Course name: **GLOBAL CHANGE FORESTRY (GCF)**

ECTS	2
Course status	optional, facultativ
Course final assessment /evaluation of outcomes	Exam
Prerequisite	knowledge and skills in the field of ecology, physiology

Main field of study*: *Forestry

Educational profile	General academic
Code of studies and education level	MSc
Semester of studies	summer
Language of instruction	English

Course offered by:

Name of faculty offering the course	Faculty of Forestry
Name of department offering the course	Department of Forest Ecology and Silviculture
Course coordinator	prof. dr hab. inż. Stanisław Małek

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands			
LES_GCF_W01	the anthropogenic impacts at a level that allows describing and interpreting natural phenomena and solving engineering tasks, fully understanding their significance and relying on empirical foundations	LES2_W01 LES2_W02	RL
LES_GCF_W02	various types of anthropogenic impacts on forest ecosystems, knows the methods for determining its elements	LES2_W01 LES2_W02	RL
SKILLS – student is able to			
LES_GCF_U01	carry out complex analytical tasks, observations and measurements in the laboratory and on research areas, describes complex natural phenomena occurring in ecosystems, proposes the optimization of selected methods used in environmental protection using knowledge of mathematical, natural and technical sciences, uses the scientific language in undertaken discourses with specialists from a selected scientific discipline	LES2_U01 LES2_U02 LES2_U05 LES2_U06	RL
SOCIAL COMPETENCIES – student is ready to:			
LES_GCF_K01	critically assess themselves, the teams they work for, and lead the group and take responsibility for it	LES2_K02	RL

Teaching contents

Lectures	**20 hours**
Topics	Principal global cycles of: water, carbon, nitrogen and phosphorus; Global change – physical principles and effects, atmospheric system, anthropogenic influences, greenhouse effects; Interaction between air pollution and global change – air pollution impact and types of interaction with global change impact, antagonism and synergisms; Role of solar radiation capture and structure of the canopy on global change on forest ecosystems; Methods of forest ecosystems investigation with special attention to forest canopy microclimatology, biomass estimation and water circulation; Anthropogenic activity and their influence on plant, soil and water on example of same

	activity; Importance of forest stands in the landscape carbon stock; Impact of deforestation on the localization of springs and water chemistry - same implications from the Western Beskid – Poland; Rehabilitation and restoration in degraded forest - same implications from Western Beskid – Poland; Global change forestry – effect on stands and waters in mountain areas
Accomplished learning outcomes	LES2_W01; LES2_W02; LES2_U01; LES2_U02; LES2_U05; LES2_U06; LES2_K02
Means of verification, rules and criteria of assessment	limited time written test - satisfactory grade 3.0 minimum 60% of points for given answers and solving given problems; the share of the lecture grade in the final grade is 50%

Classes: Seminar	**4 hours**
Topics	Presentation by student on topic: Problems in Your homeland with relation to global change forestry
Accomplished learning outcomes	LES2_U01; LES2_U02; LES2_U05; LES2_U06
Means of verification, rules and criteria of assessment	data development - report, oral presentation, demonstration of practical skills. The share of the grade for passing the seminar exercises in the final grade is 30%.

Classes: Field trip	**6 hours**
Topics	Experimental research station Jaworzyna Krynicka Global change forestry – effect on stands and waters in mountain areas
Accomplished learning outcomes	LES2_U01; LES2_U02; LES2_U05; LES2_U06
Means of verification, rules and criteria of assessment	data development - report, oral presentation, demonstration of practical skills. The share of the grade for passing the seminar exercises in the final grade is 20%.

References:

Basic	1. Małek S., Martinson L., Sverdrup H., 2005. Modeling future soil chemistry at a highly polluted forest site at Istebna in Southern Poland using the "SAFE" model, Environmental Pollution, 3, vol. 137, 568-573; 2. Małek S., 2010. Nutrient fluxes in planted Norway spruce stands of different age in Southern Poland. Water, Air, and Soil Pollution, 209, 45-59, 3. Marek M. V. Janouš D.Taufarová K.Havránková K.Pavelka M.Kaplan V.Marková I. 2011. Carbon exchange between ecosystems and atmosphere in the Czech Republic is affected by climate factors. Environmental Pollution. Vol.: 159 (5), pp. 1035 – 1039.
Supplementary	1. Crabbe R. Dash J. Rodriguez-Galiano V. Janouš D.Pavelka M.Marek M. 2016. Extreme warm temperatures alter forest phenology and productivity in Europe. Science of the Total Environment. Vol.: 563-564, pp. 486 – 495. 2. Urban O.Klem K.Holišová P.Šigut L.Šprtová M.Teslová-Navrátilová P. Zitová M. Špunda V. Marek M. V. Grace J. 2014. Impact of elevated CO_2 concentration on dynamics of leaf photosynthesis in Fagus sylvatica is modulated by sky conditions. Environmental Pollution. Vol.: 185, pp. 271 – 280. 3. Małek S., Astel A., 2008. Throughfall chemistry in a spruce chronosequence in southern Poland. Environmental Pollution 155, 517-527.

Structure of learning outcomes

Area of academic study: R – Agricultural sciences, L - forestry	2 ECTS

Structure of student activity					ECTS**
Contact hours		37	hrs.	1,5	ECTS**
Including:	lectures	20	hrs.		
	classes and seminars	10	hrs.		
	consultations	5	hrs.		
	participation in research	…	hrs.		
	obligatory traineeships	…	hrs.		
	participation in examination	2	hrs.		
e-learning		…	hrs.	….	ECTS**
student own work		13	hrs.	0,5	ECTS**

*Areas of academic study in the fields of: H- humanities; S - social studies; P – biological sciences; T – technological sciences; M- medical, sport and health sciences; R – Agricultural, forestry and veterinary sciences; A – the arts
** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes