BIOLOGY, ENVIRONMENTAL SCIENCES
Spring 2021

Course title	ECTS	Degree	Course code	Prerequisites	Subject area
Environment and Sustainable Development	6	Bachelor	B003B120	Knowledge in ecosystem degradation, climate change, environmental pollution and global environmental problems	Biomedical sciences, biology
Biometeorology	6	Bachelor	P510B129	Physiology of Plants and Animals, Environmental Chemistry, Microbiology and Mycology, Meteorology and Climatology, Ecology of Ecosystems	Physical sciences, physical geography, climatology
Ecosystems Pollution Prevention and Control	8	Master	B003M120	Ecology, chemistry, biology	Ecology, chemistry, biology
Climate Change Impact Evaluation	8	Master	B510M001	Wildlife resource management, Modern Assessment of the Anthropogenic Loads	Ecology, biology, geography
Recreation Ecology	8	Master	B003M107	Methodology of Ecology Research, Bases and Statistics of Ecological Data, Wildlife Resource Management, Bioindication in Environmental Studies	Ecology, biology, geography

Subject area: **Biomedical sciences, biology, ecology**

Status	Course code: B003B120 Course title: **ENVIRONMENT AND SUSTAINABLE DEVELOPMENT** Taught by: Prof. Dr. Ingrida Šaulienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Spring	6	Lithuanian, English, Russian	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures - 32 h Practical tasks – 32 h Laboratory – 32 h Self-study – 64 h Total – 160 h	10-point scale	Knowledge in ecosystem degradation, climate change, environmental pollution and global environmental problems	Essay -10 % Defence of laboratory -10% Oral presentation – 10% Reflection on action – 20% Group work – 20% Exam – 30%

Subject content	Carefully studying students gain knowledge and understanding about the sustainable development as a fundamental and most important goal of the European Union that aims to continually improve the quality of life and well-being of a combination of economic development, environmental protection and social justice of the present and future generations. Students will learn how to deal with current environmental issues in the context of sustainable development and how to apply sustainable development principles in the professional practice. Students will gain a systematic and critical thinking, skills for team work and for work in unforeseen circumstances. During studying time students will perform individual and group tasks and will present results and conclusions in the argumentative form.
Learning Outcomes	1. Knows and understands the philosophy of sustainable development and principles. 2. Identifying the relationship between economic, social and environmental dimensions of sustainable development and is able to act in the environment characterized by challenges and variety of content 3. Is able to follow the principles of sustainable development when organizing ecologists work in natural and anthropogenic systems 4. Is able to think critically and logically, to work independently and in team, to present the results of done task, to argue choices and to follow academic ethics 5. Assumptions to take interest on science progress and to maintain professional competence through lifelong learning are formed

Literature	International Journal of Environment and Sustainable Development Report on sustainable development. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/865-LT/LT/865-LT-LT.PDF The integration of sustainable development into ES policy: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0400:FIN:LT:PDF http://www.globalissues.org/ http://sustainablesources.com

Subject area: **Physical sciences, physical geography, climatology**

Status	Course code: P510B129 Course title: **BIOMETEOROLOGY** Taught by: Assoc. Prof. Dr. Laura Šukienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Spring	6	Lithuanian, English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Theory - 32 h, Practical work - 32 h, Laboratory work – 32 h, Individual work -64 h, Total – 160 h	10-point scale	Physiology of Plants and Animals, Environmental Chemistry, Microbiology and Mycology, Meteorology and Climatology, Ecology of Ecosystems	Laboratory notes and report - 30% Colloquium - 15% Non-traditional task -15% Non-traditional task - 20% Essay - 5% Exam - 15%

Subject content	Biometeorology is one of the most interdisciplinary subjects, combining knowledge of meteorology, climatology, physics, mathematics, physiology, anatomy and ecosystem. During the course students are clarifying the goals of biometeorology science, highlighting current research objects, interesting in constantly evolving scientific innovations. Considerable attention is paid to the analysis of influence of meteorological and climatic elements on the biological environment. Students are analysing actuality of plant biometeorology, achievements of phenology and aerobiology. During lectures explore research methods, analyse methods selection and application possibilities in the science, as well as in practice. An estimation of animal and human biometeorology tendencies, are described research methods. Previously gained knowledge and skills are used in laboratory activities solving the relevant ecological and environmental issues. Students are evaluating the possibilities to adapt of endangered plants and animals species to environmental conditions, reasonably indicate which changes in the environment determine the rapid extinction one or another species and provide possible adaptations variants.
Learning Outcomes	1. Gain the actuality and perspectives of biometeorology scientific issues and understand the importance and significance of interdisciplinarity. 2. By the integrating knowledge able to analyse the relationship between the atmosphere and nature life, to assess atmospheric processes and strategically select the tools for the adaptation of life to the changing atmospheric conditions. 3. Able to select appropriate biometeorological research methods that would correctly solve certain ecological and environmental tasks, to adjust the methods according to the changing environment. 4. Analysing the impact of meteorological and climatic elements on wildlife, able to propose variants and to assert its.
Literature	1. Lowry P. W., Lowry II P. P. Fundamentals of biometeorology. Interactions of organisms and the atmosphere. Volume I: The physical environment. Oregon. 1989. 2. Lowry P. W., Lowry II P. P. Fundamentals of biometeorology. Interactions of organisms and the atmosphere. Volume II: The biological environment. Missouri. 2001. 3. Mavi S. H., Tupper J. G. Agrometeorology : principles and applications of climate studies in agriculture. New York , 2004. 4. Silva R. G., Maia A. S. C. 2013. Principles of Animal Biometeorology. Springer 5. International Journal of Biometeorology. 1957-2015. Springer. 6. World meteorological organization. Guidelines on biometeorology and air quality forecasts. Geneva. 2004.

Subject area: Ecology, biology, geography

Status	Course code: B510M001 Course title: **CLIMATE CHANGE IMPACT EVALUATION** Taught by: Assoc. Prof. Dr. Laura Šukienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Spring	8	Lithuanian, English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 26	10-point scale	Wildlife resource management, Modern	Laboratory work – 30%

Seminars – 54 Laboratory – 46 Self-study – 87		Assessment of the Anthropogenic Loads	Non-traditional tasks – 66% Exam – 4%

Subject content	1. The climate system 1.1 The study of relationship between climatic elements 1.2 Factors influencing the climate 1.3 The research of climate system 2. Climate change 2.1 Determination of change, variability and fluctuation of climate 2.2 Reasons of climate variability and research methods 2.3 Prevention policy of climate change 3. Impacts and consequences of climate change on ecosystems 3.1 Impact on elements of terrestrial ecosystems, prevention and adaptation 3.2 Complex evaluation of climate change impact on terrestrial ecosystem 3.3 Impact on elements of freshwater and marine ecosystems, prevention and adaptation 3.4 Complex evaluation of climate change impact on freshwater and marine ecosystems 3.5 Legal regulation of prevention of climate change impacts on ecosystems 4. Climate change impacts and consequences to anthroposphere 4.1 Climate change impact for urbanisation 4.2 The impact on human health 4.3 Evaluating the socio-economic consequences of climate change 4.4 Sustainable development of region in the context of climate change
Learning Outcomes	Taking into account the available scientific information on the climate change, adequately choose protection, adaptation tools which are designed to mitigate the effects of climate change, provide reasoned conclusions and recommendations about activities intended to mitigate the effects of climate change and adapt to it.
Literature	1. Climate change 2014: Impacts, adaptation and vulnerability. WG II, IPCC. 2. Lucier A.,Palmer M., Mooney H., Nadelhoffer K., Ojima D., Chavez F. 2006. Ecosystems and Climate Change: Research Priorities for the U.S. Climate Change Science Program. Special Series No. SS-92-06. 3. The Special Report for Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. 2012. Cambridge University Press, Cambridge, UK.

Subject area: Ecology, chemistry, biology

Status	Course code: B003M120 Course title: **ECOSYSTEMS POLLUTION PREVENTION AND CONTROL** Taught by: Dr. Ilona Keriene		
Semester	**ECTS credits**	**Languages**	**Duration**
Spring	8	Lithuanian, English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 32 Practical tasks – 72 Self-study – 109	10-point scale	Environmental chemistry, ecology	Practical tasks – 60% Individual tasks – 20% Exam – 20%

Subject content	1. Distribution of toxic compounds between ecosystem components 1.1. Analysis of toxic compounds in the environment 1.2. Mechanism of compounds toxicity 2. Factors that affect the toxicity of chemicals. Toxicity tests 3. System of ecosystem pollution management and analysis of prevention measures 3.1. Ecological risk assessment 3.2. Ecological security program 4. Advanced technologies for rational use of natural resources 5. Prevention and control of industrial and agricultural effects on ecosystems 5.1. Prevention of water and soil pollution safely using plant protection products 5.2. Analysis of Ecodesign.
Learning Outcomes	Taking into account the available scientific information about the ecosystem pollution components; adequately choose the possibilities for pollution reduction in ecosystem; applied green technologies and innovations; provide reasons, conclusions and recommendations about distribution of toxic compounds in ecosystem.
Literature	1. Berthouex ., BP. Mrown L. C. 2014. Pollution Prenvention and Control:part 1 and part 2 (e-book online, free download) 2. Baird C., Cann M. 2005. Environmental Chemistry, Freeman and Company 3. Héroux P. 2013. Principles of toxicology. Course Notes 2013. Course OCCH-612 (e-book, free download) 4. Bhat S. 2013. Ecotoxicology & Impact on Biodiversity. Journal of Pharmacognosy and Phytochemistry, 2 (2): 1-19 (online).

	5. Ecodesign directive. https://ec.europa.eu/energy/sites/ener/files/documents/list_of_ecodesign_measures.pdf

Subject area: Ecology, biology, geography

Status	Course code: B003M107 Course title: **RECREATION ECOLOGY** Taught by: Assoc. Prof. Dr. Laura Šukienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	8	Lithuanian, English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 32 Seminars – 72 Laboratory – Self-study – 109	10-point scale	Methodology of Ecology Research, Bases and Statistics of Ecological Data, Wildlife Resource Management, Bioindication in Environmental Studies	Non-traditional task – 30% Reflection on action – 15% Colloquium – 20% Oral presentation – 15% Exam – 20%

Subject content	1. The development of recreation ecology science and achievements 1.1 Recreation ecology science and its development 1.2 The research methods and techniques in recreation ecology 2. Mechanical ecosystem damage during recreation process 2.1 Mechanical damage in terrestrial ecosystem 2.2 Mechanical damage in aquatic ecosystem 3. Vegetation changes because of different recreational activities 3.1 The physiological reactions of plants to damage 3.2 Changes of form and function 3.3 Vertical and structural changes of vegetation, the consequences, damage assessment 3.4 The changes in communities and populations, damage assessment 3.5 The changes of coverage and biomass, damage assessment 4. Soil changes because of different recreational activities 4.1 Waste and soil pollution 4.2 The changes of soil bulk density, porosity and penetrability 4.3 The changes of soil water, temperature and nutrients. 4.4 The changes of the living soil 4.5 Erosion 4.6 The restoration of soil condition and damage prevention 5. Animal changes because of different recreational activities 5.1 Invertebrates changes, consequences, damage assessment 5.2 Reptile changes, damage of recreation, prevention 5.3 Damage to different bird species, prevention 5.4 Small mammals changes, consequences, damage assessment 5.5 Large mammals changes, consequences, damage assessment 6. Complex recreation impact assessment and innovation 6.1 Ecosystem damage assessment and reduction measures 6.2 Environmentally friendly innovations in recreational activities process
Learning Outcomes	Deepened the knowledge of nature protection which are necessary in a process of nature ideas development, the formulation of solution of ecological problems, which are occures because the organizing of human recreation, in the selection of optimal instruments for the reduction of recreational activities damage. Able to recommend environmentally friendly alternatives of recreational activities and to make advices about nature protection.
Literature	M. Liddle. 1997. Recreation Ecology. Springer, 639 p. W. E. Hammitt, D. N. Cole. 1998. Wildland recreation: ecology and management. John Wiley and Sons, 361 p. D. Newsome, S. A. Moore, R. K. Dowling. 2002. Natural area tourism: ecology, impacts, and management. Channel View Publications, 340 p.