМА  
ОСНОВНИХ АКАДЕМСКИХ СТУДИЈА

УНИВЕРЗИТЕТ У БЕОГРАДУ - МАШИНСКИ ФАКУЛТЕТ са седиштем у  
КРАЉИЦЕ МАРИЈЕ 16, БЕОГРАД, ПИБ: 100209517, Матични број: 07032501, испунио  
услове установе, прописане Правилником о високошколским установама и поступку за акредитацију  
високошколских установа и студентских програма (Службени гласник РС" број 106/06,  
112/08), за акредитацију студентског програма "основне академске студије -  
лока техничко-технолошких наука и то за уписе 540 (дестотинчетласног) студентата у  
прву годину у основици Установе.  
Ово уверење издаје се на основу члана 16, став 5, тачка 1) Закона о високошколској  
установи („Службени гласник РС" број 76/05, 100/07, 97/08, 44/10).

Достављено:  
- високошколској установи  
- архиви КАПК

ПРЕДСЕДНИК  
Проф. др. Вепо Вујаћ



Accreditation Certificate

for the  
Bachelor's degree programme  
„Mechanical Engineering"  
at the  
University of Belgrade

The award of the subject-based ASIIN seal is valid from 28 June 2013 and limited until 30 September 2018.  
The degree programme includes the following options: full time path.  
The degree programme is aligned to Level 7 of the European Qualifications Framework for Lifelong Learning (EQF LLL).

21 July 2014

Dr.-Ing. Martin Molzahn  
Chairman of the Accreditation Commission  
for Degree Programmes

Prof. Dr. Jürgen Grottemeyer  
Chairman of the Accreditation Commission  
for Degree Programmes

Dr. Wing Wasser  
Managing Director



Accreditation Certificate

for the  
Master's degree programme  
„Mechanical Engineering"  
at the  
University of Belgrade

The award of the subject-based ASIIN seal is valid from 28 June 2013 and limited until 30 September 2018.  
The degree programme includes the following options: full time path.  
The degree programme is aligned to Level 7 of the European Qualifications Framework for Lifelong Learning (EQF LLL).

21 July 2014

Dr.-Ing. Martin Molzahn  
Chairman of the Accreditation Commission  
for Degree Programmes

Prof. Dr. Jürgen Grottemeyer  
Chairman of the Accreditation Commission  
for Degree Programmes

The ASIIN seal is awarded to a degree programme which fulfils the requirements of academia and professional life in the respective disciplines on a high level. At the same time it confirms that the conditions for good teaching and successful learning are provided. The award of the label is based on recognized learning-outcomes oriented subject specific standards aligned with the European Qualifications Framework and the „European Standards and Guidelines".





# 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

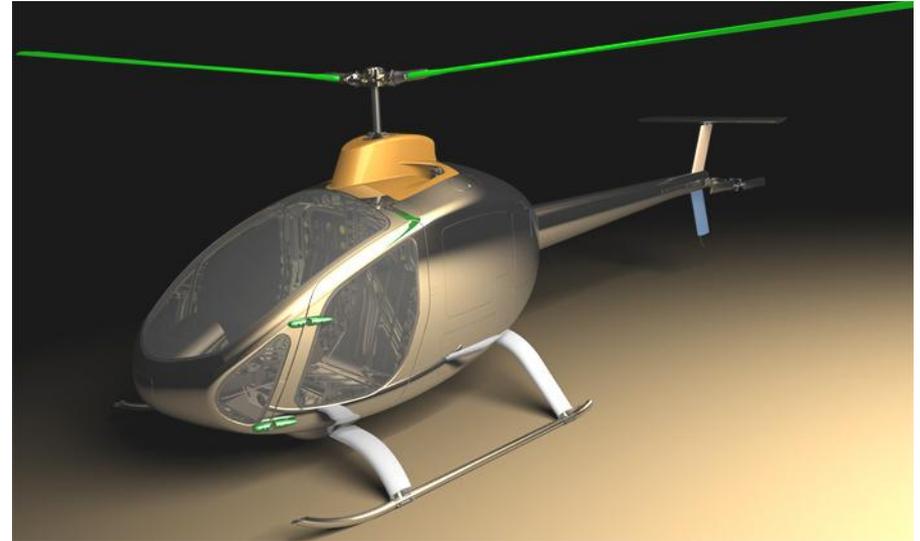


# University of Belgrade

## Faculty of Mechanical 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



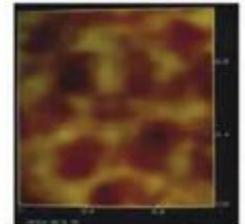
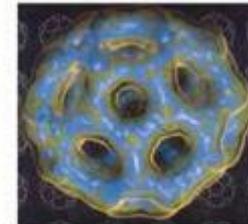
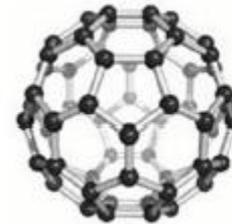


# University of Belgrade

## Faculty of Mechanical Engineering

### 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





# University of Belgrade

## Faculty of Mechanical 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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



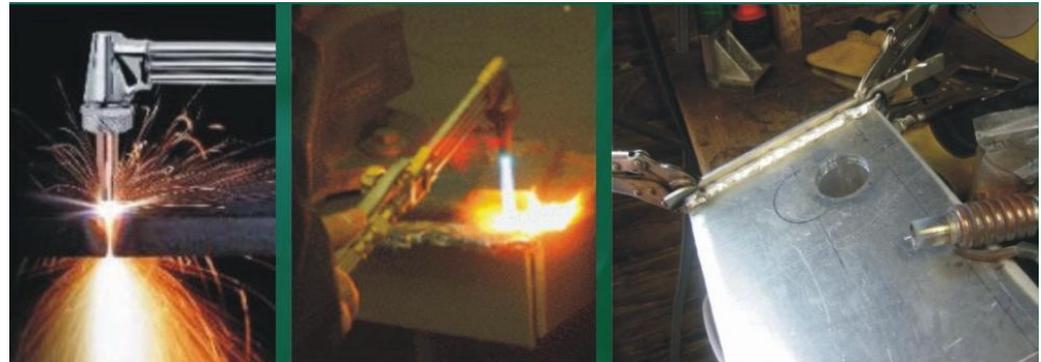


# University of Belgrade

## 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



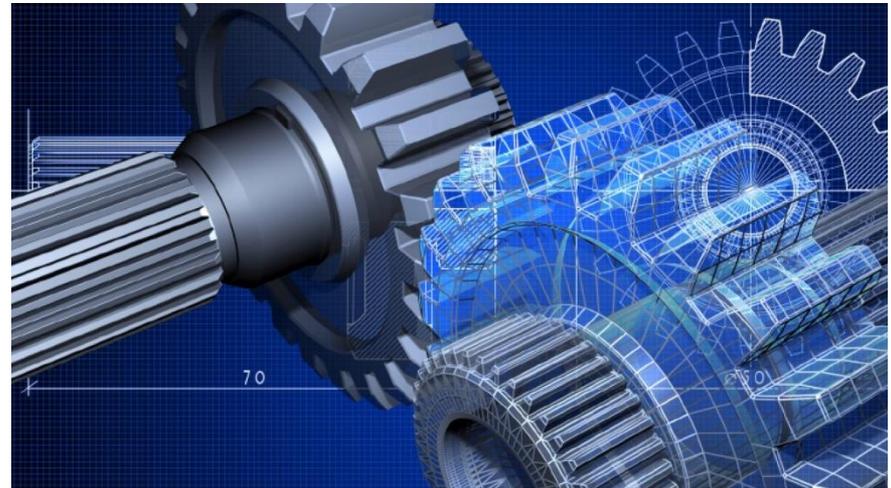


# University of Belgrade

## Faculty of Mechanical Engineering

### 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





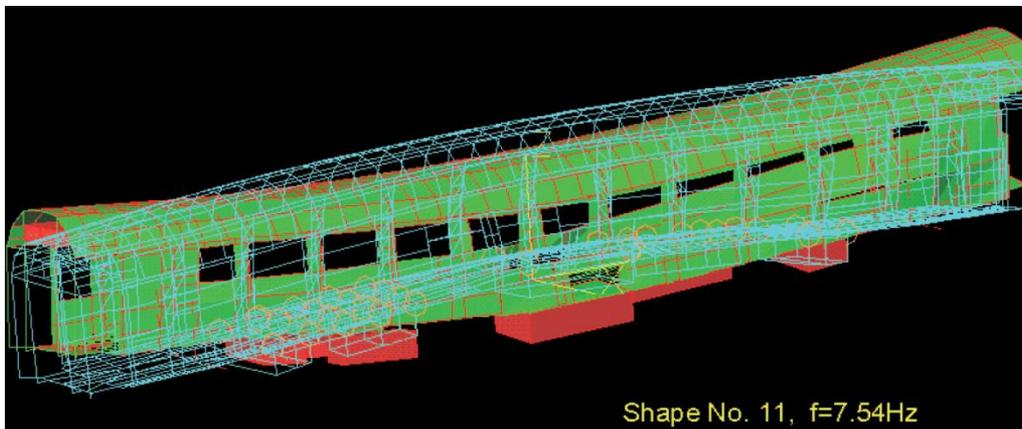
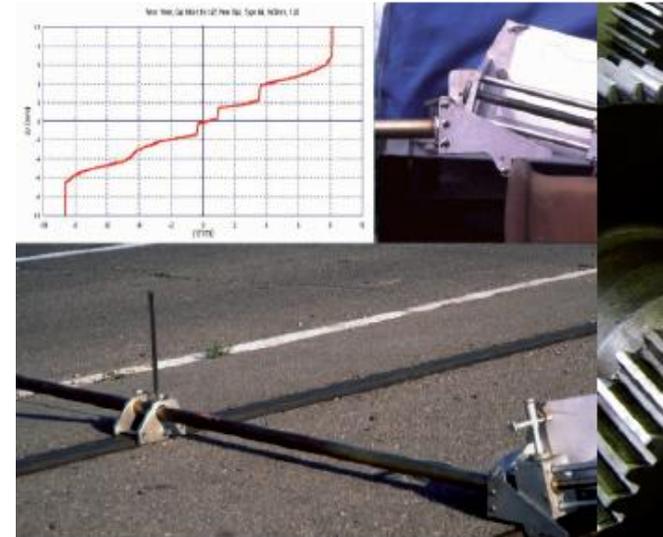


# University of Belgrade

## Faculty of Mechanical Engineering

### Railway Mechanical Engineering

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





# University of Belgrade

# Faculty of Mechanical Engineering

## 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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



**Students of the Industrial Engineering module –  
Winners of the Bosch week**





# University of Belgrade

## Faculty of Mechanical Engineering

### 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



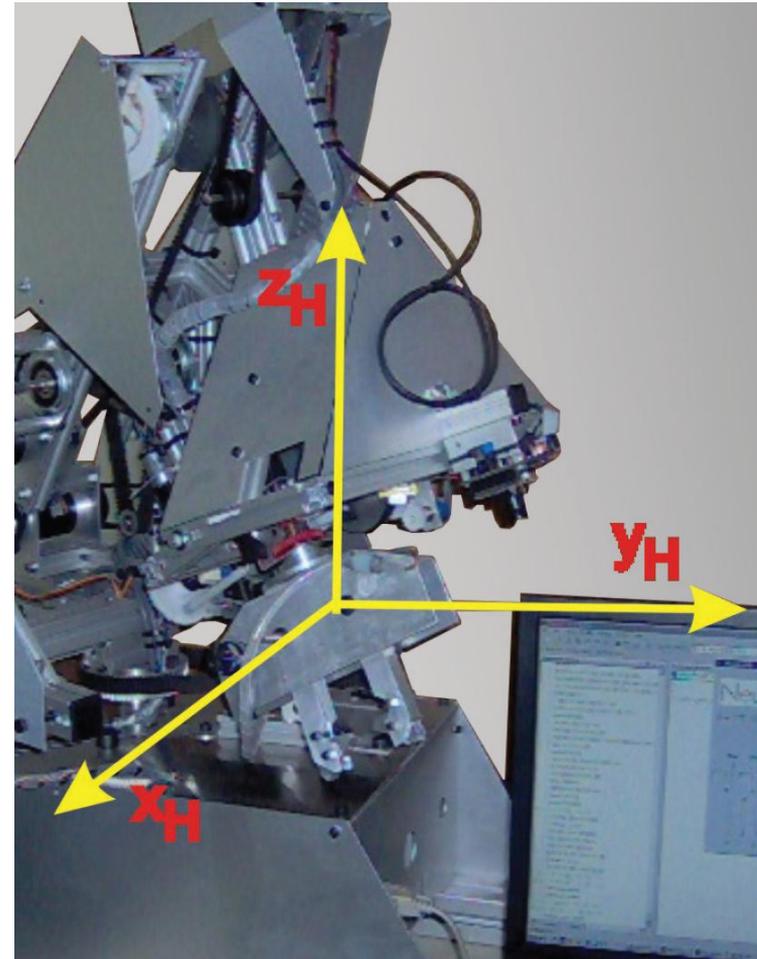


# University of Belgrade

## Faculty of Mechanical Engineering

### Mechanics

- Analytical mechanics
- Continuum mechanics
- Theory of elasticity
- Theory of finite elements
- Mechatronic robotics
- Multiphase flows
- Fluid mechanics
- Applied numerical fluid mechanics





University of Belgrade

Faculty of Mechanical Engineering

## 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



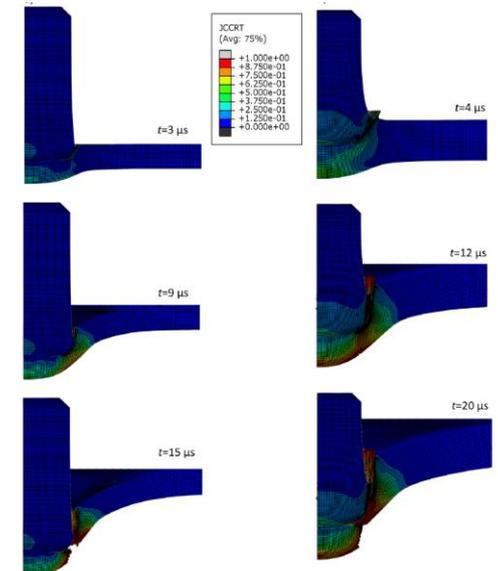


# University of Belgrade

## Faculty of Mechanical Engineering

### 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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



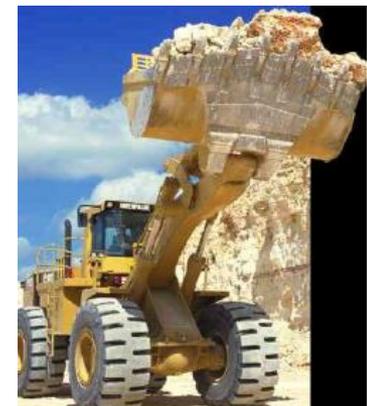


# University of Belgrade

## 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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





# University of Belgrade

## Faculty of Mechanical Engineering

### 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



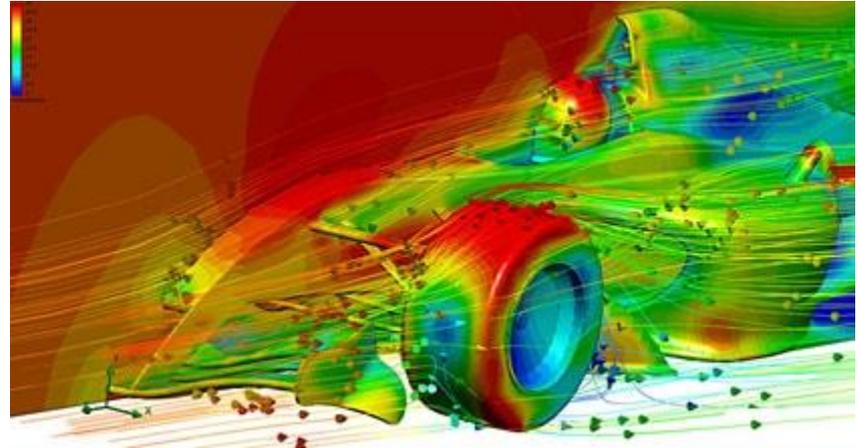


# University of Belgrade

# Faculty of Mechanical Engineering

## Computational Engineering

- Programming
- Scientific Computing
- Numerical Analysis
- Algorithms
- Software Engineering
- Parallel Numerics
- High Performance Computing
- Scientific Visualisation





# University of Belgrade Faculty of Mechanical Engineering

## University of Belgrade Formula Student Team – “Road Arrow”

- 2010 – Team founded
- 2012 – First Class I competition
- 2013 – 10<sup>th</sup> place in general standings
- 2014 – 15<sup>th</sup> place
- 2015 – 9<sup>th</sup> place
- 2016 – 14<sup>th</sup> place
- 2017 – 4<sup>th</sup> place (Cost report)
- 2018 – 5<sup>th</sup> place (Endurance test)
- 2019 – 9<sup>th</sup> place





# University of Belgrade

## Faculty of Mechanical Engineering

### 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
  - 2<sup>nd</sup> place (lightweight )
  - 3<sup>rd</sup> place (heavyweight)
  - 4<sup>th</sup> place (endurance)
- 2018 – Saint-Tropez, France, 28 teams
  - 1<sup>st</sup> place (heavyweight )
  - 4<sup>th</sup> place (lightweight)





# University of Belgrade

## Faculty of Mechanical Engineering

### 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<sup>st</sup> after the first stage (evaluation of the detailed design)
- 4<sup>th</sup> place in final stage (build and fly their design), Patras, Greece, July 2019





# University of Belgrade

## Faculty of Mechanical Engineering

### 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

