



الجامعة الأورومتوسطية بفاس
EUROMED UNIVERSITY OF FES
UNIVERSITÉ EUROMED DE FÈS

SDG7 Report

Affordable and clean energy



SDG7 report: Affordable and clean energy

The theme of clean and affordable energy is one of the priority axes of the

UEMF strategic plan. It is both a training and research theme, and a subject on the agenda in the development of the eco campus

Training

Mechanical and Energy Engineering (INSA EM)

Main activities: Learn to define the specifications, design, model, develop, optimize, implement and manage production systems for goods and services:

- in the fields of R&D services in industry, transport and energy for the “Mechanics and Industrial Engineering” course,
- in the areas of heat transfer, waste treatment and the development of process reactors for the “Energy Environment” course.

Electrical Engineering (INSA EM)

Main activities: Learn to design and implement electrical systems and acquire multidisciplinary skills in automation, signal processing, electronics and industrial IT:

- The “Electrical energy” option trains engineers involved in the production, transport, distribution and transformation of electrical energy and renewable energies.
- The “Embedded Systems” option trains engineers able to design and implement complex technological systems integrating components from different technologies (electronic components, computer and telecommunications equipment, software, networks, mechanical devices)

Civil Engineering Stream

Main activities :

Learn to :

- design and implement engineering structures using various types of energy: electrical, mechanical, hydraulic, solar, wind, oil, etc.
- use sustainable construction standards to best integrate ecology during each stage of the construction, renovation or rehabilitation of a structure.
- identify the environmental impacts of projects throughout their life cycle.
- participate in the design and sizing of the envelope and equipment of high energy efficiency buildings.
- make the best choices and make the best decisions in a complex energy context

Architecture sector

Main energy activities:

Learn to :

- Promote urban and architectural choices that favor natural resources, integrate bioclimatic principles and guarantee good thermal insulation of the entire building envelope while respecting the legislation in force.
- Use materials that consume little energy for their manufacture, transport and implementation.
- Use construction techniques with low impact on the environment and on energy consumption.
- Promote the use of renewable energies and / or low-polluting fuels.
- Opt for the choice of “smart” equipment (low consumption lighting and household appliances, efficient and correctly sized heating, etc.).

Stream: Master Transport and sustainable mobility

Modules taught in relation to energy

- Energy and climate change;
- Freight transport systems
- Environmental and transport economics;
- Sustainable development ;
- Sustainable transport and mobility
- Engineering of environmentally friendly vehicles;
- Operation of rail and guided transport;
- Choice of transport infrastructure and sustainability;
- Logistics infrastructure engineering;
- Supply Chain Management;



Master: DESIGN AND ENGINEERING OF GREEN BUILDINGS (CIBV)

Modules taught in relation to energy:

- Transfer phenomena;
- Fluid mechanics ;
- General and applied thermodynamics;
- Materials for energy efficiency in buildings;
- Standards and climate;
- Ventilation and lighting of the building;
- Air conditioning, heating and energy integration;
- Renewable energies for buildings;
- Ecodesign of a building;
- Energy analysis and economic evaluation of the building;
- Green and smart buildings;
- Sustainable development and waste management;
- Preliminary design of an efficient building;

Specialized Master: Functional Materials and Additive Manufacturing

Modules taught in relation to energy:

- Ceramic, polymer and metallic materials
- Design adapted to additive manufacturing;
- Additive manufacturing by energy beam;
- Industrial manufacturing processes;
- Mechanics and aging of materials;
- Additive manufacturing for the aeronautical and automotive industry;
- Additive manufacturing for the medical field;
- Biomaterials and their applications;

Specialized Master: Environmental Engineering and Water Management

The sector proposes to train executives with a transversal vision of the challenges of the environment and of water management in particular. The development of clean technologies (processes, methods or tools) in order to solve the environmental problems attributable to human activities is put forward with a focus on the Euro-Mediterranean region.

To do this, the student acquires in this sector advanced knowledge in the field of the environment (scientific and technical methods, knowledge of ecosystems, techniques of analysis and treatment of pollutants, water management and treatment, remote sensing tools. and GIS, national and international policy, green economy, etc.) and energy efficiency

Lifelong training

The UEMF also has a rich offer in continuous training in the energy field.

<https://ueuromed.org/formations-courtes>

It also defines offers in response to the needs of local and regional partners.

Research

Innovation structures:

Agro Energy TIC Valley

It is a mixed platform for testing, research and training in the fields of bioenergy and energy storage, jointly created by the EuroMed University of Fez and the Institute for Research in Solar Energy and New Energies (IRESEN).

Energies Renouvelables	Stockage de l'Énergie	EfficiencE Énergétique, Digitalisation et IA
Solaire et Applicatifs	Stockage Thermique/Thermochimique	Agro-Industrie '4.0'
Biomasse: Biogaz & Combustion	Stockage Electrochimique & Applications	Agriculture Efficiente et Intelligente – 'Smart Farming'
Hybridation et Systèmes de Gestion Intelligente de l'Énergie (EMS) (TIC, AI, IoT, D2D, V2G, etc.)		

Scientific publications and partnerships

UEMF contributes to international scientific production in the fields of energy: energy efficiency, renewable energies, intelligent energy management, thermal energy, etc.

<https://ueuromed.org/innovation/scientific-production>

Several doctoral theses are carried out on the theme of energy

<https://ueuromed.org/formation-doctorale/formation-doctorale-sciences-de-lingenieur>

The UEMF also carries out a large number of projects, some within a framework of cooperation:

<https://ueuromed.org/innovation/research-project>

Technological platforms

UEMF has several high-level technological platforms in different areas: Additive Manufacturing (3D) and Prototyping, Process Engineering and Civil Engineering, Materials-Synthesis and Characterization, Biotechnology and Biomedical Engineering, Renewable Energies-Storage and Energy Efficiency, Engineering Digital and Artificial Intelligence.

Additive Manufacturing (3D) and Prototyping Platform

The Platform contains both extractive and additive technologies to design, manufacture and characterize a wide spectrum of materials and shapes: 1. Polymers, 2. Metals, 3. Composites, 4. Ceramics and 5. Concrete. It is the largest additive manufacturing platform (3D printing) in Morocco and probably on an African scale. It includes around fifty 3D printing machines, some of which are designed and manufactured at UEMF. A startup for the design and manufacture of 3D printing machines was created by UEMF. Currently, several research contracts are in progress in partnership with the aeronautics and aerospace, automotive and biomedical sectors.

Process Engineering and Civil Engineering Platform



The "Process Engineering and Civil Engineering" platform includes several design equipment for both materials and processes as well as their characterization:

Material transfer -Heat exchanger-Temperature measurement Heat transfer-Compression machine-reactors, ...

Compression machine

Research teams

Renewable Energy, Storage and Energy Efficiency Platform

The " Renewable Energies, Storage and Energy Efficiency " Platform encompasses several equipment for the design, manufacture and characterization of devices meeting the criteria of sustainable development in energy matters. In addition to this intramural infrastructure, the university also has open-air laboratories including a house equipped with several types of sensors for research on energy efficiency.



Research topics:

Renewable energies and energy efficiency:

- Technological and operational development of solar thermal, photovoltaic, wind and hydroelectric type production technologies. This work will cover both possible technical developments in current energy production and storage technologies as well as the development of new materials aimed at increasing energy efficiency in the production, storage and distribution of renewable energies.
- Conduct and control of the various study phases (installation, operation, maintenance of installations and electrical equipment);
- Improvement of processes and devices related to energy engineering;
- Integration of renewable energies into industrial processes;
- Mastery of different calculation methods for energy and thermal systems;
- Development of identification and prognosis methods for wind generators (Project to be developed with the EDF Energies Nouvelles group);
- Cleaning, alignment and maintenance systems for solar parks to preserve high transformation efficiency (Project to be developed with the EDF Energies Nouvelles group).
- Materials, Nanomaterials and Additive Manufacturing
- Phosphorus bioactive substances and dendrimers: medical applications;
- Improved bioceramics for bone regeneration: manufacturing, testing and validation for medical implantation;
- Fatigue resistance of inconel 718 resulting from additive manufacturing (Project to be developed with the CEROC, SANDWIK, AEROCENTRE groups);
- New classes of nano-composite and bio-composite polymers (Project to be developed with the PSA group for the design of materials with minimal ecological impact and mechanical characteristics suitable for the construction of automobile hulls);
- Nano-devices based on 2D materials.

Vehicles and land mobility / Aeronautics and aerospace:

- Development of light and innovative meta-materials for optimal sound insulation of electric vehicles (Project to be developed with the PSA group for the creation of sound insulation plates suitable for very light vehicles);
- Innovative solutions of electric machines for the advanced electrification of passenger transport (Project to be developed with the PSA group for the study of multi-phase electric motors for traction);
- I.MOVE: Innovative MObility serVICEs for non-car owners: Prospective scenario based on participatory design (Project to be developed with the PSA group for the shaping and optimal management of carpooling networks);
- Development of tools for real-time control of vehicle fleets in an open environment and data security management;
- Modeling and dynamic identification of non-linear structural joints between carbon fiber plates and shells (Project in the definition phase with European partners).

Environmental genius :

- Development of innovative technologies for depollution, filtration and desalination of water;
- Development of innovative technologies for air pollution control and CO₂ and VOC sequestration (volatile organic components);
- Promotion of certain natural plant resources, in particular the argan tree.

Eco campus

The UEMF project was designed with the Negawatt approach:

The constructions at UEMF are new and are less than 7 years old. UEMF reconfirms its firm commitment to ensure that all renovations, restorations or new constructions comply with the highest standards of energy efficiency and sustainable development:

- the UEMF campus is an Eco-Campus which respects the best international standards in terms of sustainable development. It was labeled by the COP 22 and recently obtained the French-speaking responsible innovation label.
- construction / rehabilitation of positive-energy buildings, installation throughout the Eco-campus of sorting bins for waste, creation of sports, leisure and relaxation areas, use of a circular economy (minimize waste by optimizing the value generated by resources), installation on the UEMF Eco-campus of charging stations for electric cars. These terminals are the only ones in the Fez-Meknes Region and the only ones on a university campus in Morocco. Advertising boards have been put up in several places in the city of Fez inviting motorists to come and recharge their electric car batteries free of charge at the UEMF Ecocampus, full accessibility and in all University buildings to people with disabilities. reduced mobility (PRM), installation on all floors,



Energy efficiency plan implemented to reduce overall energy consumption

PHOTOVOLTAIC PLANT MONITORING SYSTEM

A monitoring system (SmartLogger) has been integrated into each photovoltaic power plant. This unit plays the dual role of preventing the operator from any major failure (or other abnormal situation) as well as collecting in "real time" the electrical power produced. The data collected every 5 minutes is accessible through a web service, which allows remote monitoring at any time of the status of the plant. From the web console, it is thus possible to obtain the performance values of PV plants established from the data collected:

- the daily cumulative power that has been injected into the electricity network;
- the cumulative power that has been injected into the electricity grid since the initial commissioning;
- the instantaneous power produced by the power plant (s), updated every 5 minutes;
- income calculated on the basis of the electricity tariff;
- CO₂ reduction through the use of photovoltaics.



PRODUCTION ASSESSMENT (January 2020)

- 2 photovoltaic plants with power injection into the building.
- 1,246 m² of solar panels installed.
- Total peak power of 197.8 kWp.
- Theoretical output of 300 MWh / year by the two plants.
- 248 MWh produced in 2019/441 MWh since November 2017.
- Real yield of 83% of the theoretical producible.
- Savings of 220,000 dirhams on the energy bill for 2019.
- Twelve-year (undiscounted) return on investment, based on maintaining current performance.

Responsible innovation label

The Responsible Innovation Label was awarded to UEMF during its first 2020/2021 edition. A jury specializing in responsible innovation has selected the first 3 projects that are being deployed in member universities of the Agence Universitaire de la Francophonie (AUF), including that of the UEMF entitled "**Sustainable UEMF program**".

The Responsible Innovation Label is intended for higher education and research establishments, with a twofold objective: map and promote responsible innovations from French-speaking universities around the world, but also deploy the responsible innovation network to promote synergies between universities, civil society and the socio-economic sector working for the development of a responsible society.



Responsabilité sociale de l'Université

LABEL FRANCOPHONE DE L'INNOVATION RESPONSABLE



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40 ha Eco-Campus labeled by COP22 (in 2016)



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 CAMPUS LABELISÉ COP 22**



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