Ecology and Ecosystems

Educational subject description sheet

Basic information

Field of study Joint Bachelor in Sustainability	**Education cycle** 2025/26
Speciality Environmental & Life Sciences	**Subject code** UJ.WPAJBSELSS.880.16545.25
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** Biological sciences
Education profile General academic	**ISCED classification** 0521 Environmental sciences
Mandatory obligatory	**USOS code**

Subject coordinator	Piotr Szwedo
Lecturer	Ángeles Garcia Mayor, Ana Payo Payo, Hajnalka Szentgyorgyi, Szymon Drobniak, Miguel Berdugo, Rocio Pérez Campaña

Period Semester 4	**Examination** graded credit **Activities and hours** Lecture: 28 Classes: 17	**Number of ECTS points** 5.0

Goals

C1	students know and understand key concepts related to ecology, ecosystems and global environmental change and are able to refer to them in the context of contemporary sustainability challenges.
C2	students are able to apply different methods (literature review, data processing and analytical thinking) to address ecology and ecosystem challenges at different spatial and temporal scales.
C3	students are ready to evaluate, propose and present solutions to sustainability challenges from an ecology and ecosystems perspective in a competitive job market.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	key concepts in ecology and is able to refer to them in the context of contemporary sustainability challenges.	JBS_K1_W01, JBS_K1_W02, JBS_K1_W03, JBS_K1_W04, JBS_K1_W06, JBS_K1_W07	written credit, credit with grade, report
W2	key concepts about ecosystems including types, functions, dynamics, services, degradation and restoration and is able to critically discuss them in the context of sustainability challenges.	JBS_K1_W01, JBS_K1_W02, JBS_K1_W03, JBS_K1_W04, JBS_K1_W06, JBS_K1_W07	written credit, credit with grade, report
W3	global environmental change and is able to use this knowledge to evaluate and propose solutions to sustainability challenges.	JBS_K1_W03, JBS_K1_W04, JBS_K1_W05, JBS_K1_W06	written credit, credit with grade, report
Skills – Student can:			
U1	develop and present a clear, concise, and logical solution to a problem in the field of ecology and ecosystems, referring to the relevant aspects of sustainability and using the correct ecological terminology.	JBS_K1_U01, JBS_K1_U02, JBS_K1_U03, JBS_K1_U04	credit with grade, report, presentation
U2	find and critically evaluate academic ecological knowledge sources, as well as stakeholders and expert opinions, and use this knowledge to solve sustainability problems linked to ecology and ecosystems.	JBS_K1_U01, JBS_K1_U02, JBS_K1_U03, JBS_K1_U04	credit with grade, report, presentation
Social competences – Student is ready for:			
K1	to take a position in relation to the development trends of ecological sustainability in an international context and critically assess them.	JBS_K1_K01, JBS_K1_K02, JBS_K1_K03, JBS_K1_K05	written credit, credit with grade, report, presentation
K2	to participate in and lead interdisciplinary teams aiming to solve sustainability challenges from an ecological perspective.	JBS_K1_K01, JBS_K1_K02, JBS_K1_K03, JBS_K1_K04, JBS_K1_K05	written credit, credit with grade, report, presentation

Calculation of ECTS points

Activity form	Activity hours*
Lecture	28
Classes	17
self-study regarding classes	30
preparation for final test	30
preparation for classes	20

Student workload	Hours	ECTS
	125	5.0

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes
1.	Introduction to ecology: the earth as a complex system. Spatial-temporal scales and organisation levels in ecology. The concept of ecosystem. Humans in the ecosphere	W1, K1, K2
2.	Abiotic factors as the basis for ecosystem functioning: Environmental gradients at different scales. Practical: Global patterns of abiotic factors and ecosystems	W1, U2, K1, K2
3.	Abiotic factors as the basis for ecosystem functioning: Organism response to environmental variability. The concept of ecological niche. Organism-environment interactions. Practical: Niche characterization using species distribution models	W1, U2, K1, K2
4.	Flow of matter and energy in ecosystems: Trophic structure and dynamics. Primary productivity. Environmental regulation of ecosystems: bottom-up and top-down control. Students seminars.	W1, U1, U2, K1, K2
5.	Flow of matter and energy in ecosystems: Decomposition and organic matter cycle. Global change: Human impacts on biogeochemical cycles and climate. Students seminars	W1, U1, U2, K1, K2
6.	Ecological interactions in biological communities: Intra- and inter-specific competition. Practical: Using models to understand population dynamics and management	W1, K1, K2

No.	Course content	Subject's learning outcomes
7.	Ecological interactions in biological communities: Interspecific interactions: symbiosis, mutualism, facilitation, commensalism, parasitism, and predation. The dynamics of the sign of ecological interactions. Mechanisms of coexistence between species. Practical: From global to local biodiversity patterns	W1, K1, K2
8.	Ecosystem dynamics: The different dimensions of biodiversity. The relationship between structure, diversity and functioning of ecosystems. Ecological succession. Perturbation, ecosystem stability and tipping points: the concept of resilience. The magnitude and frequency of perturbations in a changing world. Ecological basis for ecosystem management. Student seminars.	W2, U1, U2, K1, K2
9.	Examples of ecosystem functioning and services: Aquatic (freshwater and marine), terrestrial (grasslands, forest, permafrost, desert), Microbiomes. Practical: Community composition analysis (plant/microbiomes)	W2, K1, K2
10.	Urban ecosystems: Why cities matter for ecology, urban habitats pros and cons, urban ecosystem, green cities	W2, K1, K2
11.	Ecosystem services and the NCP (nature contribution to people): History, concept, types and monetary value Provisioning, regulating, supporting and cultural ecosystem services: examples, monetary value. Exploitation of natural resources (provisioning ecosystem services)	W2, K1, K2
12.	Regulating ecosystem services (examples, value) and the effect of Global change (climate change pollution, landscape, introduction of alien species) on ecosystem services	W2, W3, K1, K2
13.	Ecosystem Connectivity, Green Infrastructure and Ecological Restoration. Practical: Landscape Ecology principles in practice: understanding structure, functioning and change of landscapes	W2, K1, K2
14.	Global environmental change and prediction of ecosystem future: Practical proposal: prediction of endangered ecosystem trajectory under climate change (e.g., using coral reef data or bird population data)	W2, W3, K1, K2
15.	Practical: Examples of locally and/or globally important ecosystem services or restoration efforts – short student's presentations	W2, U2, K1, K2

Course advanced

Teaching methods :

conversation lecture, discussion

Activities	Examination methods	Credit conditions
Lecture	written credit, credit with grade	Active participation and written test (multiple choice and open questions).

Activities	Examination methods	Credit conditions
Classes	credit with grade, report, presentation	Active participation, presentation based on the content of the syllabus, written test (multiple choice and open questions). Active participation, submission of reports based on the content of practical sessions, written test (multiple choice and open questions).

Entry requirements

None

Literature

Obligatory

1. Materials provided during the class and additional literature suggested by the lecturer

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_K03	The graduate can consider different visions of the future and develop own evidence-based opinions in reference to the balance of values linked to economic development, social welfare, and environmental protection.
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_K05	The graduate can defend the importance of scientific data and methods as a basis for decision-making.
JBS_K1_U01	The graduate can critically analyse academic literature, formulate research questions and conduct research under supervision.
JBS_K1_U02	The graduate can present and report knowledge, methodologies, ideas, problems and solutions, clearly and comprehensively, in different forms destined for different audiences – including discussions and debates which require defending a substantiated opinion, as well as conversations in a foreign language at the CEFR B2 level.
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_W01	The graduate can describe the concept of sustainability and recognize the differences in relevant definitions, models and approaches.
JBS_K1_W02	The graduate can explain the axiological background of sustainability and summarize key stages of development of the concept.
JBS_K1_W03	The graduate can give examples of sustainability-related dilemmas and hypothesize on the optimal course of action.
JBS_K1_W04	The graduate can identify sustainability-related problems specific to selected cultural, geographical, and political contexts.
JBS_K1_W05	The graduate can identify essential international instruments and institutions related to sustainability and explain their potential role in resolution of a given problem.
JBS_K1_W06	The graduate can describe interconnections between various aspects of sustainability and identify their significance in the context of natural and social sciences, with a special focus on disciplines included in the selected specialisation track (law and politics; chemistry and physics; chemistry and biology; economics and geography; economics, management and engineering; humanities).
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.