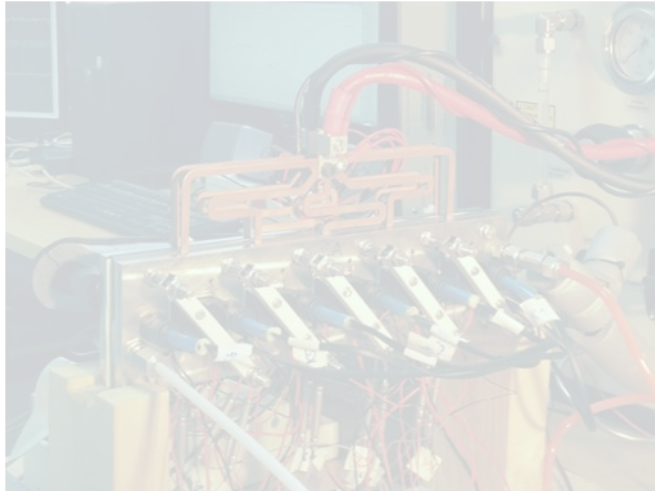




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FACULTY OF ELECTRICAL ENGINEERING,  
MECHANICAL ENGINEERING AND  
NAVAL ARCHITECTURE, University of Split,  
Split, Croatia



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# Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, University of Split Split, CROATIA (HR)

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CROATIA







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# Split, CROATIA







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Arts Academy  
Faculty of Humanities and Social Science  
Faculty of Electrical Engineering, Mechanical Engineering and  
Naval Architecture  
Faculty of Economics, Business and Tourism  
Catholic Faculty of Theology  
Faculty of Chemistry and Technology  
Faculty of Kinesiology  
Faculty of Civil Engineering, Architecture and Geodesy  
School of Medicine  
Faculty of Maritime Studies  
Faculty of Law  
Faculty of Science  
University Department of Health Studies  
University Department of Marine Studies  
University Department of Professional Studies  
University Department of Forensic Sciences  
Military Nautical Studies Courses: Military Nautical Engineering  
and Military Marine Engineering"  
Mediterranean Agriculture  
Hotel Management And Gastronomy



# Study Programs



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**Electrotechnics and  
Information Technologies**

Bachelor			Master		Ph.D.		
1	2	3	1	2	1	2	3



**Computer Science**

1	2	3	1	2	1	2	3
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**Mechanical Engineering**

1	2	3	1	2	1	2	3
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**Naval Architecture**

1	2	3	1	2
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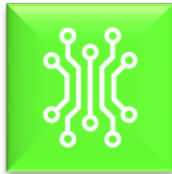
**Industrial Engineering**

1	2	3	1	2
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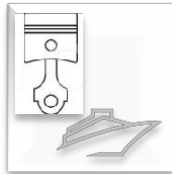
# Organization/Departments



**Power Engineering**



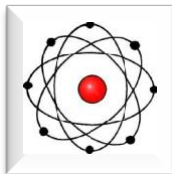
**Electronics**



**Mechanical Engineering and Naval Architecture**



**Mechanical Technology and Materials**



**Mathematics and Physics**



**Common Courses**



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# FESB in numbers

## Teaching staff/researchers

Full professors 35

Associate professors 20

Assistant professors 34

Lecturers 7

Assistants/postdocs 28

Assistant/PhD students 31

155

## Students

Current students 2600

Enrollment 600

Alumni 9000

PhD degrees awarded 55



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# FESB in numbers



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the European Union



Total area (sq.m.) 29 500

Amphitheatres 9

Classrooms 11

Computer labs 10

Laboratories 95





Department of mechanical engineering and naval architecture  
Faculty of electrical engineering, mechanical engineering and naval architecture



## **Associate prof. dr. sc. Ivan Tolj**

Research Interests: PEM fuel cells, Water and heat management of PEM fuel cells, Hydrogen storage and compression, Integration of PEM fuel cells into various systems such as Forklifts, Golfcarts, CHP systems etc.



## **Professor dr. sc. Damir Sedlar**

Research Interests: Dynamics, finite element method, noise and vibration



## **Professor Gojmir Radica**

ICE – testing, diagnostic and optimization, hydrogen systems etc. Hybrid systems control and optimization...

# Laboratory for New Energy Technologies

## Activities:

- Testing and characterization of (PEM) fuel cells
- Effect of operational parameters on fuel cell performance
- Thermal effects on cell and stack level
- Flow field configuration
- Flow of reactants through the stack
- Fuel cell applications (motorcycle, boat)



## Equipment:

- Fuel cell test station
  - up to 8 cells
  - regulation and measurements of operational parameters
  - Controllable electronic load
  - Built-in EC impedance spectroscopy
- Potentiostat/galvanostat
- Single cell hardware (50cm<sup>2</sup>) X3
- Laboratory hydrogen generator (electrolyzer)
- 1 kW complete fuel cell system (Nexa)
  - Electronic load
  - DC/DC converter
  - metal hydride bottles



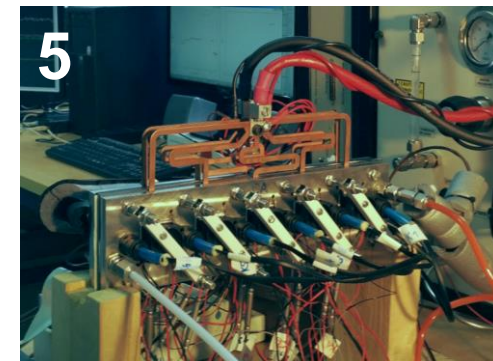
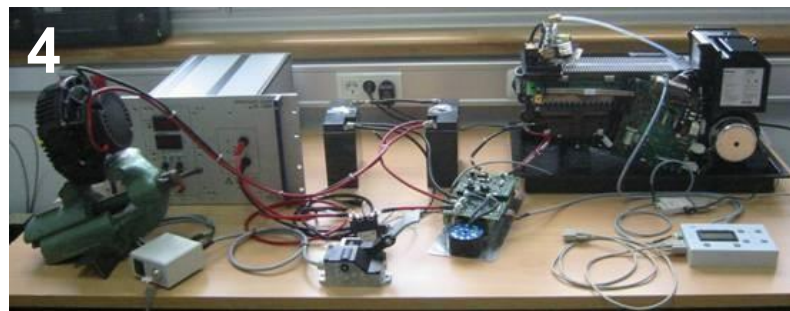
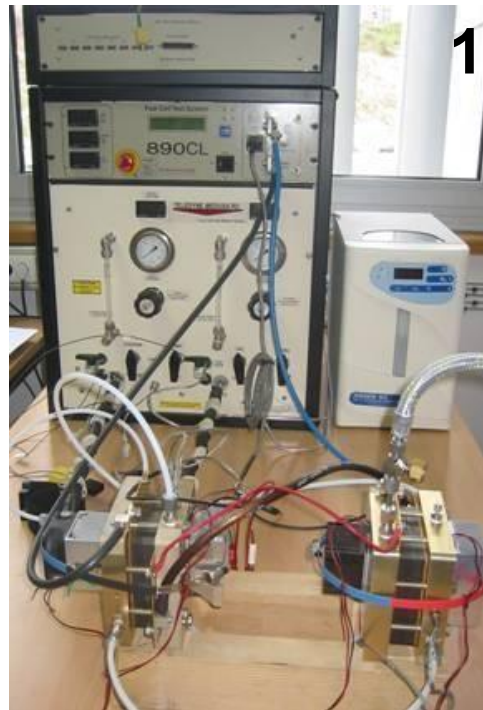
# From the Laboratory



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- ❑ Circulation of reactants through fuel cells (1)
- ❑ 1 kW stack operating on hydrogen from metal hydride bottles (2)
- ❑ Filling of metal hydride bottles (3)
- ❑ System integration; components testing (4)
- ❑ Segmented fuel cell (5)





# Newest Addition to the Lab



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## Hydrogen system

Fuel cell stack 1,2 kW

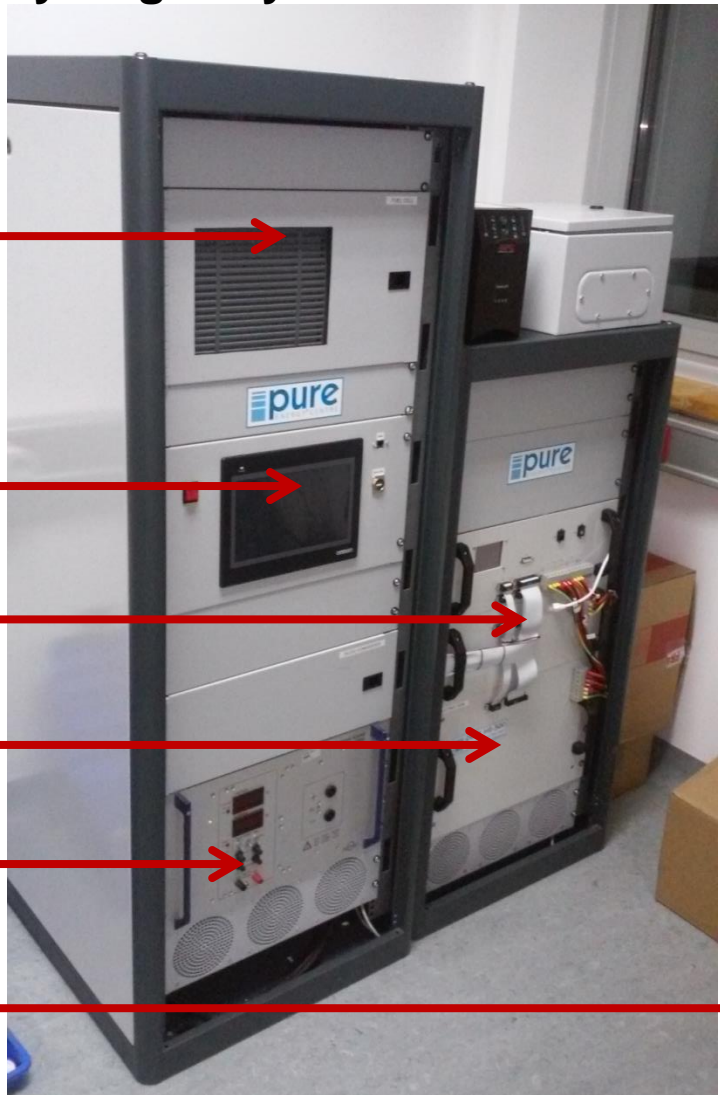
Control unit

Electrolyzer (3 kW)

DC/DC converter

Electronic load 1,5 kW

Hydrogen storage



## Electrolyzer single cell test station



# Fuel cell powered forklift



Donor vehicle	STILL RX60-30L
Bus voltage	80 VDC
Output power	~15 kW average, 30 kW peak
Dimensions	840 mm (W) x 1010 mm (D) x 777 mm (H)
Weight	1800...1900 kg
Stack	14.5 kW closed cathode PEMFC stack (Ballard);
H <sub>2</sub> storage	Integrated MH storage unit, 20 Nm <sup>3</sup>
Battery bank	Deep cycle lead-acid, 8...10 kWh



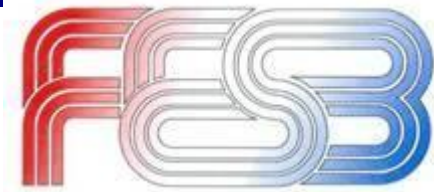
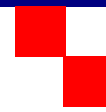
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**HySA** Systems  
Hydrogen South Africa

# Fuel Cell Activities at FESB

## Current Projects



- ❑ Water and Heat Management and Durability of PEM Fuel Cells, Croatian Science Foundation, 2014-2018
- ❑ Automotive Derivative Energy System (AutoRE) EC FCH Joint Undertaking (Horizon2020), 2015-2018
- ❑ Giantleap Improves Automation of Non-polluting Transportation with Lifetime Extension of Automotive PEM fuel cells (Giantleap) EC FCH Joint Undertaking (Horizon2020), 2016-2019
- ❑ STIM Center of Excellence for Science and Technology and Integration of the Mediterranean Region, Ministry of Science, Education and Sport, 2015-2020
- ❑ Hydrogen fuelled utility vehicles and their support systems utilising metal hydrides (Hydride4Mobility), H2020-MSCA-RISE-2017, 2017-2021



Research and  
Innovation Staff  
Exchange – RISE



STRUKTURNI I INVESTICIJSKI  
FONDIVI

GIANTLEAP



Hrvatska zaklada za znanost

SAPPHIRE





# Chair for Dynamics and Vibration

Department of mechanical engineering  
Faculty of electrical engineering, mechanical engineering and naval architecture

## Members:

dr. sc. Željko Lozina, professor

dr. sc. Damir Sedlar, associate professor

dr. sc. Ivan Tomac, assistant professor

Anđela Bartulović, mag. ing.

## Research:

- Numerical methods (meshfree)
- Structural change detection
- Modal analysis
- Wavelet analysis
- Rotordynamics

**Teaching:** Kinematics, Kinetics, C programming, FE method, Vibrations, Experimental Vibrations, Vehicle dynamics



# Laboratory for Dynamics and Machines

## Activities:

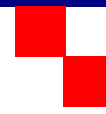
- Measuring vibration and sound
- Experimental modal analysis
- Measurement of sound absorption and isolation coefficient
- Measurement of the deformation
- Power measurement



## Equipment:

- Accelerometers for different purposes
- Microphones for different purposes
- PSV-500 Scanning vibrometer
- Electro-dynamic shaker with sliding table
- Modal shaker
- Impact hammer
- Dodecahedral sound source
- Software for modal analysis
- Anechoic and reverberant room under construction

# Dynamics and vibration activities at FESB



## Projects

- ❑ Development of innovative composite structures for sound insulation, EFRR, 2020-
- ❑ Development of an advanced integral numerical procedure with the objective of optimizing the vibro-acoustic properties of ships in the early project phase, EFRR, 2020-
- ❑ Evolutionary shape synthesis with integral and partitioned 3D phenotypes, dynamic parameterization and meshfree modeling, HRZZ, 2018-2022
- ❑ Inverse procedures and advanced algorithms in the dynamics of structures and machines HRZZ
- ❑ Numerical and Experimental Engineering Dynamics, Tempus

