Syllabus – Elective Course

Course title:

Energy Transition & Climate Solutions: Powering a Sustainable Future

Credits:

6 ECTS credits

Teaching language:

English

Target students:

Undergraduate students from all majors, particularly students interested in climate solutions, sustainability, energy, technology, business, public policy, or environmental studies. No engineering major is required.

Teacher in charge of the course:

Prof. Dhaker ABBES (Junia, *Université Catholique de Lille*)
Dr. Khaled ALMAKSOUR (Junia, *Université Catholique de Lille*)

COURSE PRESENTATION

Prerequisite:

No specific technical prerequisite is required. Students should normally have completed at least one semester at university, or equivalent experience. The course welcomes students with or without a scientific or technological background (STEM and non-STEM majors). Students should be able to work individually and in teams and communicate in English at a standard university level. Basic quantitative skills are recommended; prior engineering or renewable-energy coursework is not required.

Content:

How can we power our cities, campuses, and communities while reducing their climate impact? This course explores the technologies and real-world choices shaping the global energy transition. With Europe as a living laboratory, students combine energy fundamentals with hands-on applications, case studies, teamwork, simulation, and on-site learning.

Key themes include:

- Energy fundamentals (Energy 101) and the climate-energy challenge
- Solar power and solar thermal energy
- Wind energy: from turbines to wind farms
- Biomass and other renewable solutions
- Hybrid Energy systems
- Life-cycle cost (LCC) and life-cycle assessment (LCA)
- Energy-transition case studies
- The Energy Transition Challenge: an interdisciplinary real-world team project.

Learning Outcomes:

By the end of the course, students should be able to:

- Explain the major technological, environmental, and economic drivers of the global energy transition.
- Compare solar, wind, biomass, and other renewable-energy solutions and identify appropriate applications.

- Estimate the energy needs of a building or community and assess the potential of renewable-energy resources.
- Use basic energy-modeling and simulation tools to evaluate renewable and hybrid energy scenarios.
- Work in an interdisciplinary team to develop and present a practical climate-and-energy solution.

WORKLOAD

French contact hours = 60 minutes (in some countries/institutions, 1 contact hour = 45-50 minutes)

Form	Number of hours	Comments
Face-to-face, in-class, on-site learning	39 hours	13 sessions of 3 hours combining interactive lectures, case studies, tutorials, hands-on activities, simulation, team project work, and site visits.
Approximate personal work/homework	15 hours	Preparation, short assignments, case-study reading, project development and reports.
Student total workload	54 hours	

EDUCATIONAL METHODS

Interactive lectures, guided discussions, case studies, hands-on exercises, energy-system simulation, collaborative problem solving, student presentations, project-based learning, and on-site learning. The course emphasizes learning by doing, interdisciplinary teamwork, and communication of practical climate solutions.

RESOURCES

Reference may be made to any of the following:

- Hossain, E. & Petrovic, S. (2021). Renewable Energy Crash Course: A Concise Introduction. Springer.
- Kumar, S., Gupta, N., Kumar, S. & Upadhyay, S. (Eds.). (2022). Renewable Energy Systems: Modeling, Optimization and Applications. Wiley.
- IRENA (2023). World Energy Transitions Outlook 2023: 1.5°C Pathway. International Renewable Energy Agency. International Energy Agency (2024). World Energy Outlook 2024. IEA, Paris.
- Additional current reports, case studies and online resources from IEA, IRENA, IPCC and European institutions will be provided throughout the course.

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All requisite reading materials and case-study resources will be supplied in class. Students may also use technical documentation and datasets provided for simulation and project activities.

ASSESSMENT

Form	Comments
Continuous assessment (20%)	Short quizzes, applied exercises, case-study analysis, and preparation activities.
Final assessment (50%)	Individual assessment integrating the key concepts, technologies, and decision-making tools covered in the course.
Practical work & participation (30%)	Hands-on activities, simulation work, active participation, teamwork, and contribution to discussions and on-site learning.

This syllabus is based on information available at the time of publication (November 2026). Changes may occur. For updated information about course content, please contact us: lilleprograms@univ-catholille.fr