



WP2

Development of curricula

Lead Organisations of WP5: **UNSA–Bosnia and Herzegovina**

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

Project title	Soil Erosion and Torrential Flood Prevention: Curriculum Development at the Universities of Western Balkan Countries
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The Faculty of Forestry at the University of Sarajevo will innovate the contents of eight courses of four study programs that are in the first and second cycle and will introduce one new elective course. The new elective course will be developed through joint study MSc program and introduced into innovated syllabus of MSc studies at the Faculty of Forestry UNSA.

Study program title: BSc Forestry, BSc Horticulture, MSc Sustainable Forest Ecosystem Management, MSc Landscape architecture
Type and Level of Study: Basic and Master Academic Studies

BSc Forestry: The objective of the BSc Forestry study program is to educate a general forestry expert with a balanced knowledge of ecological, breeding, technical, technological, planning, economic, organizational and forest ecosystem protection disciplines. After completing their studies, the experts in this profile have the operational knowledge necessary to monitor and complete jobs and tasks in the forestry and related fields. Bachelors of Forestry have the ability to understand the general issues of the forestry sector and the functioning of forest ecosystems, which is the starting point for further improvement during the II cycle of studies. Based on the bachelori forestry diploma, they can be employed in jobs whose requirements correspond to the learning outcomes of this study, ie acquired knowledge, skills and competences.

BSc Horticulture: The aim of the BSc Horticulture study program is to educate horticultural professionals with multidisciplinary knowledge and skills based on general, environmental, technical, biotechnical, economics, organizational and artistic disciplines. The study program acquires theoretical and practical knowledge necessary for the planning, care and protection of urban green spaces, natural landscapes and nature protected areas (reserves, monuments and landscapes of nature, national parks, park forests, etc.) and environmental protection.

MSc Forestry: The objective of the study program is to educate a forestry expert with the knowledge and skills necessary to plan and execute complex tasks in managing and managing forest resources. After completing their studies, experts in this profile have advanced knowledge of biological-breeding, technical, technological, planning, economic-organizational and discipline of forest ecosystems, which help them to manage and manage forest resources on ecosystem bases and in conditions of their multifunctional use. Masters of forestry who complete the second cycle of studies with good success can continue their training in the third cycle of studies.



The innovations of individual subjects will be done according to article 15 of Rules for the proposal procedure, assessments, adoption of new i modification of existing study programs i curriculum program at University in Sarajevo from 2018.

List of **innovated** subjects included in the study program of basic academic studies BSc Forestry and BSc Horticulture:

1. **Torrent control;**
2. **Methods of rehabilitation of eroded terrains;**
3. **Pedology 2.**

Study program: BScForestry
Subject name: Torrent control
Teacher(s): Muhamed Bajrić
Subject status: Obligatory
ECTS: 5
Requirement:
<p>Subject aim</p> <p>The main objective of the course is to point out to students the growing trend of soil erosion and the increasing number of torrential phenomena, which are increasingly a serious problem in different industries, but also very often the danger to human lives. Given the importance of forestry as an industry in BiH, the function of forests as the highest quality natural factor in preventing erosion processes, the transfer of eroded materials and the regulation of the water regime, students will be given the necessary knowledge to be able to carry out appropriate erosion and forest management activities in future operational work in forestry. against a torrential measure.</p> <p>Given that the majority of torrential streams occurring in forest and forest lands, students will be given guidance on how to detect such streams in a timely manner, and how to properly address this problem.</p>
<p>Subject outcomes</p> <p>After the course, the student:</p> <p>recognizes erosion processes in the field and potential torrential flows to minimize preventive actions in forest management;</p> <p>understands the basic concepts in the field of torrents and erosion processes, as well as the natural and other factors under the influence of which the erosion processes intensify;</p> <p>undertakes appropriate necessary work in anti-erosion and anti-torrential combat.</p>
<p>Subject content</p> <p>Introduction, torrential phenomena and their specificities. Prevalence of torrential phenomena. Natural processes that influence the formation of torrents. Hydrological and geological processes. Relationship between soil erosion and torrential phenomena. Soil erosion and torrential floods as a factor of environmental degradation. Analysis of laws and by-laws from the aspect of treatment of soil erosion and torrential floods. Penepain. Water erosion. Aeolian erosion. Damage from erosion. Basic erosion factors. Air. Land. Vegetation cover. Relief. Geological composition of the terrain. Anthropogenic and other factors. Water erosion processes. Surface erosion. Crested erosion. Trench erosion. The importance and role of forest in erosion prevention. Dominant factors of erosion processes of occurrence of erosion processes in forestry and protection measures. Complex forms of terrain deformation. Land loss due to erosion. Estimation of soil loss in water erosion. Estimation of</p>

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land loss due to aeolian erosion. Flood. Formation of torrents. Sources of solid component of torrents. Sources of liquid component of torrents. A torrential basin and a torrential stream. Classification of torrential flows. Analysis of basic characteristics of a torrential basin. Research methods for torrents. Land erosion risk assessment methods. Calculation of torrential parameters. Maximum flows and amount of torrential application. Measurement of torrential parameters. Fall equalization and fall equilibrium. Forecasting torrents. Recording terrain for the purpose of forecasting torrential flows. A study of rainfall regimes in a torrential basin. Development of erosion maps and their importance in forecasting torrential phenomena. A modern approach to landscaping torrents and torrents. Anti-burglary works. Torrent management principles and basic systems. Arranging torrents of spiers. Technical anti-erosion work. Biological anti-erosion works. Arranging torrents of undermining. Barriers. Cascades. The thresholds. Modern methods and facilities for landscaping torrents. Maintenance of anti-storm objects.

Literature

Jahić Munir (2008): Uređivanje bujica, Šumarski fakultet, Sarajevo.

Jahić Munir (2003): Hidrotehnika, tehnički fakultet, Bihać.

Langof Zlatko (2000): Problematika klizišta u sarajevskom kantonu (uzroci pojave klizišta interventne sanacione mjere), Zavod za geotehniku i fundiranje Građevinskog fakulteta u Sarajevu. Gavrilović

Slobodan (1972): Inženjering o bujičnim tokovima i eroziji, „Izgradnja”, Beograd. Kostadinov Stanimir

(2006): Bujični tokovi i erozija, Šumarski fakultet, Beograd.

Ristić Ratko (2011): Hidrologija bujičnih tokova, Šumarski fakultet, Beograd.

Vučičević Dušan (1995): Uređivanje bujičnih tokova, Društvo bujičara Jugoslavije, Beograd.

Žurovec Jasminka (2012): Melioracije i uređenje poljoprivrednog zemljišta, Poljoprivredno-prehrambeni fakultet, Sarajevo.

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.

Evaluation of knowledge (maximum score 100)

Pre-exam obligations	points	Final exam	points
Activity during the lectures	7	Written examI	40
Practical teaching	-	Written examII	45
Seminar Essay	8	Oral exam	

Study program: BScForestry

Subject name: Methods of rehabilitation of eroded terrains

Teacher(s): Muhamed Bajrić

Subject status: Elective

ECTS: 3

Requirement:

Subject aim

The aim of the course is to familiarize the phenomena of torrential phenomena, with a focus on erosion processes, types and ways of degradation of forest terrain, as well as the principles of regulation of torrential flows using appropriate type of material for rehabilitation. Also, students will be able to easily and efficiently perceive some of the negative consequences of forest management through the completed course in this course, and by applying the acquired knowledge from the

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subject, given the significant financial resources that need to be allocated if necessary to intervene in the rehabilitation of eroded forest terrains.

Subject outcomes

After the course student

- defines, on the basis of theoretical knowledge and practical exercises, in the field, characteristic types of degradation of forest and other terrains of different forms.
- understands the dynamics of formation and formation of torrential flows.
- solves simpler problems related to the formation and occurrence of erosion processes and torrential phenomena.

Subject content

The concept and significance of eroded forest terrains. Use of natural materials in the rehabilitation of eroded forest terrains. Application of synthetic materials in the rehabilitation of eroded forest terrains. Remediation methods. (Legislation - regulations, Biological works, Biological - technical works, Civil engineering works, Modern methods of rehabilitation). Construction and technical works. Transverse objects. Partition types and their selection. The possibility of using construction and technical facilities in the field of forestry. Modern methods and facilities for editing torrents. An integral approach to the repair of eroded surfaces. Effects of application of different forest management systems on the emergence and development of erosion processes. The importance of maintaining and repairing the primary network of forest transport infrastructure in preventing erosion processes. Importance of rehabilitation of secondary network of forest transport infrastructure in preventing erosion processes.

Literature

- Jahić Munir (2008.): Uređivanje bujica, Šumarski fakultet, Sarajevo.
 Jahić Munir (2003.): Hidrotehnika, tehnički fakultet, Bihać.
 Langof Zlatko (2000.): Problematika klizišta u sarajevskom kantonu (uzroci pojave klizišta interventne sanacione mjere), Zavod za geotehniku i fundiranje Građevinskog fakulteta u Sarajevu. Gavrilović Slobodan (1972.): Inženjering o bujičnim tokovima i eroziji, „Izgradnja”, Beograd. Kostadinov Stanimir (2006.): Bujični tokovi i erozija, Šumarski fakultet, Beograd.
 Ristić Ratko (2011.): Hidrologija bujičnih tokova, Šumarski fakultet, Beograd.
 Vučićević Dušan (1995.): Uređivanje bujičnih tokova, Društvo bujičara Jugoslavije, Beograd.
 Žurovec Jasminka (2012.): Melioracije i uređenje poljoprivrednog zemljišta, Poljoprivredno-prehrambeni fakultet, Sarajevo.

Number of active teaching hours

Theoretical classes: 1

Practical classes: 1

Teaching Methods: Classes are taught in the form of lectures and exercises. Theoretical teaching is carried out using modern presentation equipment.

Evaluation of knowledge (maximum score 100)

Pre-exam obligations	points	Final exam	points
Activity during the lectures	10	Written exam I	30
Practical teaching	-	Written exam II	40
Seminar Essay	20	Oral exam	



Study program: BScForestry; BScHorticulture		
Subject name: Soil Science2		
Teacher(s): Emira Hukić		
Subject status: Obligatory		
ECTS: 5		
Requirement:		
Subject aim		
<p>The aim of the course is to explain in a short introduction the role of soil in forest habitats, the specificity and nature of forestsoils. In relation to climatic conditions and differences in the occurrence of forest vegetation during the course of teaching, they are interpretedthe physical and chemical properties of the soil, and the origin, structure, humus forms and role of soil organic matter.</p> <p>The course seeks to provide general theoretical and practical knowledge of pedogenetic processes and major onessoil properties. Practical classes will seek to develop the knowledge and skills for self-analysis andinterpretation of the morphological, physical and chemical properties of forest, nursery and potentially forestsoils. In addition, the goal is to develop basic soil assembly recognition skills for typological detectionand to enable understanding of the spatial distribution of soils in Bosnia and Herzegovina. Principles of soil degradation with special reference to water erosion and protection mechanisms treat with ecological production characteristics of soil.</p>		
Subject outcomes		
<p>1) the possibility of explaining pedogenetic processes (transformation of the mineral and organic part of the soil and their migration); 2) listing the morphological, physical and chemical properties of forest, nursery and potentially forest soils, and standard analytical methods; 3) distinguishing the typological affiliation of forest soils and connecting them in evolutionary sequences and explaining their production and ecological characteristics, in the framework of Bosnia and Herzegovina connecting pedosystematic units with regions; 4) Possession of awareness and expertise on the importance of land as a non-renewable natural resource and its ecological functions in terrestrial ecosystems.</p>		
Subject content		
<p>The subject in the introductory part explains the concept of soil as a separate natural formation that results from the action of pedogenetic factors, its specific nature and three-phase character. As the introduction to the introduction of rock materials, the process of wear within the course of Pedology 1, the subject only partially touches on the process of wear and emergence of detritus and terrigenous minerals, which is specific to mineral soils and continues to explain the basic physical, chemical, morphological and biological soil properties. Organic matter and its functional role are specifically addressed. After the first half of the semester, the systematics of soil according to the national system begins, where the student should acquire theoretical knowledge about the traits of types, which he learns in the field teaching to recognize. Special attention within one teaching unit is given to degradation processes, of which the most significant process is water erosion in forest soils.</p>		
Literature		
<p>Resulović, H.i Čustović H. 2002 Pedologija. Univerzitet u Sarajevu, Sarajevo. Resulović, H., Čustović, H., Čengic, I. 2008 Sistematika tla/zemljista. Sarajevo Sistematika tla/zemljista. Sarajevo Pedologija, Svjetlost, Sarajevo. Weil, R.R. and Brady, N.C. 2017 The Nature and properties of soil.</p>		
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.

Evaluation of knowledge (maximum score 100)

Pre-exam obligations	points	Final exam	points
Activity during the lectures	10	Written exam I	20
Practical teaching	30	Written exam II	40
Seminar Essay		Oral exam	

List of **innovated** subjects included in the study program of basic academic studies *MSc Forestry* and *MSc Horticulture*:

1. Degradation and remediation of soil
2. Soil protection
3. Sustainable land management in space planning
4. Melioration of degraded forests
5. Reforestation of bare karst land

Study program: MSc Landscape architecture
Subject name: Degradation and remediation of soil
Teacher(s): Emira Hukić
Subject status : elective
ECTS: 3
Requirement:
Subject aim: Content of the course covers issues of soil damage that can be caused by natural and anthropogenic impact. It is assumed that climate change characterized by prolonged droughts and higher frequency of stormy weather with high intensity rainfall, to grow in the future and cause new forms of soil degradation. Industrialization, settlement expansion, intensive agriculture and road construction only are some of the causes of human-generated soil damage. The student needs to gain the ability to recognize potential risk of soil damage and provides for preventive measures, which is the starting point for soil protection. Subsequent measures, including soil remediation, should be recognized as the last solutions used after exhausted degradation prevention options. Therefore, principles are interpreted within the subject remedial measures and techniques that are recognized as good practices and commonly used for mitigation of the negative effects of soil degradation.
Subject outcomes: Student who successfully fulfills the obligations in this subject: - recognizes and evaluates the shape and level of soil degradation; - recognizes the risk of soil degradation and prevention measures.
Subject content: The course explains the historical context of soil degradation and global damage trends, and then defines and explains the forms of damage to soil and land caused by natural factors and human activities. Particular attention was given to the identification and classification of damage: type, extent, consequences of soil damage to the territory of Bosnia and Herzegovina. Principles of prevention measures and techniques for repairing damaged soils are the last part of the course..
Literature:

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1. Khan Towhid, O. 2014 Soil Degradation, Conservation and Remediation, Springer.			
2. Lal, R., Lal, R, Blum, W.E.H. 1997 Methods for Assessment of Soil Degradation, CRC Press.			
Number of active teaching hours	Theoretical classes: 2	Practical classes: 0	
Teaching Methods: Classes are taught in the form of lectures and exercises, also field work. Theoretical teaching is carried out using modern presentation equipment.			
Evaluation of knowledge (maximum score 100)			
Pre-exam obligations	Points	Final exam	points
Activity during the lectures	10	Written exam	40
Practical teaching		Oral exam	
Seminar Essay	10	
Pre-exam obligations	20		

Study program: MSc Landscape architecture			
Subject name: Sustainable land management in space planning			
Teacher(s): Emira Hukić			
Subject status: obligatory			
ECTS: 3			
Requirement:			
Subject aim: The course introduces the student to the issues of sustainable land use and the consequences of development on the living environment in urban, suburban and rural areas. The course helps the student understand the mechanisms protection of land at the local level through the system of spatial planning and interpretation of international, state, federal, and municipal laws and protection programs. Course aims at providing the training for land evaluation and protection mechanisms which deal with threatening factors of soil degradation, and for finding solutions that optimize land use.			
Subject outcomes: Student who successfully fulfills the obligations in this subject: -Interprets the laws in the field of land protection, -Evaluates the production-ecological capacity of soil, Applies systems of land evaluation and evaluation for specific purposes in spatial planning.			
Subject content: Theoretical part gives basics on the content of evaluation studies, principles of soil and land evaluation and concept of general land use evaluation and also evaluation for certain purposes of land use. Through team projects and micro-teaching students apply rules and principles for land evaluation, inventory and multi - purpose land valuation, and impact assessment for space planning and management.			
Literature: 1. Bogunović, M. 2009. Vrednovanje zemljišta racionalno korištenje prostora, Zagreb. 2. Hewitt A., Dominati E., Webb T., Cuthill T. (2015). Soil natural capital quantification • by the stock adequacy method. Geoderma 241–242 (2015) 107–114 3. Nguyen, T.T., Verdoodt, A., Tran, V.Y., Delbecque, N., Tran, T.C., and Van Ranst, E. (2015). Design of a GIS and Multi-criteria Based Land Evaluation Procedure for Sustainable Land-use Planning at the Regional Level. Agriculture Ecosystems & Environment 200: 1–11. 4. Constantini, E.A.C. (2009). Manual of Methods for Soil and Land Evaluation. Science Publishers.			
Number of active teaching hours	Theoretical classes: 2	Practical classes: 0	

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Teaching Methods: Classes are taught in the form of lectures and exercises, also field work. Theoretical teaching is carried out using modern presentation equipment.			
Evaluation of knowledge (maximum score 100)			
Pre-exam obligations	Points	Final exam	points
Activity during the lectures	10	Written exam	40
Practical teaching		Oral exam	
Seminar Essay	20	
Pre-exam obligations	30		

Study program: MSc Sustainable Forest Ecosystem Management
Subject name: Soil protection
Teacher(s): Emira Hukić
Subject status: elective
ECTS: 3
Requirement:
<p>Subject aim:</p> <p>Soil protection in its content interprets the ability of soil to fulfill functions in frames ecosystems in the contemporary context of soil needs. Recognition of soil quality indicators is linked with the benefits and value of land in high mountain, forest and urban respectively artificial ecosystems. Soil quality indicators will be used to provide information on the impact of abiotic, anthropogenic and other biotic factors on soil degradation. The subject explains the causes and consequences soil degradation and explain the mechanisms of sustainable use through a general overview of monitoring measures (current ICP Forest initiatives), elaborates land management strategies and points to positive practices, model land repairs etc. The subject can be heard in native and English language.</p> <p>Subject outcomes:</p> <ul style="list-style-type: none"> - the ability to explain the basic function of soil in forest and urban ecosystems; - Critical interpretation of the soil quality complex as the capacity of the soil to fulfill functions within the framework ecosystems; - Indication of theoretical approaches and application of basic methods and tools of quality assessment based on indicators; - assessment of the impact of the use system on soil quality, evaluate changes in soil quality. - Indication of the main soil protection policy. <p>Subject content:</p> <p>Pred explains the relevant issues of soil management and use in the environment, taking into account local and regional context, soil categories, multifunctional role of soil, importance of soil surface layer, concept of soil quality, forest soil rating, soil biocomponent, soil as habitat. The main part of the course deals with the forms and consequences of soil degradation: erosion, landslides, and due to industry, mining and urbanization. This section pays attention to the classification of soil damage. First degree: poor, easily reversible, reversible damage Second Degree: Medium, difficult to repair damage; Third Degree: severe (non-renewable - irreversible) damage, displacement - translocation of soil; Fourth degree: irreversible soil damage, permanent soil loss, soil conversion. Also, protection, inventory and monitoring mechanisms are invariably addressed.</p> <p>Literature:</p>

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1. Burger, J.A., Kelting, D.L.(1999)Soil quality monitoring for assessing sustainable forest management. In:Adams, M.B., Ramakrishna, K., Davidson, E. (Eds.), Criteria andIndicators for Sustainable Forest Management. Soil Sci. Soc. Am. Spec.Pub.
2. Burger, J.A., Kelting, D.L.(1999). Using soil quality indicators to assess forest stand management. For. Ecol.Manage. 122, 155± Karlen, D.L., Stott, D.E., 1994. A framework forevaluating physical and chemical indicators of soil quality. In: Doran,J.W., Coleman, D.C., Bezdicsek, D.F., Stewart, B.A. (Eds.), Defining SoilQuality for a Sustainable Environment. Soil Sci. Soc. Am. Spec. Pub. No.35. pp. 53±72. 166.
3. Larson, W.E., Pierce, F.J.(1994). The dynamics of soil quality as a measure of sustainable management. In:Doran, J.W., Coleman, D.C., Bezdicsek, D.F., Stewart, B.A. (Eds.),Defining Soil Quality for a Sustainable Environment. Soil Sci. Soc. Am.Spec. Pub. No. 35. pp. 37±52.

Number of active teaching hours	Theoretical classes: 1	Practical classes: 1	
Teaching Methods: Classes are taught in the form of lectures and exercises, alsofield work. Theoretical teaching is carried out using modern presentation equipment.			
Evaluation of knowledge (maximum score 100)			
Pre-exam obligations	Points	Final exam	points
Activity during the lectures	10	Written exam I	20
Practical teaching		Written exam II	40
Seminar Essay		
Pre-exam obligations	30		

Study program: MSc Sustainable Forest Ecosystem Management
Subject name: Melioration of degraded forests
Teacher(s): ĆemalVišnjić
Subject status: elective
ECTS: 4
Requirement: Non
Subject aim: The aim of the course is to enable the student to independently analyze and evaluate the habitat conditions and stand characteristics of degraded forests and to propose cultivation and land improvement activities in order to preserve and improve the stability of the stand, as well as to optimally use the production possibilities of the habitat.
Subject outcomes: After successfully completing the course, the student: -is able to analyze the habitat conditions and stand characteristics of degraded forests independently and in a team; - categorizes degraded forests based on the degree of habitat degradation, stand conditions and structural degradation of degraded stands, and optimize cultivation interventions for individual categories based on the categorization performed; -coordinates and lead, independently and in a team, on a scientific basis applied in practice, by a team involved in the design of a degradation forest degradation implementation project.
Subject content: Basic concepts, low forest, coppice forest, stump, shrubbery formation, land reclamation, degradation, devastation, conversion. Classification of degraded forests, division by belonging to the primary community, division by degree of degradation. Characteristics of degraded forests, age,

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generation from stumps, number of shoots from stumps, presence of ruminants, trees of seed origin. Planning of breeding operations in degraded forests, meliorative categorization with regard to breeding needs, purpose and goal to be achieved, breeding measures to be implemented. Land reclamation categorization by priority of work execution. The plan of carrying out breeding measures, where and when to start breeding operations, how much to take.

Literature:

1. Višnjić Ć. dr (2010): Ekološko uzgojne karakteristike panjača bukve u Bosni i Hercegovini; Šumarski fakultet Univerzitet U Sarajevu, Sarajevo
2. Višnjić i dr. (2016): Meliorativna kategorizacija izdanačkih bukovih šuma na području Kantona Sarajevo, Šumarski fakultet Univerzitet u Sarajevu, Sarajevo
3. Krstić i dr. (2006): Gajenje šuma-konverzija, melioracija I veštačko obnavljanje, Šumarski fakultet Univerziteta u Beogradu, Beograd

Number of active teaching hours	Theoretical classes: 1	Practical classes: 1+1
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Teaching Methods: Classes are taught in the form of lectures and exercises, also field work. Theoretical teaching is carried out using modern presentation equipment.

Evaluation of knowledge (maximum score 100)

Pre-exam obligations	Points	Final exam	points
Activity during the lectures	5	Written exam I	40
Practical teaching	10	Written exam II	45
Seminar Essay		
Pre-exam obligations			

Study program: MSc Sustainable Forest Ecosystem Management

Subject name: Reforestation of bare karst land

Teacher(s): Ćemal Višnjić

Subject status: elective

ECTS: 4

Requirement:

Subject aim:

is the training of the student to independently analyze and evaluate the habitat characteristics in the karst area, and based on a comprehensive analysis, make decisions on the choice of species for afforestation, planting material to be used for afforestation (assortment, bare root system, baled seedlings, container seedlings), manner planting and care measures to be taken in order for the Karst forest culture to grow well and with good quality.

Subject outcomes:

After mastering the teaching discipline, the student should: 1) independently and in a team assess the ecoclimatic and orographically edaphic characteristics of forest golet on karst; 2) performs synthesis of collected habitat parameters independently and in a team in the function of selecting the species for afforestation, suitable planting material and selecting the appropriate planting method; 3) independently and in team, on scientific basis applied in practice, coordinate and lead a team that participates in the elaboration of studies for afforestation of forest pigeons on the karst.

Subject content:

Definition, division of karst, border of karst in Bosnia and Herzegovina, causes and occurrence of forest pigeons on karst in Bosnia and Herzegovina. In general, the afforestation of forest goletas on degraded lands, the importance of afforestation golet on karst, ecological, sociological and production function, ways of raising forest crops on karst. Description of karst habitat factors, climatic factors

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(temperature, precipitation), orographically edaphic factors, karst land development. Forest vegetation on karst, various forms of degraded forests (shrub forests, shrubs, shrubs), forest goletas on karst. Selection of karst afforestation species, indigenous tree species, allochthonous tree species, different models of optimization of tree species for afforestation according to the ruling habitat factors. Preparation of surface for afforestation of karst, cleaning of surface, removal of weed vegetation, soil preparation. Methods of raising forest crops, methods of raising forest crops by sowing seeds, preparing the surface for sowing seeds and sowing seeds. Methods of raising forest crops on karst by planting seedlings, special planting techniques - use of superabsorbers when planting seedlings on karst, special methods of covering the root system of seedlings with earth bale just before planting.

Literature:

1. Višnjić Ć. (2006): Aufforstung von sommertrocknenen Standorten mit heimschen Baumarten in Bosnien.
2. Višnjić, Ć. (2018): Pošumljavanje kraških područja – skripta, Šumarski fakultet, Sarajevo

Number of active teaching hours	Theoretical classes: 1	Practical classes: 1+1	
Teaching Methods: Classes are taught in the form of lectures and exercises, also field work. Theoretical teaching is carried out using modern presentation equipment.			
Evaluation of knowledge (maximum score 100)			
Pre-exam obligations	Points	Final exam	points
Activity during the lectures	5	Written exam I	30
Practical teaching	20	Written exam II	40
Seminar Essay	5	
Pre-exam obligations			

One **new subject** will be included into new MSc program developed and implemented under SETOF which will be adopted into innovated *MSc Sustainable Forest Ecosystem Management* at Faculty of Forestry.

Study program: MSc Sustainable Forest Ecosystem Management
Subject name: Conservation of karst terrains
Teacher(s): Muhamed Bajrić, Ćemal Višnjić, Emira Hukić
Subject status: elective
ECTS: 4
Requirement:
Subject aim: Anthropogenic impacts have left an indelible mark on forest ecosystems, and especially on karst terrains ranging from sub-Mediterranean areas to high mountain forest ecosystems in Bosnia and Herzegovina. Overgrown with forest vegetation, these habitats exhibit resistance to the effects of changes in environmental factors, and due to afforestation are exposed to rapid erosion processes by wind and water, and complete desertification. Therefore, the course explains the specifics of the development of different types of soil in karst terrain, as well as the development of special forms of erosion processes. Also, students will have a clear idea of the problems of space management, and above all land resources in karst terrain, through the completed course in this subject, and applying the acquired knowledge from the same course.
Subject outcomes: After finishing the course student

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- understands the dynamics of the formation and mechanism of development of the karst erosion process with all its specificities;
- applies forest management measures which prevent from site degradation
- applies silvicultural measures for site reclamation;
- independently and in team, on scientific basis applied in practice, coordinate and lead a team that participates in the elaboration of studies for afforestation of forest pigeons on the karst.

Subject content:

In the introductory part, the course deals with the geomorphology and hydrology of karst terrains, natural pedogenetic factors and soil characteristics of karst terrains. Of particular note are the water-mechanical properties of soil that predispose to erosion processes and soil degradation in karst terrain in general. Mechanisms of karst processes, types of karst erosion, specificities of karst transport and accumulation, development of specific forms of surface and underground karst relief, hydrogeology of karst areas, and causes and occurrence and state of forest golets on karst in Bosnia and Herzegovina are then discussed. The main part of the course is focused on breeding measures that prevent the degradation of forest ecosystems on the karst or deal with afforestation of forest goletas on degraded lands, the importance of afforestation golet on karst. The aim of these measures is ecological, sociological and production function, ways of raising forest crops on the karst, then forest vegetation on the karst, various forms of degraded forests (coppice forests, shrubs, shrubs), forest goletas on the karst, the choice of species for afforestation of karst, native species trees, models of optimization of tree species for afforestation according to the ruling habitat factors. Preparation of surface for afforestation of karst, cleaning of surface, removal of weed vegetation, soil preparation. Methods of raising forest crops, methods of raising forest crops by sowing seeds. Methods of raising forest crops on karst by planting seedlings, special planting techniques - use of superabsorbers when planting seedlings on karst, special methods of covering the root system of seedlings with earth bale just before planting.

Literature:

1. Jahić Munir (2008): Uređivanje bujica, Šumarski fakultet, Sarajevo.
2. Kostadinov Stanimir (2006): Bujični tokovi i erozija, Šumarski fakultet, Beograd.
3. Studija "Gospodarenjekršom" (2011): Obrađivač: CEPOS – Centar za podršku održivog gazdovanja šumskim resursima, Naručilac: Federalno ministarstvo poljoprivrede, vodoprivrede i šumarstva F BiH, Sarajevo.
4. Zoran Nikić, Radmila Pavlović (2012): Hidrogeologija sa geomorfologijom, Univerzitet u Beogradu, Šumarski fakultet, Beograd.

Number of active teaching hours

Theoretical classes: 2

Practical classes:0

Teaching Methods:Classes are taught in the form of lectures and exercises, alsofield work. Theoretical teaching is carried out using modern presentation equipment.

Evaluation of knowledge (maximum score 100)

Pre-exam obligations	Points	Final exam	points
Activity during the lectures		Written exam I	50
Practical teaching		Written exam II	20
Seminar Essay	30	
Pre-exam obligations			