



WP2

Development of curricula

Lead Organisations of WP2: **UNS - Serbia**

Participating Organisation: UB;UNI; UBL; UNSA; INSZASUM;
BOKU; UNSCM; UNIRC;FRI-BAS

Deliverable 2.3

**Title: Established new and improved existing subjects
of bachelor and master programme**

Participating Organisation: UB; UNS; UNI; UBL; UNSA



PROJECT INFO

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Project acronym	SETOF
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Ref. No and Title of Activity	2.3.Established new and improved existing subjects of bachelor and master programme
Title of Deliverable:	Report on new and improved existing subjects of bachelor and master programme
Institutions:	University of Banja Luka
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Defined goals/objectives, competencies and learning outcomes of Bachelor and Master curriculum

Soil erosion and floods are identified as one of the main land degradation drivers in the Republic of Srpska, through Land Degradation Neutrality Target Setting Process. Considering the importance of prevention and control of soil erosion as a human induced phenomena, which as a consequence has torrential floods and floods in general, higher education system of the Republic of Srpska coming into the focus of decision makers, particularly on the local community levels particularly those affected by floods in the recent decade.

Improvement and modernization of existing erosion/floods related subjects on Bachelor and Master studies at the Faculty of Forestry University of Banja Luka, will create base for better education of students but also experts employed in the forestry/agriculture/water sectors, who are enrolled on Master study program. Capacity building and knowledge improvement of experts in the area of soil erosion and floods, particularly from the prevention and mitigation point of view, will gave new insights and skills recognized on national, but also regional and international level. Existing Bachelor and Master studies (syllabus and subjects) at the Faculty of Forestry University of Banja Luka, are not aligned with the requirements of practice and international commitments that Republic of Srpska (Bosnia and Herzegovina) has. Achievement of land degradation neutrality, flood mitigation and prevention has been defined as one of the priorities in the future work of relevant institutions asking active participation of science and education. Improvement of existing curricula and subjects on the Bachelor and Master studies at the Faculty of Forestry UBL, will be carried out in accordance with the Bologna Declaration and experiences of EU countries (Austria, Italy, Bulgaria) and countries in the region.

Integrative management of natural resources has been recognized as very important approach in flood mitigation, where forestry sector plays a central role. Improvement of existing situation and efficient prevention of future floods and soil erosion, draws attention to the importance of highly skilled professionals and experts who will gain required knowledge through improved syllabuses and subjects of Bachelor and Master studies. Sustainable use of natural resources, particularly forests, land, water requires appropriate management systems, but also modern education system in this regard.

New Master study program established by the University of Belgrade, and supported by University of Banja Luka and other partners, will be the starting point for delivering trainings and knowledge to forest engineers and soil scientists how soil erosion can be controlled through implementation of practical techniques. Prevention and combat land degradation, soil erosion, and floods has particular importance on the local level of implementation. With this study program, experts will be trained for innovative techniques and measures that will



have a positive impact on sustainable land/forest management reflected through decreased floods events and soil erosion. Students of new Master program will be trained and educated for soil protection, soil erosion control and prevention of torrential floods.

Expected learning outcomes based on modernized Bachelor and Master curricula at the Faculty of Forestry UBL and new Master program established at the Faculty of Forestry UBG are:

- Capability to analyze and research environmental principles related to soil erosion and flood control, aimed to define main gaps and challenges for sustainable soil management and efficient flood prevention and control;
- Knowledge on modern techniques and approach and capability to select and implement the most important ones in the field of soil erosion and floods, to identify appropriate solutions against erosion and prevention of torrential floods;
- Create and develop new systems aimed to protect soil, prevent floods and decrease soil erosion;
- Appropriate application of knowledge and skills, with the capability for lifelong learning.

Expected competencies of the students are:

- Work in teams to design and implement advanced solutions to problems in soil erosion and torrential floods;
- Independently research, analyze and implement tasks in the field of soil erosion and torrential floods;
- Communicate clearly and precisely, both verbally and in writing;
- Think critically and creatively, both independently and with others and organize ideas effectively;
- Ability to prepare effective oral presentations and to deliver it among a broad audience.

Upon finishing modernized study program on Bachelor and Master study at the Faculty of Forestry UBL, and newly established Master program, graduates and experts will be well educated in the field of soil erosion and torrential floods, capable to develop, implement and control soil erosion and torrential floods, as well as to continue their education in doctoral studies in forestry or other scientific fields of biotechnical sciences.



Study program title: **Forestry**

Type and Level of Study: **Basic Academic Studies (Bachelor)**

1. Forest eco-climatology
2. Forest soils
3. Land degradation
4. Forest utilization 2

Study program: Forestry		
Subject name: Forest eco-climatology		
Teacher(s): Marijana Kapovic Solomun		
Subject status: compulsory		
ECTS: 4		
Requirement:		
Learning objectives		
<p>This subject allows future engineers to learn about climatic factors of forest biogeocenosis as a basis of forest ecology. Students are introduced to general data on the composition, division and physics of the atmosphere, with the role and importance of meteorological and climatic elements and finally factors, processes and phenomena in forest ecosystems. Also, students are introduced to global trends and climate change and their impact on forest ecosystems and land degradation. The course analysis climate extremes in BiH, especially those that cause the occurrence of floods and droughts, with characterization of forests role in flood prevention, as well as adaptation and mitigation opportunities.</p>		
Learning outcomes		
<p>Students are capable to independently analyze and define climate characteristics of any region, influence and interactions between climate and forests. Students are capable to estimate the most important climate parameters and expected climate changes important for silviculture and forest management, considering role of forests in prevention of floods and torrents.</p>		
Subject content		
<p>Concept and division of meteorology and climatology; Basic meteorological elements and meteorological phenomena; Atmosphere and soils; Climate elements and factors; Keppen climate classification; General atmospheric data; Solar radiation; Air pressure and winds; Water and water vapor in the atmosphere; Precipitation; Air Masses and Fronts; Climate change and forestry; Climate extremes, floods and wildfires; Emission og gases and atmosphere pollution; Role of forests in prevention of floods and torrents; Sustainable development and climate change mitigation; Climate, soil and plant interaction; UNFCCC Convention; Meteorological instruments in forestry</p>		
Literature		
<ol style="list-style-type: none"> 1. Kolić, B. (1988): Šumarska ekoklimatologija sa osnovama fizike atmosfere. Naučna knjiga, Beograd, 2. Milosavljević, M. (1984): Klimatologija. Naučna knjiga, Beograd 3. Milosavljević, M. (1988): Meteorologija. Naučna knjiga, Beograd 4. LRozenzweig, C., (2007): Adaptation and mitigation strategies in agriculture: an analysis of potential synergies, NASA, publication 25. 		
Number of active teaching hours	Theoretical classes: 2	Practical classes: 2
Teaching Methods: Classes are taught in the form of lectures and exercises. Theoretical teaching is carried out using modern presentation equipment.		

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Forms of assessment of students knowledge					
Attending classes	5	Test 1	20	Final exam	50
Activbity on classes	5	Test 2	20		

Study program: Forestry					
Subject name: Forest soils					
Teacher(s): Marijana Kapovic Solomun					
Subject status: compulsory					
ECTS: 4					
Requirement: Petrography with geology and Soil science, passed exams					
Learning objectives The learning objectives for students is to master properties and ecologic-production potential of main soil types of our region. Also, they will learn about actual soil classifications and the methods of soil maps development. Besides, students will learn about the most frequent factors of forest soil degradation, endangerment of floods, erosion and wildfires, and possibilities for prevention through sustainable land management.					
Learning outcomes The student acquires the necessary knowledge about soil types, properties and productive potential. They are capable for independent determination of soil types, to recognize degraded soils and factors of degradation, to estimate production potential for plant species, and plan and implement possible measures for sustainable land management under particular conditions.					
Subject content Classification of soils of Yugoslavia; WRB and other land classifications; Undeveloped soils class; Class of humus-accumulating soils; Cambic soils class; Class of eluvial - illuvial soils; Class of epigleyic soils; Class of hypogleyic soils; Class of fluviatile and fluviogleyic soils, Anthropogenic and Peat soils; Soil combinations; Development of soil maps; Field research methods; Land degradation drivers; Soil erosion; Floods and soils; Influence of wildfires on forest soils; Sustainable land management.					
Literature <ol style="list-style-type: none"> 1. Ђирић, М. (1984): Педологија, I издање, ООУР Завод за уџбенике и наставна средства, Сарајево. 2. FAO/ISRIC (2006). World References Base for Soil Resources, World Soil Report, No.103, Rome, 128 3. WOCAT database 4. *** (1966): Методика теренског испитивања земљишта и израда педолошких карата, Приручник за испитивање земљишта, књига 4, ЈДПЗ. Београд. 					
Number of active teaching hours		Theoretical classes: 2		Practical classes: 2	
Teaching Methods: Lectures, exercises, fieldwork and consultations.					
Forms of assessment of students knowledge					
Attending classes	5	Test 1	20	Final exam	50
Activbity on classes	5	Test 2	20		



Study program: Forestry					
Subject name: Land degradation					
Teacher(s): Marijana Kapovic Solomun					
Subject status: elective					
ECTS: 4					
Requirement: Petrography with geology and Soil science, Forest soils passed exams					
Learning objectives The objective of the subject is to introduce to student basic aspects of land degradation (erosion, floods, overexploitation of forests, pollution, desertification, etc.) and the factors that cause land degradation. The objective is also to learn and master modern methods of land conservation, and possibilities of prevention through different techniques and approaches.					
Learning outcomes The student acquires the necessary knowledge and understanding of global changes in pedosphere, consequences of soil/land degradation on global and local level. They are capable to recognize degraded sites and to define drivers and causes of degradation. Also, they can estimate possible measures for that will rehabilitate degraded land.					
Subject content The role of land in an ecosystem; Land use ; The drivers of global change in the pedosphere; Global soil resources, processes and trends: land degradation, organic carbon content, erosion, floods, soil contamination, soil acidification, salinization, land use change, urbanization, lost of soil. Land as part of global natural resource management. Land degradation neutrality. Land management and land protection policies (global and regional agreements, national policies).					
Literature					
<ol style="list-style-type: none"> 1. Ђоровић, М. (2005): Водна и еолска ерозија земљишта, Унија биолошких и научних држава Југославије, ЈДПЗ, Београд. 2. Lambin, E. F., & Geist, H. (Eds.). (2006). Land-Use and Land-Cover Change – Local Processes and Global Impacts (Global Change – The IGBP Series). Heidelberg, Germany: Springer. 3. Blanco, H., & Lal, R. (2010). Principles of Soil Conservation and Management. Heidelberg, Germany: Springer. 4. Morgan, R. P. C. (2005). Soil Erosion and Conservation (3rd Edition). Oxford, UK: Blackwell Publishing. 5. FAO and ITPS. (2015). Status of the World’s Soil Resources (SWSR) – Main Report. Rome, Italy: Food and Agriculture Organization of the United Nations 					
Number of active teaching hours		Theoretical classes: 2		Practical classes: 2	
Teaching Methods: Lectures, exercises, fieldwork and consultations.					
Forms of assessment of students knowledge					
Attending classes	5	Test 1	20	Final exam	50
Activbity on classes	5	Test 2	20		



Study program: Forestry					
Subject name: Forest utilization 2					
Teacher(s): Dane Marceta					
Subject status: elective					
ECTS: 5					
Requirement: Forest products, Mechanisation in forestry passed exams					
Learning objectives The objective of this course is to acquaint students with the technique of working on the production of forest wood assortments, and to qualify them, as future forestry engineers, to independently planning and carrying out production, respecting the principles of productivity and economy and the principles of sustainability and protection of biodiversity.					
Learning outcomes The student will be able to independently make planning decisions, important for selecting the right technology and planning of wood production and transportation					
Subject content INTRODUCTION - Wood transportation, Main issues, definitions, phases and general indicators of transportation. Modes of transport and machinery. Costs of transport. Choosing a machinery. Forest trails, Optimum density of forest trail network and other communications. Cable yarders. Loading and unloading of wood. Transportation of wood. Standardization of work on the costs of the first and second phases of transport and loading. Transport of wood by water and air. ENVIRONMENTALLY ACCEPTABLE WAYS OF FOREST UTILISATION - The consequences of logging and timber transport. Damage to the stand. Rutting and compaction of soil, Erosion caused by cutting and transport. Measures to reduce land damage. Selection of ecologically optimal mechanization and working methods. PLANNING OF FORESTRY OPERATION - Types of plans for forest utilization. Forest utilisation plan within the forest management plan. Operational (production) plans for forest utilization and immediate production costs. Annual production plan. An operational plan. OPERATIONAL MANAGEMENT IN PRODUCTION OF FOREST WOOD ASSORTMENTS - Selection of contractors. Monitoring and control of the realization of works. Reception and dispatch of produced assortments.					
Literature 1. Nikolić S. (1993): Iskorišćavanje šuma. Zavod za udžbenike i nastavna sredstva. Beograd. 2. Kulušić B. (1977): Iskorišćavanje šuma – proizvodnja šumskih drvnih sortimenata. Šumarski fakultet u Sarajevu. 3. Бајић, В. Даниловић, М. (2003): Искоришћавање шума - практикум, Шумарски факултет Универзитета у Београду, Београд 4. Поповић В. (1969): Искоришћавање шума - други део, уџбеник / Forest exploitation, Vol. 2, Textbook / Beograd: Građevinska knjiga, 368 str. 5. Heinrich, R. (1996). The FAO programme on environmentally sound forest harvesting operations. FAO Forestry Paper (FAO).					
Number of active teaching hours		Theoretical classes: 2		Practical classes: 2	
Teaching Methods: Lectures + exercises + fieldwork (3 days)					
Forms of assessment of students knowledge					
Attending classes		Test 1	20	Final exam	50
Activity on classes	10	Test 2	20		



Name of the study program: **Forestry Type and level**
of study: **master's degree studies new subject**

Study program: Forestry - Forest ecology and forest establishment					
Subject name: Sustainable land management and global trends					
Teacher(s): Marijana Kapovic Solomun					
Subject status: compulsory					
ECTS: 6					
Requirement:					
Learning objectives					
This subject is inter-connected with subjects on Bachelor study program: Soil science, Forest soils and Land Degradation. During the course, students are introduced to global trends in land degradation, through synergies with climate change and biodiversity and international conventions and agreements relevant to land resources. Particular emphasis is put on condition of land resources of the region, and the most important land degradation drivers, where floods, droughts and wildfires are among the most important ones. Subject also elaborates land use systems, modern approaches and techniques for the sustainable land management in order to prevent land degradation.					
Learning outcomes					
The learning outcome is the knowledge needed to improve land management by introducing new approaches and technologies, which implementation will contribute to the prevention, conservation and sustainability of natural resources, where soils play an important role.					
Subject content					
Global trends and land degradation; International conventions and agreements; The UNCCD Convention; The UNFCCC Convention; UNCBD Convention; Synergy between international conventions and significance for land/soil; State of Land Resources of RS (BiH); The most important factors of land degradation in RS (BiH); Possibility of prevention of land degradation (floods, fires, drought); Approaches to Sustainable Land Management; Techniques in Sustainable Land Management; WOCAT; Land PKS; Land Degradation Neutrality.					
Literature					
<ol style="list-style-type: none"> 1. Kapović Solomun, M., Barger, N., Keesstra, S., Cerda, A., Marković, M. 2018. Assessing land condition as a first step to achieving Land Degradation Neutrality: A case study of the Republic of Srpska, Environmental Science and Policy 90 (2018), 19-27. 2. Kapović Solomun, M., 2018. Program dostizanja neutralnosti degradacije zemljišta u Republici Srpskoj, Banja Luka. 3. Marković, M., Brujić, J. 2017. Overview of the natural resource management in Bosnia and Herzegovina. In: Dragovic, N., Ristic, R., Püzl, H., Wolfslehner, B. (Eds.), Natural Resource Management in Southeast Europe: Forest, Soil and Water. UNEP, 2017: Akcioni Program za borbu protiv degradacije zemljišta i ublažavanja posljedica sue u BiH, 2017 4. UNDP, 2016: Treći nacionalni i drugi dvogodišnji izvještaj u skladu sa Konvencijom UN o klimatskim promjenama. 					
Number of active teaching hours		Theoretical classes: 3		Practical classes: 2	
Teaching Methods: Lectures, exercises, field work and consultations. Seminar work.					
Forms of assessment of students knowledge					
Attending classes	10	Test 1	20	Final exam	50
Activity on classes		Test 2	20		

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Name of the study program: **Forestry** Type and level
of study: **master's degree studies modernized**
subject

Study program: Forestry - Forest ecology and forest establishment					
Subject name: Syndinamics of forest phytocaenosis					
Teacher(s): Jugoslav Brujic					
Subject status: compulsory					
ECTS: 6					
Requirement: Phytocoenologia					
Learning objectives					
Theoretical knowledge of syndinamics of forest stands and practical applications.					
Learning outcomes					
Students acquire theoretical knowledge of types of vegetation successions and the application of acquired knowledge in practice.					
Subject content					
Fundamentals of syndinamics of forest vegetation, types of successions and syndinamic units. Climax and para-climax. Vegetation successions in the world, preliminary. Reversible and irreversible successions (by changing the water regime, by changing the micro-orographic conditions, by changing the substrate and by the forming technogenic soils, or by severe erosion). Bio-meliorative aspect of successions of bareland, karst, eroded areas and landslides. Sequences of exogenous successions (after wildfires, storms, logging, etc.), progressive and regressive stages. Developmental sequences of endogenous successions of our most important forest phytocaenosis: downy oak-oriental hornbeam, sessile oak-common hornbeam, Turkey-Hungarian oaks, submontane beech forests, pannonian beech-fir forests, oromediterranean beech-fir forests, altimontane spruce-beech-fir forests, subalpine forests (beech, spruce, Bosnian pine, Balkan pine); flood forests of pedunculate oak, forests of Austrian and Scots pine, canyon forests, forests of noble hardwoods etc. Relationships with forest types and management classes, importance in determining management objectives. In the field - recognizing models in nature.					
Literature					
1. Стефановић, В. (1986): Фитоценологија. Свјетлост-Завод за уџбенике и наставна средства. Сарајево.					
2. Стефановић В. (1970): Један поглед на рецентну сукцесију буково-јелових шума прашумског карактера у Босни. АНУБИХ, Одјељење природних и математичких наука, Посебна издања XV, књига 4, стр. 141-150. Сарајево.					
3. Redžić S. (2000): Patterns of succession of xerophylous vegetation on the Balkans. Proceedings IAVS Symposium, pp. 76-79. IAVS; Opulus Press Uppsala. UK					
4. научни радови из синдинамике шумске вегетације					
Number of active teaching hours		Theoretical classes: 3		Practical classes: 2	
Teaching Methods: Lectures, exercises, field work and consultations. Seminar work.					
Forms of assessment of students knowledge					
Attending classes	10	Test 1	20	Final exam	50
Activity on classes		Test 2	20		