Overview of Departmental Activities

Contact: Prof. dr. sc. Zoran Lulić
Faculty of Mechanical Engineering and Naval Architecture
Ivana Lučića 5
HR-10000 Zagreb
Croatia
Tel: +385 (0)1 616 81 77
Mob: +385 (0)91 616 81 77
Fax: +385 (0)1 615 69 40
E-Mail: zoran.lulic@fsb.hr
Faculty of Mechanical Engineering and Naval Architecture (FSB) Zagreb

• Approx. 480 employees
  ≈ 200 teaching staff (professors, lecturers, assistants)
  ≈ 200 supporting staff
  ≈ 80 research and scientific associates
• Approx. 2500 students
• 13 Chairs
• 19 Laboratories
FSB Chair of Transportation – Department of Engines and Vehicles (KMV)

15 employees:
- 1 professor
- 1 lecturer
- 6 assistants
- 2 scientific associates
- 2 laboratory technicians
- Secretary
  (2 honorary lecturers)
FSB – KMV Centre of Excellence

Long-term goals of the Department:
- To become a Centre of Excellence in all fields of motor vehicle technology and engineering,
- To turn the KMV Laboratory into a national reference centre for the analysis, control and treatment of exhaust emissions, as well as the centre for the study of future green fuels.
# Teaching Activities

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours</th>
<th>ECTS</th>
<th>Undergraduate study (semester)</th>
<th>Graduate study (semester)</th>
<th>Postgraduate study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumetric Machines</td>
<td>4+1</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Combustion Engines A</td>
<td>3+2</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Combustion Engines B</td>
<td>2+1</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocating Engines</td>
<td>3+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Vehicles</td>
<td>3+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Vehicles</td>
<td>2+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Engines - Laboratory</td>
<td>3+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine Design</td>
<td>3+2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engines and Vehicles - Practicum</td>
<td>0+4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Combustion Engines B</td>
<td>2+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homologation of Motor Vehicles</td>
<td>2+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Simulations in Engine and Vehicle Development</td>
<td>1+3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Systems and Testing of Motor Vehicles</td>
<td>2+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engines and Vehicles – Selected Topics</td>
<td>3+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gliders and Hang Gliders</td>
<td>2+1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engines and Vehicles – Selected Topics</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Simulations in Engine and Vehicle Development</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Powertrains for Motor Vehicles</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design of Motor Vehicles</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Combustion Engine Thermodynamics</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engines and Vehicles – Selected Topics</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Simulations in Engine and Vehicle Development</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Powertrains for Motor Vehicles</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Teaching Activities

The KMV Department is promoting regular academic exchange and scientific experience abroad for undergraduate students, PhD students and PostDocs.

• Dr. D. Kozarac: Fulbright scholarship (09/2011 – 06/2012) at the UC Berkeley, San Francisco, USA

• Dipl. Ing. J. Gusić: 6 months MPhil research semester (05/2010 – 11/2010) at the DLR Institute of Aeroelasticity, Göttingen, Germany

• Dipl. Ing. B. Beban: 6 months internship (04/2010 – 10/2010) at the BMW-FIZ research centre, Munich, Germany

• Dipl. Ing. Z. Zmaić: 6 months PhD research semester (06/2008 – 12/2008) at the DLR Institute of Aeroelasticity, Göttingen, Germany

• Dr. H. Kozmar: 2 months PhD research semester (05/2006 – 07/2006) at the DLR Institute of Aeroelasticity, Göttingen, Germany

• Dr. F. Majić: 6 months PhD research semester (03/2005 – 09/2005) at the DLR Institute of Aeroelasticity, Göttingen, Germany
Extracurricular Activities

• Student excursion to the BMW research centre, production plant and museum (2007 and 2010) – Munich, Germany

• Safe driving training for students at the PZ Auto testing track – AMC Mičeveč, Zagreb

• Study trips to Adria Diesel Karlovac, shipyards Pula and Rijeka, Đuro Đaković Sl. Brod, Lipik Glas, Rasco Kalinovac, Hittner Bjelovar, Diamond Aircraft Wiener Neustadt (Austria), Revoz Novo Mesto (Slovenia), itd.


Partners from Industry

- Eurobus Zagreb
- ZET – ARZ
- ZET – Tramway and streetcar production
- AZ Crobus
- Ziegler – Fire engine technology
- VIP
- Cro Dakar Team
- Gredelj – Railway technology
- PSP Okoli – Natural gas storage
- Kvočić
- Rimac Automobiles

Donations from industry:
- Citroen Croatia
- PZ Auto
- INA d.d.
- Scania
- AutoZubak
- ProKlima

- Croatian Ministry for the Environment
- Croatian Department of Trade and Industry
- Croatian National Office for Metrology and Surveying

- AVL-AST d.o.o. Zagreb (AVL LIST GMBH Graz)
- DLR Göttingen
- BMW München
Research & Development for Industry

• Testing of IC engines and electric motors, parameter identification and modelling, verification of engine concepts, optimisation of fuel injection mapping and ECU
Research & Development for Industry

• Development of the shuttle bus design for the airport Zagreb (in cooperation with Eurobus)
• Development of the touristic autobus design for Zagreb, Dubrovnik and other cities (ZET)
• Technical overhaul of the tramway design (ZET Zagreb)
• Analysis of the autobus frame structural stresses by experiment and FEM numerical simulation
Research & Development for Industry

• Design of the racing car for the DAKAR Team Croatia 2012
• Development and testing of the mechanical steering system for vehicles used by drivers with a physical disability
Research & Development for Industry

• Development and implementation of novel numerical methods for the simulation of HCCI engine combustion process (in cooperation with AVL, Graz)

Klasični Otto motor

HCCI motor

\[ \eta_C = 95.0\% \]
\[ \eta_{\text{exp}} = 99.2\% \]
\[ \eta_{\text{calc}} = 96.7\% \]
Research & Development for Industry

- Translation of existing vehicle constructions and parts into digital data for CAD/CAM software (reverse engineering) using GOM 3-D hardware and software Tritop and Atos
Research & Development for Industry

- Feasibility study of the reduction of NOx level for the underground natural gas storage PSP Okoli, Ivanic-Grad
- Improvement of the cooling system and optimisation of the overall operating performance for the stationary Diesel engines used for electricity production (VIPnet Zagreb)
Research & Development for Industry

Numerical simulation (CFD) of external and internal aerodynamics for production and racing cars

CFD for underbonnet thermal management analysis
Research & Development for Industry

- Homologation and ECE type approval for imported vehicles, racing cars and prototypes
Scientific Activity

- Development of new turbulence models for 0-D numerical simulations of combustion and their implementation in the AVL-Boost software
Scientific Activity

- Analysis and simulation of traffic accidents, accident modelling, investigation and improvement of passive vehicle systems for prevention of accidents
Scientific Activity

- Analysis of dynamics of road and railway vehicles, simulation-based analysis of complex multibody systems, testing and optimisation of virtual vehicle parts

- Simulation of kinematic or elasto-kinematic systems in order to study structural stresses, driving safety and ride comfort
Scientific Activity

• CFD and wind tunnel measurements for aerodynamics and aeroelasticity of bridge sections, wind barriers and wind-related traffic safety issues (in cooperation with the DLR Göttingen and the University of Florence)
Scientific Activity

- Validation of advanced CFD methods (DES/LES) for bluff-body aerodynamics
List of Selected Publications


Šagi, G., Tomić, R., Ilinčić, P.: Razvoj propisa o dopuštenim emisijama štetnih tvari iz motora s unutarnjim izgaranjem, Goriva i maziva, br. 48 (2009), ISSN 0350-350X, GOMABN 48, 2, pages 159–188


