About UMONS

The University of Mons (UMONS) located in the Walloon Region of Belgium has developed a strong, sustainable and highly-performing Research, Development and Innovation (R&D&I) platform in the field of Energy Efficiency in City Districts according to the late concept of Net Zero Energy City Districts (NZED). Research activities are concentrated on the combination of four major research areas such as
i) electricity micro-grids,
ii) thermal behaviour of buildings,
iii) energy production/energy storage systems
iv) urban planning, environmental assessment and mobility.

As a next step in its will to connect R&D activities to its education programs, UMONS will propose the next academic year an Erasmus Mundus degree focusing on Smart Cities and Communities. Partner Universities are HERIOT-WATT University (UK), INTERNATIONAL HELLENIC UNIVERSITY (GR) and UNIVERSIDAD DEL PAIS VASCO (SP).

Context and domain of competences

City Districts will play a major role in the Energy Transition. They appeared to be the perfect scale to deal with main issues such as:
- Energy consumption reduction
- New economic models
- Renewable energy integration through local energy grids
- Mobility
- Urbanism
- Reinforcement of social cohesion

These topics have to be considered in an integrated way, thus appealing for new education programs that evolve towards multi-disciplinarity and ensure high education level for professionals. As a result of the creation of a new education programme (Master’s Degree) in Smart Cities and Communities, UMONS is opening part time positions for visiting lecturers or substitute teacher in the Faculty of Engineering of UMONS in the following areas:

- Sustainable Transport in Cities
- Sustainable Urban Planning and Buildings
- Strategic Energy and Transport Management
- Optimization Tools for Energy Systems
- Innovation and Entrepreneurship
Course description

UE - Sustainable Transport in Cities (6 credits)

AA - Sustainable Transport in Cities (36 hours of theory; 36 hours of practical work) (0.16 FTE)

This course will focus on the development and deployment of innovations for achieving sustainable urban mobility:

- Latest innovations in technology, design, strategies and policies employed by cities to increase energy efficiency, reduce carbon emissions and improve overall access and mobility for increasingly dense and crowded urban environments.

- Innovations that go beyond incremental improvements and utilize system-level integration, holistic thinking, ecosystem solutions and cutting-edge technology. It will also partially focus on understanding the complexities of cities through the use of Urban Monitoring, Collection Data and Analytics and the design of Innovative Urban Systems for high-density cities such as for mobility and energy. The design of these systems must be resilient, scalable, and reconfigurable.

The course will introduce a broad survey of the following key areas of sustainable urban mobility and transport:

- Vehicles: morphology of vehicle types (buses, cars, motorcycles, bicycles, segways, etc.) and technologies (electric, hybrids, fuel cells, biofuels, compressed natural gas, etc.) will be presented as well as the latest vehicle innovations (Autonomous Driving).

- Urban infrastructure: electric charging infrastructure, rapid charging stations, Vehicle-to-Grid (V2G), smart grids and bike lanes, Urban Implementation: urban design of parking, buildings, creation of new urban policy (i.e., dynamic road pricing), use of intelligent fleet management systems, integration into public transit systems, pilot testing, and deployment.

- Economic Models: Private car ownership, shared-use systems (i.e. ZipCar, Uber, bike and e-bike sharing programs), fleet operations/mixture, public transit, on-demand systems (carpooling).

UE - Sustainable Urban Planning and Buildings (6 credits)

AA – Sustainable Urban Planning and Buildings - Basics and Concepts – Part A (3 credits) (18 hours of theory; 18 hours of practical work) (0.08 FTE)

AA - Sustainable Urban Planning and Buildings - Tools and Software – Part B (3 credits) (36 hours of theory; 36 hours of in-class exercises) (0.08 FTE)

General Overview:

- Planning principles to meet contemporary sustainability challenges of cities and districts such as urban sprawl, smart growth, traffic congestion, ‘green’ cities and other issues that share common policy linkages: land use planning and buildings.

- Understanding of the energy use in built environments with an emphasis on fundamental drivers of energy demand, strategies to promote energy efficiency and essential features of energy supply. It examines the relationship between energy demand and supply in development - and addresses how advances in construction technology can help to counter greenhouse gas emissions. Specific attention in line with this course is the extent use of BIM (Building Information Modelling) involving the generation and management of digital representations of physical and functional characteristics of buildings within 3D modelling or GIS (Geographical Information Systems). The practical sessions in the course will introduce students to both traditional and emerging technologies in geographical information science through the use of desktop GIS software like Arc
GIS, Quantum GIS and the powerful statistical software environment, R. In developing technical expertise in these software tools, students will be introduced to real-world geographical analysis problems and, by the end of the course, will be able to identify, evaluate and process geographic data from a variety of different sources, analyse these data and present the results of the analysis using different cartographic techniques.

**UE - Strategic Energy and transports Management (6 credits)**

**AA - Strategic Energy and transports Management (36 hours of theory; 36 hours of practical work) (0,16 FTE)**

This course will address questions related to the nature of demand in the different countries as part first of the EU and then of the global energy and transport system along with the nature of supply. The capabilities for Energy Business along with the key Stakeholders for Energy Business and Strategic considerations in Energy Business will also be considered. This course will show how energy needs and policy either under a city/country scale can be developed by making use also of techno-economical tools while understanding the basic principles and practice of energy transportation. The student will be able to assimilate new information regarding propulsion systems, formation of pollutant emissions along with new technologies such as alternative fuelled vehicles, hybrids, plug ins, fuel cells and hydrogen are also addressed. Its content includes: primary energy sources and energy prices, energy demand, energy intensity and its environmental consequences, carbon markets, the hydrogen economy, the use of hydrogen as an energy vector; fuel cells, the role of transports in the global energy and environment problem, alternative propulsion and fuels in transportation.

**UE - Optimization Tools for Energy Systems (6 credits)**

**AA - Optimization Tools for Energy Systems (36 hours of theory; 36 hours of practical work) (0,16 FTE)**

- Conceptual models and solutions to complex problems (energy systems optimization taking into account technical, economic, societal, ethical and environmental aspects).
- Study of numerical methods for solving problems to minimize or maximize a linear real objective function submitted to linear equality or inequality constraints (both continuous and discrete cases are considered), understanding the working of the optimization methods, choosing the adequate method for solving a given optimization problem, being aware of the growing complexity of the problems and the evolution of the optimization techniques, continuous linear programming (real variables), simplex algorithm, integer linear programming (discrete variables): Branch and Bound algorithm, etc.
- Energy context and energy market models throughout the world and their evolution with time in the framework of the energy transition.
- Existing tools for energy system optimization.

**UE - Innovation and Entrepreneurship (3 credits)**

**AA - Innovation and Entrepreneurship (15 hours of theory; 20 hours in-class exercises) (0,07 FTE)**

Business model, business plan, themes connected to venture creation and coaching

**Assignment**

Recruited candidate(s) will be responsible for teaching to international students within the context of the ERASMUS MUNDUS Master’s Degree in Smart Cities and Communities. The candidate(s) will be responsible
for defining the content of the course(s) in order to fit the Education Programme objectives and to conduct the students evaluation based on the recommendations of the Education Programme. The student’s evaluation is organized twice a year (June and end August - early September). The candidate(s) will bring its (their) expertise for coaching Master Thesis and PhD students and for participating to collaborative R&D programmes.

Profile

You have a high-level experience in academic research (publications in high impact factor journals). You are experienced in academic teaching (past or present experience in teaching, coaching of PhD students). You have developed valuable competences in at least one of the above-mentioned fields. You develop contacts with stakeholders in your domain of competences.

Minimum admission requirement

You are a preferably doctorate holder. Upon evaluation of a foreign (non-EU) diploma, a certificate of equivalence may still have to be requested.

Important information

A part-time assignment of a certain degree of the professorial staff cannot be combined with a part-time assignment of a different degree of the professorial staff within the same institution. The recruitment is possible no sooner than 1 September 2019. The annual designation may be renewed every year. For PhD holders, the remuneration is in line with the official rate for university lecturers. The rate for visiting lecturers (105€ per hour) will be used otherwise.

Procedure

Applications, including attachments, have to be sent by e-mail to doyen.polytech@umons.ac.be and should be received at the latest on 28 November 2018. Please merge all documents into one pdf attachment and mention the reference UMONS_ErasmusMundus in the subject line of your email.

Pay attention : Applications sent in after the deadline will not be accepted.

The following documents should be attached:

1) Cover letter indicating why you consider meeting the requirements regarding ‘experience’ in the vacancy profile
2) Copy of your doctoral degree and diplomas
3) A ranking of your 5 most impactful academic achievements and a short comment on each
4) A summary of research activities (no more than 4 pages in English)
5) A summary of previous teaching experience
6) A detailed description of the pedagogical project : selection of subjects, content of learning activity, learning resources and references, articulation of course chapters, educational means, assessment method, ...

For further information regarding these vacancies, please contact Professor Marc Frère, Head of the Thermodynamics and Mathematical Physics unit (e-mail : marc.frere@umons.ac.be).

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