Landscape Ecology

Course description sheet

Basic information

Field of study Geospatial Computer Science **Major** - **Organisational unit** Faculty of Geo-Data Science, Geodesy, and Environmental Engineering **Study level** First-cycle (engineer) programme **Form of study** Full-time studies **Profile** General academic	**Didactic cycle** 2023/2024 **Course code** DIGPS.li20.14172.23 **Lecture languages** English **Mandatoriness** Elective **Block** Elective Modules in Foreign Language **Course related to scientific research** No

Course coordinator	Robert Mazur, Zbigniew Kowalewski, Aleksandra Wagner
Lecturer	Robert Mazur, Zbigniew Kowalewski, Aleksandra Wagner

Period	**Method of verification of the learning outcomes**	**Number of ECTS credits**
Semester 6	Completing the classes **Activities and hours** Lectures: 10 Workshop classes: 20	3

Goals

C1	Introducing students to basic phenomena and terms in the field of Landscape Ecology, climate change, human ecology, anthropopressure, environmental modeling, processes of ecological succession and other factors actively influencing changes in the natural environment
C2	Introduction to modeling of selected catchment areas, along with predicting phenomena such as droughts and floods.
C3	Introducing students to natural and anthropogenic threats negatively affecting the ecology of the landscape in selected areas of the world.

Course's learning outcomes

Code	Outcomes in terms of	Learning outcomes prescribed to a field of study	Methods of verification
Knowledge – Student knows and understands:			
W1	basic processes shaping the natural landscape resulting from human activity and selected types of natural phenomena (weather, climate)	GI1A_W03, GI1A_W04, GI1A_W05, GI1A_W06, GI1A_W10	Activity during classes, Project, Examination
W2	simple catchment models describing selected phenomena occurring in the area of selected river and reservoir catchments	GI1A_W09, GI1A_W10	Activity during classes, Project, Examination
W3	basic terms in the field of climate and area changes resulting from anthropogenic processes or natural phenomena	GI1A_W03, GI1A_W10	Activity during classes, Project, Examination
W4	types and effects of anthropogenic and natural threats actively affecting selected areas of the world	GI1A_W02, GI1A_W03	Activity during classes, Project, Examination
Skills – Student can:			
U1	make a simple mathematical model of the catchment area for selected types of phenomena and interpret the obtained result	GI1A_U09, GI1A_U10, GI1A_U13	Activity during classes, Project, Examination
U2	make a simple GIS model for selected land use parameters in various areas of the world (taking into account changes over time - over many years)	GI1A_U02, GI1A_U06, GI1A_U10	Activity during classes, Project, Examination
U3	predict and interpret possible climate changes resulting from variable anthropogenic and natural processes	GI1A_U07, GI1A_U09	Activity during classes, Project, Examination
U4	list and characterize selected types of anthropogenic threats and natural conditions that have been observed in the last 20 years	GI1A_U02, GI1A_U06, GI1A_U09	Activity during classes, Project, Examination
Social competences – Student is ready to:			
K1	assessment of changes in processes influencing the ecology of the landscape	GI1A_K01, GI1A_K02, GI1A_K04	Activity during classes, Project, Examination
K2	working with data describing changes in the environment resulting from climate change	GI1A_K02, GI1A_K03	Activity during classes, Project, Examination
K3	active social debate in order to raise awareness of the threats posed by negative anthropogenic phenomena on natural areas	GI1A_K02, GI1A_K03, GI1A_K05	Activity during classes, Project, Examination

Program content ensuring the achievement of the learning outcomes prescribed to the module

The module introduces basic knowledge of landscape ecology, selected issues of climate change, environmental modeling; prepares for GIS modeling for selected areas in terms of changes in land use (over a multi-year period), data processing and risk assessment resulting from unsustainable human activity and natural ecological disasters; allows you to acquire the ability to recognize selected types of environmental threats, assess changes that take place in the natural environment and predict negative consequences resulting from various types of anthropogenic and natural threats.

Student workload

Activity form	**Average amount of hours* needed to complete each activity form**
Lectures	10
Workshop classes	20
Realization of independently performed tasks	30
Examination or final test/colloquium	2
Contact hours	5
Preparation of project, presentation, essay, report	20
Student workload	**Hours** 87
Workload involving teacher	**Hours** 30

* hour means 45 minutes

Program content

No.	Program content	Course's learning outcomes	Activities
1.	Project 1. Landscape Ecology. Processes and phenomena responsible for shaping the natural landscape in a selected area. Environmental and climatic data, biotic and abiotic conditions shaping the type of landscape. Anthropogenic phenomena modeling natural resources in the region. 2. Basic issues of Human Ecology. Data on land use forms in the selected region, human impact on climate change. GIS models in tracking changes in land use over many years. 3. Deforestation and secondary succession processes in various regions of the world - evaluation of changes with the use of GIS tools. 4. Familiarizing students with environmental models as part of the InVEST package - used in the assessment of natural, economic and social phenomena. 5. Ecohydrological models - allowing to assess the impact of land use on the eutrophication of watercourses and reservoirs in selected catchments (eg .NDR, Polination, SDR, etc.).	W1, W2, W4, U2, K1, K2	Workshop classes

No.	Program content	Course's learning outcomes	Activities
2.	Lectures * Basic information on the discipline of Landscape Ecology. Discussion of the issues and processes responsible for the formation of landscapes in anthropogenic areas. * Discussion of basic issues in the field of Human Ecology. Linking the processes of shaping the environment by human civilization with changes that took place in the ecology of the country and selected areas of the world. Discussion of the cause-effect relationship in the mutual influence of atrogenic activities and the reproduction of renewable resources. * Presentation of the basic issues in the field of carbon footprint and linking them with climate changes that take place in the most stable geological period of the Earth (Holocene). * Discussion of climate change on selected examples, taking into account various types of environmental data (temperature data, rainfall - runoff, droughts and floods, extreme phenomena, deforestation, secondary succession, species extinction, etc.) * Presentation of selected mathematical models that can be used in the assessment of landscape and environmental changes in a given area (catchment, atmospheric, soil, microbiological, thermal models, etc.) * Discussion of selected types of anthropogenic and natural hazards on the examples of ecological disasters that took place in the world, taking into account the intensity of weather anomalies in the last 20 years. * Discussion of GIS models that can be used in assessing land use changes and assessing the impact of these changes on the natural environment in a given region.	W1, W2, W3, W4, U1, U2, U3, U4, K1, K2, K3	Lectures

Extended information/Additional elements

Teaching methods and techniques :

Group work, E-learning

Activities	Methods of verification	Credit conditions
Lectures	Activity during classes, Examination	attendance at lectures and a positively written exam
Workshop	Project	attendance and evaluation of the project

Additional info

During the course of the course, the skills acquired during the training in voice emission and presentation will be applied.

Conditions and the manner of completing each form of classes, including the rules of making retakes, as well as the conditions for admission to the exam

The condition for admission to the exam is the completion of design exercises. The condition for passing the project exercises, apart from attending classes, is the execution and passing of all the required projects. There is allowed at most one unexcused absence during the laboratory exercises and one unexcused absence during the design exercises. General knowledge checked in the written exam.

Method of determining the final grade

The module's final grade (OK) is calculated according to the formula: OK = (E + P) / 2 where: E - exam grade P - design exercise grade

Manner and mode of making up for the backlog caused by a student justified absence from classes

Arrears caused by absences from classes can be made up during consultations after individual agreement with the teacher. Unauthorized absence from the design exercises results in a reduction of the grade for the given exercises by half a degree.

Prerequisites and additional requirements

General knowledge of ecology, geography, physics and chemistry at the level of the secondary school program

Rules of participation in given classes, indicating whether student presence at the lecture is obligatory

Lecture: Students participate in classes, learning about the next content of teaching in accordance with the syllabus of the subject. Students should ask questions and explain doubts on an ongoing basis. The audiovisual recording of the lecture requires the consent of the lecturer. Laboratory exercises: Students perform design exercises in accordance with the materials provided by the teacher. The student is obliged to prepare for the subject of the exercise, which may be verified by an oral or written test. . Design exercises: Students perform practical work aimed at acquiring the competences assumed by the syllabus. The method of project implementation and the final effect are subject to evaluation.
Class attendance is obligatory.

Literature

Obligatory

1. Sharp, R., Tallis, H. T., Ricketts, T., Guerry, A. D., Wood, S. A., Chaplin-Kramer, R., ... & Vogl, A. L. (2014). InVEST user’s guide. The Natural Capital Project: Stanford, CA, USA.
2. Zhang, L., Hickel, K., Dawes, W. R., Chiew, F. H. S., Western, A. W., & Briggs, P. R. (2021). 2.2. 5 NDR: Nutrient Delivery Ratio. InVEST, 116.
3. Haines-Young, R., Green, D. R., & Cousins, S. H. (Eds.). (2003). Landscape ecology and geographical information systems. CRC Press.
4. Naveh, Z., & Lieberman, A. S. (2013). Landscape ecology: theory and application. Springer Science & Business Media.
5. Farina, A. (2008). Principles and methods in landscape ecology: towards a science of the landscape (Vol. 3). Springer Science & Business Media.
6. Wòlanski, N. (2006). Ekologia cztowieka.

Optional

1. Kędziora, A. (1995). Prognoza zmian klimatycznych. Zeszyty Naukowe/Polska Akademia Nauk. Komitet Naukowy przy Prezydium PAN" Człowiek i Środowisko", (10), 97-132.
2. Cowie, J. (2009). Zmiany klimatyczne. Przyczyny, przebieg i skutki dla człowieka, Warszawa.

Learning outcomes prescribed to a field of study

Code	Content
GI1A_K01	ma świadomość konieczności samodoskonalenia się, a także postępowania profesjonalnego, odpowiedzialnego i zgodnego z zasadami etyki zawodowej
GI1A_K02	jest gotów do aktywnego i kreatywnego współdziałania w zespole
GI1A_K03	rozumie potrzebę popularyzowania korzystania przez społeczeństwo z danych i danych przestrzennych
GI1A_K04	ma świadomość dynamicznego rozwoju i postępu w dziedzinie geoinformatyki oraz znaczenia i roli danych w rozwoju społeczeństwa informacyjnego
GI1A_K05	prawidłowo identyfikuje i rozstrzyga dylematy związane z wykonywaniem zawodu; zachowuje etyczną postawę przy wykonywaniu powierzonych zadań i prezentacji ich wyników
GI1A_U02	potrafi wykorzystywać poznane modele fizyczne do analizowania i wyjaśniania obserwowanych zjawisk, oraz tworzenia i weryfikacji modeli świata rzeczywistego, a także posługiwać się nimi w celu predykcji zdarzeń i stanów
GI1A_U06	potrafi tworzyć, modyfikować, aktualizować i administrować bazy danych w tym przestrzenne
GI1A_U07	umie komunikatywnie prezentować wyniki analiz stosując raporty, grafiki, wizualizacje i metody kartograficzne
GI1A_U09	potrafi stosować wybrane metody i narzędzia umożliwiające wsparcie systemu ocen stanu środowiska i prognozowania jego zmian
GI1A_U10	potrafi posługiwać się technikami geoinformacyjnymi, w tym CAD/GIS/BIM, do realizacji wybranych zadań z zakresu inżynierii
GI1A_U13	potrafi posługiwać się technikami informacyjno- komunikacyjnymi właściwymi do realizacji zadań typowych dla działalności inżynierskiej
GI1A_W02	ma uporządkowaną wiedzę w zakresie podstawowych działów fizyki, w tym wiedzę niezbędną do zrozumienia fundamentalnych zjawisk fizycznych zachodzących w środowisku; posiada poszerzoną wiedzę w aspekcie propagacji fal elektromagnetycznych
GI1A_W03	ma podstawową wiedzę z zakresu nauk o ziemi i nauk technicznych pozwalającą na zrozumienie, opis i analizę wybranych zjawisk
GI1A_W04	zna podstawowe zasady pozyskania i źródła danych przestrzennych oraz środowiskowych
GI1A_W05	ma uporządkowaną wiedzę w zakresie programowania niezbędną do czytania ze zrozumieniem, pisania, uruchamiania, weryfikacji programów zapisanych w językach programowania
GI1A_W06	zna zasady i metody automatyzacji przetwarzania danych pozwalające na rozwiązywanie zagadnień geoinformatycznych i inżynierskich
GI1A_W09	posiada podstawową wiedzę w zakresie modelowania i wizualizacji obiektów oraz zjawisk, a także o systemach i narzędziach informatycznych służących do realizacji takich zadań
GI1A_W10	ma wiedzę na temat metod i technik pozyskania danych przestrzennych i środowiskowych