Course code	Course group	Volume in ECTS credits	Course hours
BIO 3012	C	4	

Course type (compulsory or optional)	**Compulsory**
Course level (study cycle)	**Bachelor**
Semester the course is delivered	**Autumn (3)**
Study form (face-to-face or distant)	**Face-to-face**

Course title in Lithuanian

AUGALŲ EKOLOGIJA

Course title in English

PLANT ECOLOGY

Short course annotation in Lithuanian

Negyvieji ir gyvieji veiksniai augalų aplinkoje. Augalai – aplinkos atspindys molekuliniame-biocheminiame, rūšiniame, ekosistemos lygmenyse. Kerpių, samanų, sporinių induočių, plikasėklių, gaubtasėklių atsakas užterštai aplinkai. Vidurūšiniai, tarprūšiniai augalų santykiai. Invazinės rūšys. Pasaulio klimato kaita ir augalai. Žmogaus įtaka anglies apytakai ir pasaulio klimatui. Žemės naudojimo kaitos reikšmė augalams. Augalų įvairovė ir žmonių veiklos įtaka pasaulio biologinei įvairovei.

Short course annotation in English

Natural abiotic (climatic and edaphic), biotic and anthropogenic factors of the environment of plan molecular, individual and community level. Interaction of plants with physical and biological environme Phytoindication of pollution. Climate change effects on plants. Distribution and abundance of plan Population ecology. Community ecology. Ecosystems, plant diversity and conservation. Laboratory wo includes analyses of morphological-physiological adaptations of plants to surrounding environment

Prerequisites for entering the course

General Biology BIO1001; Fungy, Algae and Plant Morphology and Systematics; BIO1002; Field work in Botany BIO1003

Course aim

Course aims to introduce students to the main problems of nowadays Plant Ecology, methods, achievements, diversity of plant habitats, temporal and spatial variations of environment

Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
Will obtain knowledge about main environmental factors, methods of investigation, history, nowadays trends in ecology; environment as stress factor; abiotic and biotic factors, causing stress; reception and transmission of stress; light (visible light, UV), temperature effects on plants, temperature borders limiting life; heat. frost, cold, oxygen deficiency, water deficiency, salt effects on plants; adaptations to salt excess, heavy metal, aluminium, xenobiotics influence on plants, stress caused by biotic factors	Students will know main concepts, terminology and methods of the plant ecology; understand basic principles of behaviour plants in various changing conditions of environment, will distinquish main effects of different environmental stressors – acid rain, fluorides, ammonia, nitrogen oxides, elevated carbon dioxide, methane, heavy metals, aluminium, organic pollutants. Interactions between plants, plant and animal interactions
Will understand: terminology applied in ecological science, the most important problems of the ecology in the past, present and future, complexity of the plant environment, possible combined effects of pollutant mixtures, stress	Students will be able to understand the essentials of ecological science, properties of organism environment on the basis of three-hierarchial structure; the origin of form and function diversity of the plants growing in various contrasting environmental conditions,

concept, stress mitigation possibilities, main environment factors influencing exsistence of individuals, species, communities, forecats of environment quality in the future, to distinquish environment peculiarities of Europe when compared to other continents, to know perspectives of the world ecology, to forecast environment quality of the future	complexity of relationships between organisms; will understand biogeochemical cycles of the main elements important for plants, will understand global ecology problems, tasks, perpectives
Will be able to define environmental factors, according to various criteria, to select proper groups of organisms, model plants to detect adverse effects of environment, to select proper methods, to evaluate strength of effects of environmental factors according to limit values of deposition and critical concentrations of air pollutants, to distinquish between human effects and naturally occuring stressors, to find out the most important for plants factors, plant role in the main element cycling, to explain plant-plant interactions, plant and animal interactions, to analyze importance of ecological problems, to distinguish problems of local, regional and world significance	Students will acquire the primary skills in using various methods in ecological and environmental studies, selecting indicatory species to test effect of different stressors. Students will be able to do research at the laboratories, analysing plant features related to environment, to analyse biotic interactions in the crop field and planted forests, also wild environment; will be able to pick up the most important trends and select modern methods

Content (topics)

Lectures
1. Introduction to Plant Ecology. Definition and subdivisions of Plant Ecology, history, methods
2. Environment as a stress factor. Stress concept. Specific and general response to stress factors
3. Light. Temperature
4. Insufficient supply with oxygen. Water deficiency
5. Salt stress. Heavy metals. Aluminium. Xenobiotics
6. Stress caused by biotic factors. Allelopathy
7. Autecology. Atmosphere as an environment factor
8. Acidic pollutants
9. Plant and light
10. Combined effects of several environment factors on plants
11. Properties of ecosystems. Subdivisions of ecosystems and borders. Biogeochemical cycles
12. Nitrogen cycle and transformations of anthropogenic origin
13. Carbon cycling and its anthropogenic transformations
14. Synchorology. Synecology
15. Total Earth ecology. Management of natural resources. Human impact on environment quality, biodiversity
Laboratory works
1. Shadow and opened light plant adaptations
2. Plant requirements to nitrogen
3. Adaptations to drought
4. Adaptations to water excess
5. Assessment of barrier organ quality
6. Pollen structure and dispersal type
7. Structural adaptations of various types of seed and fruit for dispersal

Distribution of workload for students (contact and independent work hours)

Lectures – 45 hours, practicals (seminars and laboratory work) – 22.5 h, consultations, exam - 5,5 hours, individual work – 47 hours (it includes essay, preparations for practicals, colloquium, exam, etc.).Totally

120 hours.

Structure of cumulative score and value of its constituent parts

Colloquium – 17 %, practicals – 23 %, essay – 10 %, exam – 50 % of the total score

Recommended reference materials

No.	**Year of issue**	**Authors, title, publisher**		**Number of the books**		
				Library of the university	*Methodical cabinets*	*Other libraries*
Basic material						
1.	2011	E. Kupčinskienė. Aplinkos fitoindikacija [Phytoindication of Environment]	Kaunas	40		
2.	2005	Schulze E.D., Beck E., Muller-Hohenstein K. Plant Ecology	Springer	1		
3	1997	Crawley M.J. Plant Ecology	Blackwell Science, Oxford			
4.	1998	Bazzaz, F.A. Plants in Changing Environments: linking physiological, population, and community ecology	Cambridge, Cambridge University Press	1		
5.	1988	Harborne J.B. Introduction to Ecological Biochemistry	Academic Press, London	1		
6.	1990	Begon M., Townsend C.R., Harper J.L. Ecology: from Individuals to Ecosystems	Blackwell Publishing	1		
7.	2008	Grime J.P., Hodgson J.G., Hunt R.. Comparative Plant Ecology. A functional approach to common British species	2nd ed. Castlepoint Press		1	
8.	1991	Ellenberg H., Weber H.E., Düll R., Wirth V., Werner W., Pauliβen D. Indicator values of plants in Central Europe	Scripta Geobotanica, 18, Gottingen		3	
Supplementary materials						
1.	2006	Groom M.J., Meffe G.K., Carroll C.R. Principles of Conservation Biology. 3rd ed.	Sinauer Associates, Inc. Sunderland, Massachusetts	1		
2.	1980	J. Dagys Augalų ekologija [Plant Ecology]	Mokslas, Vilnius		2	
3.	2003	Ingrouille M.J., Eddie B. Plants: Diversity and Evolution	Cambridge University Press, Cambridge		1	
4.	1989	Harborne J.B. Introduction to Ecological Biochemistry	3rd ed. Academic Press, San Diego			

Course programme designed by

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