Sustainable Energy Systems

Educational subject description sheet

Basic information

Field of study Joint Bachelor in Sustainability	**Education cycle** 2025/26
Speciality Economics, Management & Engineering	**Subject code** UJ.WPAJBSEMES.880.16491.25
Organizational unit Faculty of Law and Administration	**Lecture languages** english
Study level first cycle (joint degree programme)	**Subject related to scientific research** Yes
Study form full-time degree programme	**Disciplines** Chemical engineering
Education profile General academic	**ISCED classification** 0711 Chemical engineering and processes
Mandatory obligatory	**USOS code**

Subject coordinator	Piotr Szwedo
Lecturer	Joshua Lacey, Dries Haeseldonckx, Stijn De Jonge

Period Semester 4	**Examination** exam **Activities and hours** Lecture: 25 Classes: 20	**Number of ECTS points** 5.0

Goals

C1	Based on the course, students will have a general understanding of different energy technologies and the interrelationships between them. The challenges for a sustainable energy transition are known and the possible methodologies to achieve this are outlined.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the fields of Engineering Technology, Chemical and Electromechanical Engineering	JBS_K1_W07	written exam
W2	the different sustainable energy sources and how to use them in energy systems	JBS_K1_W07	written exam
W3	has a quantitative and relative idea of the amounts of sustainable energy	JBS_K1_W07	written exam
Skills – Student can:			
U1	to perform problem analysis and solving	JBS_K1_U01	written exam
U2	to combine the scientific and technological understanding of energy systems with non-technical economical and societal parameters in order to develop realistic scenarios for a sustainable energy transition	JBS_K1_U01, JBS_K1_U03	written exam
U3	to solve basic exercises about these subjects	JBS_K1_U03, JBS_K1_U04	written exam
Social competences – Student is ready for:			
K1	to take on social responsibility	JBS_K1_K01	written exam
K2	to embody an entrepreneurial attitude	JBS_K1_K02	written exam
K3	to critically approach their knowledge and its sources	JBS_K1_K04	written exam

Calculation of ECTS points

Activity form	Activity hours*
Lecture	25
Classes	20
preparation for classes	33
preparation for the exam	49

Student workload	Hours	ECTS
	127	5.0

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes
1.	Energy basics – current state of the art	W1, W2, W3, U1, U2, U3, K1, K2, K3

No.	Course content	Subject's learning outcomes
2.	Solar and Wind Energy	W1, W2, W3, U1, U2, U3, K1, K2, K3
3.	Energy from fossil fuels + combined heat and power	W1, W2, W3, U1, U2, U3, K1, K2, K3
4.	Synthetic fuels + power to X	W1, W2, W3, U1, U2, U3, K1, K2, K3
5.	Heat pumps	W1, W2, W3, U1, U2, U3, K1, K2, K3
6.	Hydrogen technologies + fuel cells	W1, W2, W3, U1, U2, U3, K1, K2, K3
7.	Heat storage	W1, W2, W3, U1, U2, U3, K1, K2, K3
8.	Sizing: load profiles + SLP’s + peak shaving	W1, W2, W3, U1, U2, U3, K1, K2, K3
9.	Demand/Production balancing	W1, W2, W3, U1, U2, U3, K1, K2, K3
10.	Electrical Storage	U2, K2, K3
11.	Economics of energy systems	U1, U2, U3, K1, K2, K3
12.	Company visit or guest lectures on sustainable energy topics	U2, K2, K3
13.	Supervised exercises	U1, U2, U3, K1, K2, K3

Course advanced

Teaching methods :

lecture, practicals, field trips

Activities	Examination methods	Credit conditions
Lecture	written exam	Attendance and active participation; exam mark at least 50%
Classes	written exam	Attendance and active participation; exam mark at least 50%

Entry requirements

None

Literature

Obligatory

1. Slides of lectures and supportive on-line audiovisual material.

Effects

Code	Content
JBS_K1_K01	The graduate can encourage sustainability-driven practices in the workplace and appraise sustainability of own values, perceptions, roles, and actions, with a special focus on environmental wellbeing.
JBS_K1_K02	The graduate can demonstrate considerable entrepreneurial initiative, autonomy, and readiness to act in complex and changing environments, especially in the context of supporting, undertaking, and co-organising activities beneficial for a sustainable society.
JBS_K1_K04	The graduate can critically assess and verbalize own competencies and skills related to different aspects of sustainability as well as their need for development.
JBS_K1_U01	The graduate can critically analyse academic literature, formulate research questions and conduct research under supervision.
JBS_K1_U03	The graduate can apply adequate methods and tools, including selected IT tools, to solve problems related to data collection, analysis, and management in the context of sustainability.
JBS_K1_U04	The graduate can plan and effectuate simple sustainability-related projects under supervision and in the context of personal lifelong learning, both individually and in a team, using appropriate transversal skills and taking shared responsibility for the outcome.
JBS_K1_W07	The graduate can apply the theory and methodology of disciplines included in the selected specialisation track to sustainability-related problems, taking into consideration practical limitations such as protection of intellectual property.