

COURSE DESCRIPTION

Course code	Volume in ECTS credits	Institution	Faculty	Department
MIS8025	7	VDU ŽŪA	Forest sciences and ecology	Forest monitoring laboratory

Course title in Lithuanian

Globali kaita ir miškų būklė

Course title in English

Global changes and forest condition

Study methods	Volume in ECTS credits
Lectures	2
Consultations	1
Practice	1
Individual work	3

Short course annotation in Lithuanian (up to 500 characters)

Kurso metu analizuojamas aplinkos globalios kaitos, įskaitant klimata, oro taršą ir rūgščiąsias iškritas bei pažemio ozoną, poveikis miško ekosistemų pagrindiniams komponentams: medžių būklei ir prieaugiui, epifitinių kerpių ir žaliųjų oro dumblių gausai, bei dirvožemio pedobiontams ir upelio makrobentosui. Praktinių užsiėmimų metu supažindinama su Aukštaitijos kompleksiško monitoringo stoties veikla bei ES šalių inicijuota kompleksiško monitoringo programa. Įsigilinama į medžių būklės ir produktyvumo tyrimus bei remiantis medžių momentinėmis ekofiziologinėmis reakcijomis, nagrinėjami veiksniai turintys reikšmingos įtakos jų kaitai.

Short course annotation in English (up to 500 characters)

The course is designed to overview and analyse the effect of environmental global changes on forest ecosystems. The course covers forest tree health, productivity and their relationships with environmental factors as well as interrelationships between biotic and abiotic components of the forest ecosystem. Based on the results of the ecophysiological reactions of different tree species causation between environmental factors and changes in tree condition and increment are presented. The field trip to Aukštaitija Integrated monitoring station is intended to acquaint the students related to the aim of the UN ECE ICP programme and research conducted in the station.

Relevance of the course

The course helps the PhD students to understand processes of environmental global changes, key factors and main equipment and procedures applied for monitoring their tendencies and trends. The students will acquire competence in defining, assessing, analyzing and discussing various problems related to climate warming, changes in air pollution and acid deposition as well as interaction and synergies among VOC emitted by stressed trees, surface ozone and CO₂ air concentrations and use this knowledge in practice, suggesting environmental protection measure and assessing the effect environmental changes on different components of forest biota, including forest health and productivity. Dendrochronological approach is presented for the detection of the effect of environmental changes on tree rings formation. Having completed this course the students will know how to apply their theoretical and methodological knowledge and skills in research.

Course aims

The aim of the course - to gain knowledge, understanding and practical skills in the area of global changes, synergies between environmental factors which enhance or inhibit their effect on different components of forest ecosystem main attention paying on climate warming, air pollutants, acid deposition, surface ozone and their integrated effect on tree condition, increment epiphytic lichens, green algae and soil pedobionts diversity and abundance.

Content (topics) and methods

Lectures:

Topic 1. Environmental factors: climate change, global, regional and local pollution level, long range transboundary air pollution; their interrelationships.

Topic 2. Emissions: international legislation and conventions aimed at reduction of the environmental pollution level, new threats for forest ecosystem.

Topic 3. Air pollution: acid components, acid deposition and base cation; effect of meteorology on scattering of pollutants; effect of acid deposition on geochemical processes in soil; direct and indirect effect of acidifying compounds on different biotic components of forest ecosystems; critical concentrations and load; tree condition, crown defoliation, tree stem radial increment.

Topic 4. Surface ozone, its formation and main tendencies, interrelationships between VOC emitted by stressed trees, nitrogen oxide and CO₂; effect of climate warming on enhancing of formation of surface ozone; its phytotoxic effect on plant and trees; ozone flux content; transpiration rate and changes in increment; critical ozone flux, AOT40 and AOT80; effect of surface ozone on different biotic components of forest ecosystem. Experiences from Aukštaitija Integrated monitoring station.

Topic 5. Tree transpiration rate. Radial increment of tree stem. Hourly, diurnal, weekly and seasonal variation in tree stem circumference. Interrelationships between transpiration rate and tree stem increment. Increment of prevailing in Lithuania tree species. Water use efficiency – bioindicator of tree capacity to adapt to global environmental changes and mitigate their new threats.

Topic 6. Climate change: most significant changed meteorological parameters, their integrated effect on environmental processes and forest sustainability, including tree condition and their capacity to adapt to climate changes and mitigate their new threats. The significance of the gradual increase in CO₂ concentration and their sequestration in forest ecosystem.

Field trip: Aukštaitija Integrated monitoring station;

ICP Integrated monitoring of forest ecosystem, its conception, aim, and objectives, key methodological approach, measures and equipment;

Air chemistry, precipitation chemistry, climatic parameters and their changes;

Soil chemistry, main tendencies and key factors resulting them;

Soil, ground and surface water, their chemical composition, key factors resulting them;

Mass balance of the main nutrition and pollutants components;

Tree condition – crown defoliation. Radial increment of tree stem. Measure and methods.

Dendrochronology and increment analysis.

Bioindicators of forest condition: epiphytic lichens, green algae, herbs – species diversity and abundance, key factors.

Individual tasks:

Search of the main tendencies in environmental factors.

Dendrochronological analysis of the tree ring width series. Detection of key environmental factors which have the most significant effect on tree ring formation.

Dalyko studijų metodai:

Lectures, consultations and practical tasks at Aukštaitija Integrated Monitoring Station.

State of knowledge based on references analysis, publication and presentation of the recommendations for review preparation.

Structure of cumulative score and value of its constituent parts

Practical task at Aukštaitija IMS 20%, Individual tasks - 30%; final exam - 50 %.

Compulsory reference materials

No.	Authors of publication, title, publishing house, year of publication.
1.	Forest Condition in Europe: 2018 Technical Report of ICP Forests. https://www.researchgate.net/publication/328956391_Forest_Condition_in_Europe_2018_Technical_Report_of_ICP_Forests_Report_under_the_UNECE_Convention_on_Long-Range_Transboundary_Air_Pollution_Air_Convention
2.	Miško ekologija. 2008. Sudarytojas S.Karazija. Vilnius, Enciklopedija, 296 p.

3.	V.A.Šlapakauskas. 2006. Augalų ekofiziologija. Lututė, 412 p.
4.	R.Ozolinčius. 1998. Lietuvos spygliuočiai: morfologinės struktūros transformacijos bei jas indikuojantys veiksniai. Kaunas, Lututė, 300 p.
5.	V.Marozas. 2008. Sausumos ekosistemų įvairovė ir apsauga. Lietuvos žemės ūkio universitetas, 246 p.
6.	Sąlygiškai natūralių ekosistemų kompleksiškas monitoringas. 2006. Sudarytojas A.Augustaitis. Aplinkos apsaugos agentūra, 112 p.
7.	Lietuvos miškų būklė ir ją sąlygojantys veiksniai. Monografija. Redakcinė kolegija: R.Ozolinčius, K.Armolaitis, A.Augustaitis, L.Kairiūkštis, V.Stakėnas, M.Vaičys. Kaunas 1999, 308 p.
8.	Study on impacts of climate change on European forests. http://ec.europa.eu/agriculture/analysis/external/euro_forests/factsheets_en.pdf .

Supplementary reference materials

No.	Authors of publication, title, publishing house, year of publication.
1.	Publication on internet. Key words: <i>forest ecosystem, climate change, acid rain, acid deposition, surface ozone, forest health</i> . http://www.sciencedirect.com/
2.	Forest health and global change. S. Trumbore, P. Brando, H. Hartmann. <i>Science</i> 21 Aug 2015: Vol. 349, Issue 6250, pp. 814-818. DOI: 10.1126/science.aac6759
3.	Forest health in a changing world: Effects of globalization and climate change on forest insect and pathogen impacts. T. D. Ramsfield; Barbara Bentz https://doi.org/10.1093/forestry/cpw018
4.	"Forests, health and climate change" is now ready to be downloaded at https://www.eea.europa.eu/downloads/3578ec8a-c6a2-40ab-8b21-e468a52b5b60/1500283255/forests-health-and-climate-change.pdf
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Course programme designed by

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