5-YEAR FULL-TIME FACULTY POSITION IN ENERGY ELECTRONICS

Faculty of Engineering

The University of Mons (UMONS) announces the vacancy of a **full-time faculty position at associate professor level** in the field in Engineering Sciences and technology, with a **specialized focus on Energy Electronics**. The position is to be filled from September 15th 2022, within the Electrical Power Engineering Unit of the Faculty of Engineering. **It is part of an academic chair funded by ALSTOM company** in collaboration with the "Cyber Physical System in Energy conversion and Transportation" CPSET innovation platform, **a consortium of four major companies (ALSTOM, TAS-B Alenia Space, AISIN and Sonaca) and research centers.**

Leading societies to a low carbon future, ALSTOM (https://www.alstom.com/company) develops and markets mobility solutions that provide the sustainable foundations for the future of transportation. ALSTOM's product portfolio ranges from high-speed trains, metros, monorail and trams to integrated systems, customized services, infrastructure, signaling and digital mobility solutions. The company has currently 150,000 vehicles in commercial service worldwide.

The incumbent of the position will be appointed for an initial fixed term of three years, renewable for a period of two years after an intermediate assessment.

Missions

Research

The position holder will develop new research activities in the field of Energy Electronics. S/He will have to interact strongly with the consortium members of the CPSET platform and the existing departments of UMONS involved with the themes covered by Energy Electronics. Depending on the needs, s/he will be asked to stimulate and coordinate multidisciplinary approaches with the research teams in place. The person hired will actively seek funding from private sector and public agencies at regional, national and European levels, participating to collaborative projects. S/he will have achieved well-recognized scientific excellence in previous research in the field of Energy Electronics (although without covering all aspects as that the theme is relatively broad). Confirmed expertise in one or more of the following fields (non-exhaustive list) is preferred:

- Power converter architectures and design
- Active devices and passive components (including their intrinsic reliability)
- Reliability of power electronic converter systems
- Control and modulation of power electronic converters
- Thermal management of power electronic systems
- Electromagnetic compatibility
- Acoustic noise control in power electronic systems
- Electrical energy storage

Knowledge of industrial applications in the field of railway transportation and/or in the space sector would be a plus.

Teaching

The applicant will be entrusted with developing teaching activities in the field of Energy Electronics, setting up links between the various underlying themes in the field. S/He will have to actively participate in teaching activities at master's and continuing education levels. These activities, mainly in English, will take place both in Mons and Charleroi. S/he will also have to support the development of the existing Joint Certificate in Energy Electronics (particularly in an international perspective) and participate to complementary training programs according to the identified needs

Job functions

- Actively seek funding and facilitate research programs;
- Ensure teaching missions (courses, seminars, industrial visits) both in master's degree and as part of continuing education;
- Propose/contribute to student's projects (internships, first year master's projects and master's degree final projects);
- Supervise doctoral theses;
- Steer the activities of the academic chair in Energy Electronics (see Appendix).

Suitable qualifications

The applicant will hold a doctoral degree in Engineering Sciences in the relevant field. S/He will have to:

- Prove significant experience outside her/his home institution (extended research stay abroad);
- Prove well-recognized scientific excellence supported by international publications in peer-reviewed journals;
- Demonstrate experience and skills in university level teaching (if possible, supported by formal assessments);
- Have the qualifications to conduct high-level scientific research in a multidisciplinary environment (ability to raise research funding, carry out projects, lead and manage a research team)
- Be able to communicate easily in English (written and spoken). A minimum command of the French language (oral understanding) is a plus.

More specifically, **since this position falls within the context of an academic chair funded by ALSTOM and in collaboration with the CPSET innovation platform**, the incumbent is expected to develop partnerships with industry in the field of Energy Electronics. S/He will also propose specific training programs adapted to the needs of the industry partners and support the organization of scientific events for experts and non-experts (industrials, academics, researchers and students) in the research areas of the partnership.

Work environment

To carry out his/her work program, **the position holder will benefit through the UMONs Research Institute for Energy of an already existing and well-established collaborative structure around that theme**. Moreover, s/he will be assisted by support persons from the industry partners involved in the CPSET platform, from the department of Research Support and Technology Transfer of UMONS, as well as from the research and teaching departments involved in the activities of the academic chair in Energy Electronics.

The **Research Institute for Energy (RIE)** is a collaborative structure that gathers the departments of the University working in Energy related topics. It is responsible for multidisciplinary R&D projects managements (involving several departments) and for providing a coherent information about R&D activities of its different departments (external communication). The RIE is composed of **125 researchers and academics** working in **13 different departments** and **4 faculties**. The scientific skills of the Institute are organized following the European Energy Research Alliance Joint Programs themes: Bioenergy and Combustion, Carbon Capture and Storage; Photovoltaic Technologies; Smart Cities; Energy Storage; Materials and Processes for Energy Applications; Wind power; Smart grids; Geothermal Energy. Activities span from scientific services and expertise to technology development (prototyping, simulation tools, demonstration projects, control strategies, simplified calculation tools) as well as fundamental research (mainly related to materials for energy).

More info available from: https://web.umons.ac.be/energie/en/

UMONS through the RIE is also the leader of the C3E2D project portfolio ("Centre d'Excellence en Efficacité Energétique et Développement Durable"). That project portfolio aims to create research infrastructures in Charleroi for carrying out research projects (universities, research centers), the ultimate objective being to create an ecosystem to promote innovation in energy efficiency and sustainable development by bringing together a series of high-level actors with complementary activities.

As the person hired will join the Electrical Power Engineering Unit of the Faculty of Engineering, s/he will be solidly supported by the team already in place in order to develop her/his teaching and research activities. The Electrical Power Engineering Unit is a member of the RIE. It has currently **3 professors**, **13 PhD students** and **3 postdoctoral researchers**. The teaching and research activities focus on power systems, electrical machines, power electronics and drives. The Unit has international collaborations with well-recognized research teams in many universities (most in Europe), as e.g. Electrical Engineering and Energy Analytics and Market group at Technical University of Denmark (DTU), Electrical Power group at University of Oxford, Grenoble Electrical Engineering Laboratory (Grenoble Alpes University), etc.

More specifically, the Unit is active in the following research fields:

- Smart grids and micro-grids (data analytics, electricity markets, long-term planning, interaction models, power quality aspects)
- Energy communities (modelling and energy management)
- Renewable energy systems (wind and photovoltaics; grid-connected and autonomous systems)
- Wireless power transfer (electric vehicle battery charging; modelling and control)
- Power electronics for railway and space applications (modelling, design, optimisation and control; converter structures and topologies)
- Modelling of electromagnetic devices using numerical methods

The Electrical Power Engineering Unit was/is engaged in some major projects at regional (GREDOR, SMARTWATER, INOGRAMS, E-CLOUD, etc.), national (EPOC, BEOWIND, ADABEL, DISCRETE, etc.) and European levels (RESIZED). It closely works in collaboration with territorial development agencies (IDEA, IDETA) and industry (ORES, ELIA, Engie Laborelec, ALSTOM Belgium, Thalès Alenia Space, etc.) through research funding and within the framework of students' projects.

Since 2019, the Unit is also the referent entity for the academic coordination of the **joint certificate program in Energy Electronics** organized in Charleroi with industrial partners. Since the same year, it is also coordinating the **Master Erasmus Mundus in Smart Cities and Communities (SMACCs**), a collaboration between four universities in UK, Spain, Greece and Belgium.

More info available from: https://www.umons.ac.be/gele

Practical information

Applications must be sent by registered letter with acknowledgment of receipt to the Rector of the University of Mons, at Place du Parc, 20, B-7000 Mons (Belgium), as well as by email to secretariat.ca@umons.ac.be.

The application deadline is **June 15, 2022**.

Applicants are invited to join a file, written in English or French, including the following:

- a motivation letter,
- a *curriculum vitae*,
- a full list of publications
- a research proposal plan in the field of Energy Electronics (maximum 5 pages with your vision of the research mission),
- a pedagogical proposal with your vision of the teaching missions,
- a copy of the diplomas,
- a copy of your five most important publications,
- The names and contact details of two international experts.

Any additional information can be obtained from: Prof. Christine Renotte, Dean of the Faculty of Engineering (christine.renotte@umons.ac.be)

Selected candidates will be called for an interview which will include a lesson presentation and a discussion of their teaching and research plans.

Our offer

- Internationally competitive salary (with the possibility of recognizing years of seniority)
- Operating and promotion budgets (10 k€ per year) granted by the chair.
- Possibility of part-time teleworking.
- Reimbursement of public transport pass and bicycle allowance.
- Your well-being at the center of our concerns (nursery, sports and cultural activities, access to university restaurants, etc.).

The Chair in Energy Electronics

The UMONS University Chair in Energy Electronics aims at developing activities in that field focusing on four main axes. A summary description of each area of activity is in the figure below.

Teaching

Master in Engineering

- Multi-disciplinary programs
- Student's projects with industry
- Internships and master's degree final projects
- Industrial contributions (illustration)
- Industrial visits for students

Post graduate International

- PhDs with the industry
- Continuing education (certificate – complementary master)

Research

- Collaborative research programs (competitiveness clusters or others) with additional partners potentially (industrial or universities) → specific partnership agreement
- Fundamental research on underlying technologies

Events

- Scientific / discovery workshops with academics, industry representatives and students
- International (when possible) scientific events (researchers, industry, …)
- Complementary training programs for industrials

Visibility

- Special CPSET Prize (best master's degree final project in the field of the chair)
- Promotion and communication around the chair (website, journals, …)

The CPSET Platform

The UMONS University Chair in Energy Electronics is supported by the CPSET Platform founded in 2018 by industrial and research actors. ALSTOM is one of the founding members of this technological Platform.

CPSET
Cyber Physical System in Energy conversion & Transportation

The return on experience from multiple collaborations in different industrial domains such as aeronautics, railway, space and automotive industries has pushed some industrial and research actors in Wallonia to consider strengthening the sustainability of these collaborations through the creation of a new R&D ecosystem centered on Cyber-Physical Systems (CPS). It has been implemented as a shared and open Platform, supported by training tools dedicated to critical resources.

This initiative allows to federate skills and resources over the long term in a context of multi-partnerships involving research centers, universities, university colleges and industrial actors and capitalize on the results. The involvement of research centers in the management committee together with industrial members ensures that their research efforts meet the innovation needs of the industry. It also accelerates the complete maturity growth cycle from concepts towards industrial applications.

CPSET is a new, shared and open innovation Platform with the following objectives:

- Develop and integrate technological building blocks to be integrated into complex systems in domains interconnected in terms of innovation such as railway, automotive, space and aeronautics industries;
- Allow focusing R&D resources on generic themes in order to increase the innovation capacity and efficiency of the industry in these fields;
- Create a sustainable ecosystem mixing public and industrial research actors to master the technological assets and build up a critical mass of competencies, infrastructures, equipment and collocated technical resources;
- Facilitate the transfer of technologies and competencies into the industry through services and training;
- Dynamically involve SMEs and start-ups to allow them developing their technologies and getting access to an ecosystem connected to multiple markets;
- Contribute to the creation of a regional centre of excellence by supporting training programs adapted to the needs of the industry.

The CPSET Platform is structured around the following themes:

- Simulation of complex systems: digital modelling, simulation and virtual prototyping;
- Methods and tools for the development and validation of Cyber Physical Systems (CPS), new cybersecurity testing tools and processes;
- Electrical energy conversion, energy storage and production: power electronics, high efficiency architectures, new materials and components;
- Autonomous vehicles and automated driving;
- Asset management & Infrastructure Integrity: preventive / predictive maintenance;
- New architectures for complex systems: multicore processors, distributed systems.

CPSET currently includes the four founding industrial actors (Alstom, TAS-B Alenia Space, AISIN and Sonaca), two research centers (CETIC and CENAERO) and is supported by three competitiveness clusters (Mecatech, Logistics in Wallonia and Skywin). It is open to all willing to join this collaborative approach.

A Memorandum of Understanding was established and signed at the end of 2018 by the founding partners of the Platform.

CPSET supervises over time a set of collaborative R&D projects involving at least one of the two certified research centers and at least one industrial partner and addressing some of the generic themes defined above. Each project (single or multi-industry) supported by the Platform will systematically address a generic content which will then be further deployed by the Platform in all the targeted industrial domains.

This University Chair is part of a global strategy including structured partnerships between CPSET members and Universities.

The themes of this structured partnerships are defined in the table below.

Topics and Priority Themes

CPSET
Cyber Physical System in Energy conversion & Transportation

Topics	Power Conversion	Production & Storage	Complex Systems	Methods & Tools	Autonomous Vehicles	Asset Management
Energy Electronics	• Architecture of power converters • Semiconductors and components • Digital networks applied to power converters control and command • Electromagnetic Compatibility • Thermal engineering of power converters • Energy storage					
Embedded Critical Systems			• Development processes (cycle V / Agile) • Model-based System Engineering and tools • Hardware and Software reliability • Safety by design and demonstration • Applicable standards et Certification • Cybersecurity			
Mobility					• Autonomous Vehicles / Driving assistance • Intermodal mobility / Supervision • Connected passenger / Passenger Experience • Big data / Artificial Intelligence • Asset Management / Maintenance • Human factors / Legal aspects • New business models in	

The partnership with UMONS addresses the "Energy Electronics" theme.