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The ULB is a leading university located in the heart of Brussels, the capital of Europe. It is a multi-disciplinary university covering all major fields and study cycles, composed of 10 faculties, 32 schools and 1 institute.

The ULB is active in numerous disciplines related to Aeronautics and Space research development such as Active Vibration Control, Fluids Mechanics, Lubrication, Maintenance, Health Monitoring, Embedded Systems, Structural Dynamics, ... In order to meet the needs of the industry, the ULB takes part in several joint research projects with private companies. Here are the research units that deal with Aeronautics at the ULB.

Description of Products and/or Services Aero-Thermo-Mechanics Department (ATM)

Keywords: Fluid mechanics - Lubrication - Aero-engines - CFD - UAV's - Heat exchangers - Helicopters - Space propulsion - N2/O2 separation

The research activities of the ATM department cover a wide range of fluid mechanics applications mainly focused on aeronautics: lubrication systems for aero-engines, air-oil heat exchangers (compact and surface coolers), CFD of reactive flows (combustion), propulsion systems for UAV's and helicopters among others.

Latest research projects:

- E-Break: Engine Breakthrough Components and Subsystems [FP7]
- ESPOSA: Efficient Systems and Propulsion for Small Aircraft [FP7]
- LuBest: Performance and qualification tests of lubrication system equipment (JTI Clean Sky)

More details: atm.ulb.ac.be

Structural and Material Computational mechanics (BATir-SMC)

Keywords: Computational mechanics - Multiscale Modelling - Damage and Failure - Robustness of structures - Microstructural Plasticity - Coupled problems - Structural health monitoring

The BATir-SMC research group develops advanced computational modelling methods for mechanical and coupled problems. The various application fields for the developed methods cover the modelling of composite materials, the study of microstructural plasticity processes in multi-phase metallic materials, lightweight materials and structural health monitoring.

Latest research projects:

- EnLightenIt !: Multiscale Modelling of Lightweight Materials (metallic foams and 3D printed lattices) accounting for uncertainties (PDR-FNRS)
- ENTROTROUGH: Développement, optimisation et modélisation des alliages à haute entropie (Wallinov)
- SEED: Consortium Erasmus Mundus Joint Doctorate - Simulation in Engineering and Entrepreneurship Development [EU-FP7 Marie Curie]

More details: batir.ulb.ac.be

Bio, Electro and Mechanical System (BEAMS - Embedded Electronics)

Keywords: Embedded systems - Digital electronics - Power Electronics - FPGA

BEAMS research activities focus on four major axes:

- Multi-processor System-on-Chips with real-time operating systems [MPSoc/ RTOS]
- Better algorithm/architecture adequation using system-level design flows
- 3D-chips design and optimization
- Control of power electronics devices

Latest research projects:

- Digital electronics based on micro-controllers, DSP and FPGA complex embedded processors [SoCV: System on Chip; MPSoC: Multi Processor System on Chip] in deep sub-micron technology and coarse-grain architecture, including an interconnection network [NoC: Network on Chip]
- Real-time networks [field busses] for industrial monitoring and control

More details: www.beams.ulb.ac.be

Bio, Electro and Mechanical System (BEAMS - Mechatronics)

Keywords: Active vibration isolation - Interferometric inertial sensor - Active vibration damping

The lab is specialized in the development of instruments and robust strategies for active control of structural vibration.

Latest research projects:

- MAVERIC: Maîtrise des vibrations des structures aéronautiques au moyen d'absorbeurs intelligents [WallinnoV]
- IGOR: Isolation of gravitational wave observatories [FNRS - MIS]
- AVIS: Active vibration isolation system [ESA - NPI]

More details: homepages.ulb.ac.be/~ccollett/research_main.html

Department of System Analysis and Control Engineering (SAAS)

Keywords: Automatic systems - Fault detection - Condition monitoring - Health monitoring systems - Robust control - Force feedback

The team of SAAS studies and develops model-based condition monitoring systems. Such systems process in real time the measurements available on the supervised device in order to detect and localize small degradations, and hence to plan maintenance operations in due time, before a failure occurs.

Latest research projects:

- HM+: The more intelligent airplane: health monitoring and predictive maintenance
- MINT: Intelligent maintenance
- POWER: Condition monitoring and optimization of the operation of wind turbines

More details: saas.ulb.ac.be

Transfers, Interfaces and Processes (TIPs)

Keywords: Microgravity - Multiphase systems - Mixing - Gas-liquid mass transfer - Dynamics of interfaces - Heat transfer - Evaporation - Crystallization - Wetting - Capillarity - Microfluidics

At TIPs, the main goal of the ongoing research is to develop new theoretical, numerical and experimental methods allowing to understand and predict the behavior of multiphase systems, and to design or optimize industrial processes dedicated to the transformation of matter (mineral, organic or biological) and energy.

Latest research projects:

- MULTIFLOW: Multiscale Complex Fluid Flows and Interfacial Phenomena [EUF7 Marie Curie Initial Training Network]
- MicroMAST: Multiscale Applications of Surface Tension - Microfluidics and Micromanipulation [BELSPO IAP Network]
- Prodex-EVAPORATION et Prodex-HEAT TRANSFER [funded by ESA and BELSPO]

More details: www.sites.google.com/site/tipsulbachbe

Materials Engineering, Characterization, Synthesis and Recycling (4MAT)

Keywords: Additive manufacturing - Micro-structural characterization - Metallurgy

The research activities of 4MAT cover the entire life-cycle of materials from their synthesis and processing to the optimal management of their end of life going through the optimization of their [micro] structures. A special interest is given to the relationship between the process parameters and the properties [both bulk material and thin films].

Latest research projects:

- Additive manufacturing of Ti-6Al-4V parts: from microstructural control to architecture materials
- Titanium dioxide thin films deposited by pulsed vacuum arc

More details: www.4mat.ulb.ac.be/HOME-FR.html

