

Table 2. Course syllabus in the study program of master's academic studies in Forestry and Natural Resources Management

No.	Course code	Course title	Semester	Number of classes	ECTS	Course type
FIRST YEAR						
1.	SM0001	Research Design	1	8	10	required
2.	SM0002	Forest Resources	1	7	10	required
3.	SM0003	Applied Forestry	1	7	10	required
4.	SM0004	Natural Resources Management	2	7	10	required
5.	SM0015	Medicinal Plants Production	2	5	5	elective
	SM0016	Forest Soil Science	2	5	5	elective
	SM0017	Hunting management	2	5	5	elective
	SM0018	Forest Inventory	2	5	5	elective
	SM0019	Modern Instrumental Methods of Analysis	2	5	5	elective
	SM0020	Digital Modeling and Visualization	2	5	5	elective
	SM0021	Soil and Water Conservation	2	5	5	elective
6.	SM0022	Anatomical and Physiological Traits of Woody Plants	2	5	5	elective
	SM0024	Wildlife Management	2	5	5	elective
	SM0025	Environmental Chemistry	2	5	5	elective
	SM0026	Management of Protected Areas	2	5	5	elective
	SM0027	Soil Degradation and Climate Changes	2	5	5	elective
7.	SM0028	Conservation of Forest Genetic Resources	2	5	5	elective
	SM0029	Dendrology	2	5	5	elective
	SM0030	Wildlife Management and Conservation	2	5	5	elective
	SM0031	Entrepreneurship and Management in Forestry	2	5	5	elective
	SM0032	Wood Drying	2	5	5	elective
	SM0033	Pests of Woody Plants	2	5	5	elective
	SM0034	Agroforestry Systems	2	5	5	elective
8.	SM0005	Field Trip	2	8	5	required
Total number of active teaching classes				52		
Totally ECTS					60	
SECOND YEAR						
9.	SM0035	Climate Adaptive Forest Establishment	3	5	5	elective

	SM0036	Silviculture	3	5	5	elective
	SM0037	Sustainable Forest Utilization	3	5	5	elective
	SM0038	Furniture Design	3	5	5	elective
	SM0039	Sustainable Land Management	3	5	5	elective
10.	SM0040	Forest Plantations	3	5	5	elective
	SM0041	Forest Growth and Yield	3	5	5	elective
	SM0042	Wood-Based Composite Panels	3	5	5	elective
	SM0043	Sustainable Utilization of Water Resources in the Protected Areas	3	5	5	elective
11.	SM0045	Forest Protection	3	5	5	elective
	SM0046	Bioeconomy in Forestry	3	5	5	elective
	SM0047	Applied Ecoclimatology in Silviculture	3	5	5	elective
	SM0048	River Basin Management	3	5	5	elective
12.	SM0049	Forest Mycology				elective
	SM0050	Forest Machinery	3	5	5	elective
	SM0051	Forest Management Planning	3	5	5	elective
	SM0052	Decision Making in Soil and Water Resources	3	5	5	elective
13.	SM0006	Professional Practice	3	10	5	required
14.	SM0007	Master Thesis Subject	4	20	25	required
15.	SM0008	Master Thesis	4	10	10	required
Total number of active teaching classes				40		
Totally ECTS					60	

Course title: Research Design			
Teacher(s): dr Smiljana Jakšić assistant professor; dr Jelena Beloica assistant professor			
Course type: required			
Number of ECTS credits: 10			
Conditions: /			
Subject goal Do you want to learn what are the key points in designing of research in forestry? Do you want to make decisions and conclusions about the state and potential impacts on forest ecosystems based on the collected data? You find answers to these questions after taking the course.			
Outcome of the subject The subject provides a strong basis that spurs on independent and critical thinking. The student can design, conduct, analyze and present studies on forestry and natural resources.			
Subject content <i>Theory</i> Data collection; Presentation of Data (Bar Charts, Histograms, Pie Charts, Scatter Plots, Tables); Description of Data (Measure of Location and Dispersion); The Normal Distribution (Characteristics, Testing for the Normal Distribution, Confidence Interval for the Mean); Analysis of Qualitative Data (Binomial Distribution, Chi-Squared Test); Error Sources and Planning (Random Error and Sample Size, Systematic Errors, Sampling); Assessment of Relationship Between Two Variables (Linear Regression, Logistic Regression); Comparing two groups (Paired t-Test, Comparing Two Groups Mean); Analysis of variance. <i>Practical learning</i> Special focus is put on exercises. Exercises consist of data analysis utilizing software R and of presenting and communicating the findings. The data used in the program are obtained through research carried out at the Faculty of Forestry			
Literature 1. Seth Michelson, Timothy Schofield, <i>The biostatistics cookbook: the most user-friendly guide for the bio/medical scientist</i> , Springer 2002. 2. Winston Chang, <i>R Graphics Cookbook: Practical Recipes for Visualizing Data</i> , O'Reilly Media 2012.			
Number of active teaching classes Theoretical teaching: 60 Practical teaching: 60			
Method of carrying out the teaching Multidisciplinary thinking and problem-solving skills are emphasized in teaching.			
Evaluation of knowledge (maximum number of points 100)			
Pre-exam obligations	Points	Final exam	Points
Seminar(s)	45	Oral exam	55

Course title: Forest Resources			
Professor/professors: Dr Košanin Olivera, Dr Belanović-Simić Snežana, Dr Ivetić Vladan, Dr Perović Marko, Dr Lukić Sara, Dr Nonić Marina			
Course type: required			
ESPB number: 10			
Condition: -			
Goal of the subject: The goal of subject is to provide students with basics of forest resources, considering morphological and genetical diversity and ecological requirements of main forest plant species and communities, their commercial importance, as well as soil types, their properties and usage.			
Result of the subject: The knowledge obtained in this course is a foundation for various forestry and environmental disciplines and has multiple implications in practice.			
Content of the subject <u>Theoretical part:</u> Lectures will discuss of main forest plant species considering their morphological and genetical variety, ecological requirements as well as their commercial importance and their. Soil types and their properties and usage will also be discussed. <u>Practical part:</u> Students learn in laboratory how to recognize and differentiate forest plant species, and learn to recognize various soil types. Apart from laboratory study, practical teaching in Arboretum of Forestry faculty is included.			
References: 1. Johnson, O. (2004): Tree guide. Collings books. London 2. Šijačić-Nikolić, M., Milovanović, J., Nonić, M. (2018): Forests of Southeast Europe Under a Changing Climate: Conservation of Genetic Resources. eBook ISBN 978-3-319-95267-3; Hardcover ISBN 978-3-319-95266-6; DOI 10.1007/978-3-319-95267-3; Springer International Publishing: 486 pages 3. Pritchett L. W, Fisher F. R. (1987): Properties and Management of Forest Soils, 2nd Edition. John Wiley & Sons. ISBN 0-471-89572-5. (494) 4. Adriano, D.C. (2001): Trace Elements in the Terrestrial Environment, Biogeochemistry, Bioavailability and Risk of Metals, second edition Springer, New – York, Inc. 867 p. ISBN 0-387-98678-2.			
Number of active teaching lessons: 2+2		Theoretical part of teaching: 2	Practical part of teaching: 2
Methods of giving lectures: Theoretical part of teaching includes modern references using video-presentations with numerous practical examples. Practical part of teaching is organised in a laboratory, as well as at the Arboretum of the Forestry Faculty.			
Knowledge evaluation (max 100 points)			
Before exam obligations:	points	Final exam:	points
Activity during lectures	5	Oral exam	50
Activity during practicals	5		
Seminary	10		
Writing test	30		

Course title: Applied Forestry			
Teacher and teaching assistant: Dr. Babić Violeta, Dr. Kanjevac Branko			
Course type: required			
Number of ECTS: 10			
Subject aim: Introducing students with the nature of the forest, influence of basic ecological factors (climate, edafic, orographic and biotic) on the forest, basic methods of natural regeneration and tending of forest, criteria for defining the state and degree of degradation of forests, methods of conversion of degraded and devastated forests into forests of better quality.			
Subject outcomes: Training students to apply methods of forest regeneration and tending, adjustment the silvicultural treatments to the actual state of the forest, conversion of degraded and devastated forests into higher quality forests.			
Content of the subject: <i>Active (theoretical) lectures:</i> Aim and tasks of the silviculture, nature of the forest, influence of basic ecological factors on the forest and influence of forest on ecological factors: climate factors and forest, edafic factors and forest, orographic factors and forest, biotic factors and forest. Basic methods of natural regeneration of forests (Clearcut system, Shelterwood system, Selection system). Development phases of stand, basic methods of forest tending and forest thinning. Degraded and devastated forests and deforested land. Causes of forest degradation. Ameliorative methods in degraded forests. Adjustment the silvicultural treatments to the actual state of the forest and climate change. <i>Practical lectures:</i> Defining environmental conditions (climate, orographic, edafic, characteristics of the locality, local heat potential); defining vulnerability and degree of degradation of forests and deforested land; defining methods and silvicultural treatments based on the type and degree of degradation; cost calculation according to the existing norms.			
Basic literature: Kimmins J.P. (2004): <i>Forest ecology</i> . New Jersey; Matthews J. (1989): <i>Silvicultural systems</i> . Clarendon press, Oxford; Puettmann K., Coates D., Messier C. (2009) <i>A critique of Silviculture: Managing for Complexity</i> . Island Press .Washington • Covelo • London. Nicolescu V.N. et al. (2018) <i>Silvicultural guidelines for European Coppice forests</i> . In eds: <i>Coppice forests in Europae</i> , Freiburg, Germany. Diaci J., Govedar Z., Krstic M., Motta R. (2012) <i>Importance and perspectives of Silviculture for science and practice of forestry</i> . International Scientific Conference: <i>Forestry science and practice for the purpose of sustainable development of forestry - 20 years of the Faculty of forestry in Banjaluka</i> . <u>Plenary lecture</u> . Proceedings, 23-40. Banja Luka, Republic of Srpska/B&H. 1th - 4th November. Krstić, M., Stojanović, L.J., Rakonjac Lj. (2010): The tasks of siculture in regard to the curent climate shange. International Scientific Conference “Forest ecosystems and climate changes“. Institute of Forestry Belgrade, March 9-10 th . <u>Plenary lectures</u> pg. 117-130. Krstic M., Govedar Z. (2012). Tasks of silviculture with special emphasis on the conversion of degraded forests. <u>Invited paper</u> . International Scientific Conference: <i>Forestry science and practice for the purpose of sustainable development of forestry - 20 years of the Faculty of forestry in Banjaluka</i> . Plenary lecture. Proceedings, 447-464. Banja Luka, Republic of Srpska/B&H. 1th - 4th November Actual papers about silvicultural works in scientific journals.			
Number of classes per week:	Lectures:	Exercises:	Other forms of teaching:
Method of teaching: Active (theoretical) lectures in the classroom on PowerPoint presentations; Exercises - examples about simulation of appropriate silvicultural works. Practical lectures: group seminar work of students by processing ameliorative-silvicultural works; individual work of students by creating elaborates of practical simulation of silvicultural works on examples; 2 days of one-day field lessons on the experimental plots around Belgrade; 2 days of school practice in the educational bases of the Faculty of Forestry where students practically perform appropriate ameliorative-silvicultural works.			
Rating of knowledge (maximum score 100)			
Pre-exam obligations	points	Final exam	points
activity during the lectures	5	oral exam	65
practical lectures	10		
elaborate	20		

Course title: Natural Resources Management			
Teachers: Dr Ristić Ratko, Dr Petrović Nenad, Dr Keča Ljiljana, Dr Todosijević Mirjana, Dr Nedeljković Jelena, Dr Borota Dragan			
Course type: required			
ECTS: 10			
Condition:			
Subject objective Introducing students to methods and ways of studying natural resources management, with a review of issues, approaches and techniques			
Outcome of the subject Ability of students to choose adequate models of natural resources management in the specific conditions of the investigated area.			
Content of the subject Public Participation Approach; Community based natural resources management; Collaborative management; Ecosystem approach; WEHAB approach; <i>Practical work:</i> development of a model of natural resources management in a specific area			
Proposed literature 1. Grazia Borrini-Feyerabend, M. Taghi Farvar, Jean Claude Nguingiri and Vincent Awa Ndangang (2007): Co-management of NaturalResources, Kasperek Verlag, Heidelberg 2. Ilić, B., Mihajlović, D. (2017): Upravljanje prirodnim resursima, održivost i zaštita, Megabiznis 1/1. 3. Editors: Zlatic, M. and Kostadinov, S. (2018): Soil and water resources protection in the changing environment, Catena, Soil Science, Advanced in GeoEcology 45, ISBN 978-3-510-65418-5, US-ISBN 1-59326-257-1			
Number of classes of active teaching:		Theoretical teaching:	
Methods of teaching:			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	20	Oral exam	60
Seminar	20		

Course title: Medicinal Plants Production			
Professor/professors: PhD Dušan D. Jokanović, Assistant Professor			
Course type: elective			
ESPB number: 5 (five)			
Condition: -			
Goal of the subject: The main goal of the subject is adopting of new knowledge related to importance, way and technologies of forest and medicinal plants producing.			
Result of the subject: Forest experts should be capable for medicinal plants recognizing, they have to know which parts of plants have medicinal properties, then they must have basic knowledge about the ways of collecting, preserving and drying of medicinal plants. There is another very important aspect of the subject – possibility of medicinal plants planting according to some technologies and agritechnical measures applying such as watering, fertilizing, soil preparing, etc.			
Content of the subject <u>Theoretical part:</u> History of industrial producing of medicinal plants. Importance of modern producing of medicinal plants on national and international level. Natural site conditions for plantation producing. Yields and effects. Productive methods based on the seed (collecting, sowing, stratification methods). Productive methods based on vegetative organs (micropropagation, tissue culture, root dividing, etc). Technologies of producing: planting at open areas, in containers, in closed areas with regulated temperature and humidity of the air. Land processing – care, treatment, protection. Care of the land (spraying, digging, thinning, fullfilling of empty spaces). Prevention (protection from diseases and pests). Watering (drop by drop, surface watering, watering by nozzle using). Feeding: a) organic fertilizers (manure, compost, peat, green fertilizer, humus); b) mineral fertilizers (N, P, K and Ca fertilizers). New trends in medicinal plants producing. Polimers using – organic polimers. New medicinal plants species introducing in plantation production. <u>Practical part:</u> It will be organised in different ways such as: a) in labs for Botany and Seed Science; b) in nurseries and hothouses. During this practical part of the teaching process, students will get to know to new trends and technologies related to industrial producing of medicinal plants.			
References: 1. Farnsworth, N.R., Akerele, O., Bingel, A.S., Soejarto, D.D., Guo, Z. (1985): Medicinal plants in therapy 2. Chevallier, A. (2016): Encyclopedia of Herbal Medicine: 550 Herbs and Remedies for common ailments			
Number of active teaching lessons: 2+2 Theoretical part of teaching: 2 Practical part of teaching: 2			
Methods of giving lectures: There are two classes of practical and two classes of theoretical work per week. The whole teaching process includes overall 60 classes (30+30) during one semester. The main idea is to enable a modern approach to students that can make the subject much easier to them.			
Knowledge evaluation (max 100 points)			
Before exam obligations:	points	Final exam:	points
Activity during lectures	5	Writing exam	30
Practical teaching	5	Oral exam	30
Writing tests	10		
Study	20		

Course title: Forest Soil Science			
Teachers: dr Olivera Košanin, associate professor; MSc Janko Ljubičić, teaching assistant			
Course type: elective			
Credits: 5 ECTS			
Requirement: None			
Purpose of course: Mastering knowledge in forest soils and obtaining a comprehensive picture of the importance of soil in the ecosystem, the production potential of the soil, the sustainable and rational use of soil as the basic natural resource.			
Course outcome Students will be able to apply physical and chemical soil analysis methods in the field and laboratory; describe soils in the field, classify them and evaluate their properties; argue and interpret results; identify soil processes, soil classification system and effects of soil management; understand production and ecological functions of the soil			
Contents of the course <i>Theoretical lectures:</i> Evolution and evolutionary-genetic series of soil. Fertility and productivity of the soil. Classification of the forest soils of Serbia. Soil-plant community link. Properties and functions of the soil. Sustainable use of soil. The degradation of soil. Legislation on the use and protection of land space. <i>Practical lectures:</i> Execute laboratory experiments. Laboratory analysis and their interpretation. Climate and humidity regime of the soil. Relief and hydrological characteristics of the soil. Determination of total nitrogen in the soil. Determination of physiologically active forms of phosphorus and potassium in soil. Ecological quality of the soil.			
Literature: <ol style="list-style-type: none"> 1. Pritchett L. W, Fisher F. R. (1987): Properties and Management of Forest Soils, 2nd Edition. John Wiley & Sons. ISBN 0-471-89572-5. (494) 2. Hillel D. (1982): Introduction to Soil Physics. Academic Press. ISBN 0-12-348520-7. (364) 3. Plaster J. E. (2008): Soil Science and Management, 5th Edition. Delmar, Cengage Learning. ISBN 978-1-4180-3865-6. (495) 4. Baver L. D., Gardner H. W., Gardner R. W. (1972): Soil Physics, 4th Edition. John Wiley & Sons. ISBN 0-471-05974-9 5. Soil Atlas of Europe (2005). European Soil Bureau Network, European Commission, Office for Official Publications of the European Communities, L-2995 Luxembourg. ISBN 92-894-8120-X 			
Hourse of active teaching 60		<i>Lectures:</i> 30	<i>Practical:</i> 30
Methods of teaching Lectures, practical teaching, students presentations, field excursions			
Mark (max. of poens 100)			
In-course assessment	points	Exam	points
Activity during lectures	20	Oral exam	50
Seminar	30		

Course tittle: Hunting Management			
Наставник/наставници: Вукан Лавадиновић			
Course type: elective			
Број ЕСПБ: 6			
Услов: -			
Циљ предмета: Aim of the subject is to provide students knowledge on sustainable hunting management			
Исход предмета: Students will learn about main game species managed in Balkans (birds and mammals), management of hunting grounds, hunting practices, cynology, human dimensions in hunting, ethics, international regulations			
Садржај предмета: Theory Introduction to hunting; Ecology and biology of game species in Serbia; game management; hunting ground management; hunting practices; trophy evaluation; cynology; human dimensions of hunting; international trend and regulations. Practice Visit to a game farm, a fenced hunting ground and an open hunting ground			
Литература: On line documents (sources: FACE, CIC, FAO, FCI, Council of Europe and IPBES) Thesis (Lavadinović. 2016. Analysis of the hunting sector in Serbia. Albert Ludwig University of Freiburg) Scientific manuscripts and books (Bennet et al., 2002. Hunting the world's wildlife to extinction. Oryx 36 (4):328-329; Rosser. 2009. Regulation and Recreational Hunting. Wiley Online Library)			
Број часова активне наставе:		Теоријска настава:	Практична настава:
Методе извођења наставе: Power point presentations, interactive discussions, practical exercises and field excursions.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	50	усмени испит	30
практична настава	10		
семинар-и	10		

Course title: Forest Inventory			
Teacher/teachers: dr. Damjan Pantić, dr. Dragan Borota			
Course type: elective			
ESPB number: 5 (five)			
Condition: None			
The aim of the course: Introduce students with different levels of inventory, from a stand-wise, national, to global inventory, with a designing of a terrestrial inventory and data collection on the basis of satellite images, with legal and technical assumptions for the establishment of a regional and global database on forest ecosystems.			
Outcome of subject: Students' ability to design and coordinate with different levels of forest inventory, as well as correspondence with international institutions dealing with the state of the forest fund at the regional and global level.			
Contents of the subject: <u>Theoretical teaching</u> Types of Sample in forest inventory, significance, value and structure of information, inventory plan, stand-wise inventory, NFI concepts in European countries, standardization and harmonization (ENFIN, EUSTAT), GFRA, state of Europe and World Forest Fund. <u>Practical teaching</u> Data (measurement) collection from images, GIS data analysis			
Literature: Published by Springer <ol style="list-style-type: none"> 1. Kangas A., Maltamo M. (2006): <i>Forest Inventory-Methodology and Applications</i> 2. West P.W. (2015): <i>Tree and Forest Measurement</i> 3. Tomppo E., Gschwantner T., Lawrence M., McRoberts R.E. (2010): <i>National Forest Inventories - Pathways for Common Reporting</i> 4. Vidal C., Alberdi I., Hernández L., Redmond J. (2016): <i>National Forest Inventories - Assessment of Wood Availability and Use</i> 5. Chirici G., Winter S., McRoberts R.E. (2011): <i>National Forest Inventories - Contributions to Forest Biodiversity Assessments</i> 6. http://enfin.info/ 7. http://www.fao.org/forest-resources-assessment/en/ 			
Number of active teaching:	Theoretical teaching:	3	Practical teaching: 2
Teaching methods: Oral presentation, video presentations, computer laboratory			
Knowledge assessment (maximum number of points 100)			
Pre-exam obligations:	Points	Final exam:	Points
activity during lectures	10	Oral exam	50
practical teaching	10		
Seminars	30		

Course title: Modern Instrumental Methods of Analysis			
Наставник/наставници: dr Milica Rančić			
Course type: elective			
Број ЕСПБ: 5			
Услов:			
Циљ предмета: Introduction to the latest instrumental methods of instrumental analysis of materials in wood technologies, primarily with the kind of devices that are commercially produced today. Particular attention is paid to the distinction between physical and chemical characterization. The additional objective of the course is to understand what a particular method can or can not provide as a relevant result required for scientific research or professional work. The candidate will get acquainted with the laboratories using modern laboratory equipment for instrumental analysis.			
Исход предмета: After completing the course, student is able to state the advantages and disadvantages of destructive and non-destructive methods of chemical analysis of materials, properly select and apply a particular method or set of methods that can provide relevant results required for the scientific research or professional work. Student is also capable of critically interpreting and analyzing the obtained results and introducing new approaches to work in a professional environment.			
Садржај предмета: <i>Теоријска настава</i> Introduction to instrumental methods and their application in wood technologies. Non-destructive methods in relation to destructive methods. Overview of destructive methods. Review of non-destructive methods. Types and preparation of samples for analysis. Elemental analysis methods. Methods for material characterization. Atomic emission (fluorescence) and absorption spectrometry (AAS). Molecular absorption spectrometry. Fluorimetry. Spectroscopic methods in ultraviolet, visible and infrared region (UV/VIS, FT-IR and Raman spectroscopy). Nuclear-magnetic resonance spectroscopy (NMR). Chromatographic separation methods. Gas chromatography (GC). High Efficiency Liquid Chromatography (HPLC). Mass spectrometry. Methods combined with mass spectrometry (GC-MS and HPLC-MS). X-ray methods of analysis. Thermoanalytical methods of analysis: thermogravimetric methods (TGA), differential thermal analysis (DSC). Microscopic spectroscopy: SEM, TEM, AFM. Rules for applying methods and interpreting results. Methods for qualitative and quantitative analysis. Selection of the optimal method of analysis. Interpretation of the results of the analysis. <i>Практична настава</i> Methods of elemental analysis. Methods for material characterization. Choosing the appropriate method or set of methods in accordance with the set project task. Preparation of the sample. Critical interpretation and analysis of results.			
Литература: 1. Eero Sjostrom, Raimo Alen, <i>Analytical methods in Wood Chemistry, Pulping and Papermaking</i> (1999) Springer Series in Wood Science, Springer-Verlag Berlin Heidelberg GmbH 2. Douglas Scoog, F. James Holler, Stanley R. Crouch, <i>Principles of Instrumental Analysis</i> (2016) Saunders, Philadelphia.			
Број часова активне наставе:		Теоријска настава: 2	Практична настава: 2
Методе извођења наставе: Lectures, laboratory work, seminars, consultations.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	5	усмени испит	50
практична настава	5		
колоквијум-и	20		
семинар-и	20		

Course title: Digital Modeling and Visualization			
Наставник/наставници: Dr. Biljana Jović, assistant professor			
Course type: elective			
Број ЕСПБ: 5			
Услов: -			
Циљ предмета: Developing a higher level of ability for computer visualization and optimal graphic expression, identification and interpretation of various 3D geometric forms and their relations. Introduction to the principles of photorealistic representation of 3D objects in characteristic projections and defining their geometric properties.			
Исход предмета: The student is able to use different techniques for displaying 3D model objects for the purpose of final presentation, in order to get their real-life appearance in different scenes. Techniques of this display are used as a substitute for currently inaccessible technologies that make prototype 3D model objects.			
Садржај предмета: <i>Теоријска настава</i> Perspective and restitution of perspective picture. Photography and fitting 2D images. 3D model and set design. Types and methods of digital visualization of 3D models. Lighting and shade: parallel and central lighting. Sources of light. Augmented Reality (AR). Virtual reality - Virtual reality (VR). <i>Практична настава</i> Materializing 3D models, textures, mapping and rendering models. Visualization of 3D space: Generated image - rendering (photorealistic image). Processing and preparing print images (digital printing). Computer animation of 3D models. Preparation of 3D models for 3D printing.			
Литература: Чучаковић, А., Теофиловић, Н., Јовић, Б., <i>Геометријска едукација применом принципа и алата 3Д анимације</i> , мултимедијални DVD, Архитектонски факултет Универзитета у Београду, Београд, 2013. Baker, R. <i>Designing the Future – The Computer Transformation of Reality</i> , Thames and Hudson, Hong Kong, 1993. George Omura, Brian C. Benton: <i>Mastering AutoCAD 2013 and AutoCAD LT 2013</i> , AutoDesk, Official Training Guide, Indianapolis, Canada, 2012.			
Број часова активне наставе: 90 Теоријска настава: 2 Практична настава: 3			
Методе извођења наставе: Teaching is carried out through lectures and classes that involve students' individual work in a computer lab in the preparation of seminar work.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	писмени испит	30
практична настава	30		
семинар-и	30		

Course title: Soil and Water Conservation			
Teachers: dr Ratko Ristić, dr Mirjana Todosijević, dr Snežana Belanović Simić			
Course type: elective			
ECTS: 5			
Condition:			
Subject objective Introducing students to the processes of soil erosion (water and wind erosion). Study with methods used to analyze the risk of degradation of natural resources (soil and water) as well as significant elements of integral management of the risk of degradation. Introducing to principles and methods for soil and water conservation.			
Outcome of the subject Students are able to define the causes, factors and correlation of the process of soil and water degradation. They know to explain the types and indicators of land degradation and resilience; to define and describe the basic processes and components within individual classification systems, using modern information technologies; to analyze and select methods and models for developing strategies for the sustainable use and protection of soil and water resources.			
Content of the subject Introduction to risk analysis and methods for the assessment of natural disasters in mountainous areas; getting acquainted with the natural disasters that occur in the mountainous area: torrential floods, landslides, rock collapsing, mass movement of sediments, avalanches, forest fires; discussion of natural resource sensitivity and risk assessment; the level of risk tolerance; disaster preparedness and management. Describe the direct and indirect effects of the soil degradation process; describe the system of measures for soil conservation. Practical work: Defining the risk of natural disasters. Determining the degree of risk based on: analysis of erosion processes; soil and geological composition of the terrain; land use; physical-geographical characteristics of space; climatic-meteorological characteristics of the site.			
Proposed literature -Boardman, J.; Poesen, J. (2006): <i>Soil Erosion in Europe</i> . JohnWiley&Sons, England. -Harmon, S.R.; Doe, W.W. (2001): <i>Landscape Erosion and Evolution Modelling</i> . KluwerAcademic/Plenum Publishers, NewYork. -Morgan, R.P.C. (1990): <i>Soil Erosion and Conservation</i> . Longman, Scientific&Technical, with JohnWiley&Sons, NewYork. -Koboltschnig, G. et al., (2012): INTERPRAEVENT (International Research Society)-2012. Proceedings, Vol. 1&Vol. 2 (ISBN: 978-3-901164-19-4), Grenoble, France. Pg. 1-1126. -Chang, M. (2003): <i>Forest hydrology-an introduction to water and forests</i> , CRC Press, NewYork. -Imeson, A. et al., (2006): <i>SCAPE (Soil Conservation and Protection in Europe)-The way ahead</i> (ISBN: 90-75312-06-7), Heiloo, Holland. -Ristić, R.; Kostadinov, S.; Radić, B.; Trivan, G.; Nikić, Z. (2012): <i>Torrential Floods in Serbia – Man Made and Natural Hazards</i> , 12th Congress INTERPRAEVENT 2012, Proceedings (ISBN 978-3-901164-19-4), pg. 771-779, Grenoble, France. -Ristić, R.; Macan, G. (1997): <i>The Impact of erosion control measures on runoff process</i> , Red Book- IAHS Publ. No. 245 (ISBN 1-901502-30-9), pg. 191-194, England. -Ristić, R.; Kašanin-Grubin, M.; Radić, B.; Nikić, Z.; Vasiljević, N. (2012): <i>Land degradation in ski resort “Stara planina”</i> , Environmental Management, (ISSN: 0364-152X, print version; ISSN: 1432-1009, electronic version), No. 49, pg. 580-592 (DOI: 10.1007/s00267-012-9812-y). -Ristić, R.; Kostadinov, S.; Abolmasov, B.; Dragičević, S.; Trivan, G.; Radić, B.; Trifunović, M.; Radosavljević, Z. (2012): <i>Torrential floods and town and country planning in Serbia</i> , Natural Hazards and Earth System Sciences (ISSN: 1561-8633), No. 1, Vol. 12, pg. 23-35 (DOI: 10.5194/nhess-12-23-2012). -Edward Bryant (2005): <i>Natural hazards</i> . CambridgeUniversity Press, NewYork -Patrick L. Abbott (2008): <i>Natural disasters</i> . McGraw-Hill Higher education, sixth edition			
Number of classes of active teaching:		Theoretical teaching:	
Methods of teaching:			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	20	Oral exam	60
Seminar	20		

Course title: Anatomical and Physiological Traits of Woody Plants			
Professor/professors: PhD Dušan D. Jokanović, Assistant Professor			
Course type: elective			
ESPB number: 5 (five)			
Condition: -			
Goal of the subject: Basic knowledge obtaining related to anatomical structure of woody plants and physiological processes in xylem and phloem.			
Result of the subject: Students should be capable for recognizing conifers and hardwoods, and they also have to realise relation between anatomical structure and physiological processes that permanently occur in the plants.			
Content of the subject <u>Theoretical part:</u> Meaning of the Wood Anatomy. Anatomical structure of conifers wood. Axial tracheids, radial tracheids, resin canals. Wood rays (classification based on structure, origin, width and height). Anatomical structure of hardwoods. Vessels, wood fibres. Transitive elements (fibrilar, vascular and vasicentric tracheids). Anatomical structure of conifers wood without resin canals. Anatomical structure of conifers wood with resin canals. Anatomical structure of diffuse-porous hardwoods. Anatomical structure of ring-porous hardwoods. Anatomical structure of exotic species. Анатомска грађа дрвета егзота. Compression and tension wood. Watering regim of plants. Mineral nutrition. Macro- and microelements. Growth and development. Physiology of plants resistance. Phytoremediation (heavy metals and their impact to the environment). <u>Practical part:</u> Recognizing of woody species based on its macroscopic structure. Recognizing of woody species based on its microscopic structure. Establishing of number and dimensions of some anatomical elements on microscopic preparations. Monitoring of growth stimulants and its effect on growth dynamics. Monitoring of nutrition and watering effect on growth dynamics. Assessment of heavy metals content in some vegetative plant organs.			
References: 1. Fahn (1990): Plant Anatomy, Fourth Edition 2. Crivellaro, A., Schweingruber, F.H. (2013): Atlas of Wood, Bark and Pith Anatomy of Eastern Mediterranean Trees and Shrubs with a special focus on Cyprus, Springer 3. Stanković, D., Jokanović, D. (2017): <i>Pollutants in plants</i> , Lambert Academic Publishing, p. 1-54, ISBN 978-3-659-91695-3			
Number of active teaching lessons: 2+2		Theoretical part of teaching: 2	Practical part of teaching: 2
Methods of giving lectures: Theoretical part of teaching includes modern references using followed by video-presentations with numerous practical examples. As for practical part of teaching, it will be organised not only in a modern laboratory, but also outside at experimental plots made for this purpose.			
Knowledge evaluation (max 100 points)			
Before exam obligations:	points	Final exam:	points
Activity during lectures	5	Writing exam	30
Practical teaching	5	Oral exam	30
Writing tests	10		
Study	20		

Course title: Wildlife Management			
Наставник/наставници: Вукан Лавадиновић			
Course type: elective			
Број ЕСПБ: 6			
Услов: -			
Циљ предмета: Aim of the subject is to get students familiar with the most important wildlife species in Serbia and their management according to modern principles of sustainability.			
Исход предмета: Students will gain knowledge on wildlife managed in Serbia, their biology and ecology, management practices and threats. Multilateral agreements and international initiatives will be analyzed in order to be familiar with global trends.			
Садржај предмета: Theory Ecology and biology of wildlife in Serbia (birds and mammals); wildlife census; population dynamics; monitoring; protection of endangered species; landscape ecology; wildlife diseases; wildlife use; human dimensions of wildlife management; modern trends in wildlife management Practice Field visit to forest habitats; visit to an agriculture landscape; visit to a protected area			
Литература: Online sources (IUCN Red list; European Commission Environment documents; Large carnivore's initiative for Europe, European Bird species Action plans, KORA...) Books and thesis (Red Book of Serbia – Birds; Lancia et al., 2015 Estimating the number of animals in wildlife populations. Wildlife society, Lavadinović 2010. Estimation of chamois abundance in Swiss National park – thesis; ...) Scientific papers (Robbins. 1978. Census techniques for forest birds. U.S. Forest Service, Southeastern Forest Experiment Station; Holmes. 1995. Population regulation: a dynamic complex of interactions. Wildlife research 22(1): 11-19; Clauss et al., 2003. Ruminant Diversification as an Adaptation to the Physicomechanical Characteristics of Forage. A Reevaluation of an Old Debate and a New Hypothesis. Oikos 102 (2): 253-262...) International initiatives (CITES, TRAFFIC, Un Environment, IPBES...)			
Број часова активне наставе: 2+0 Теоријска настава: 2 Практична настава: 0			
Методе извођења наставе: Lectures with power point presentations, field visits.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	20	усмени испит	50
практична настава	10		
семинар-и	20		

Course title: Environmental Chemistry			
Наставник/наставници: dr Milica Rančić			
Course type: elective			
Број ЕСПБ: 5			
Услов:			
Циљ предмета: Environmental chemistry is an introduction to chemical processes that regulate the composition of air, water, and soil. The main attention of the course is paid to the understanding of chemical equilibrium and kinetics of natural systems and how they are influenced by human actions. Additional topics of study include sources, effects, and remediation of pollution, principles of green chemistry and the analysis of environmental samples.			
Исход предмета: Through the course students acquire capability to: <ul style="list-style-type: none">• express an understanding of the global connections between chemical cycles and human activities• explain how chemical theories are applied to understand models of global processes and systems• reflect upon how global relations affect the flow of chemical systems in the environment in ways that impact our life Through the course, students become able to provide balanced assessments of positive and negative aspects of recent development in our environment.			
Садржај предмета: <i>Теоријска настава</i> <ul style="list-style-type: none">• Introduction to environmental chemistry• Stratospheric chemistry: Global warming; Ozone layer; Ozone holes• Chemistry of ground-level air pollution• The environmental and health consequences of polluted air—outdoors and indoors• Global warming; The greenhouse Effect• The chemistry of natural waters• The pollution and purification of water• Toxic heavy metals• Pesticides• Dioxins, furans, and PCBs• Other toxic organic compounds of environmental concern;• Persistent organic pollutants (POPs)• Renewable energy; Hazardous wastes, soils, and sediments <i>Практична настава</i> <ul style="list-style-type: none">• Introduction to environmental chemical analysis laboratory• Sample preparation, sampling methods and data processing• Solutions, preparing solutions and measures of concentrations• Analytical methods for analyzing quality of air, water and soil (volumetric, spectrophotometric and electrochemical techniques)• Modern analytical methods for determining pollutants in air, water and soil (colorimetry, spectrophotometry and absorption spectra; metals in natural waters and in sediments; atomic absorption spectrometry; the chemical oxygen demand of natural waters and wastewaters; the fluorimetric determination of polycyclic aromatic hydrocarbons; environmental hydrocarbons; carbon dioxide in the atmosphere; acid rain; decomposition of pollutants with an application to plasticizers and detergents).			
Литература: Julian E. Andrews, Peter Brimblecombe, Tim Д. Jickells, Peter S. Liss, Brian Reid, <i>An Introduction to Environmental Chemistry</i> (2004) School of Environmental Sciences, University of East Anglia, United Kingdom, Blackwell publishing			
Број часова активне наставе:		Теоријска настава:	Практична настава:
Методе извођења наставе: Lectures, laboratory work, seminars, consultations.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	5	усмени испит	50
практична настава	5		
колоквијум-и	20		
семинар-и	20		

Course title: Management of Protected Areas			
Teacher(s): Prof. dr Jelena Tomićević-Dubljević			
Course type: elective			
Number of ECTS: 5			
Condition: /			
Course objective: Practical and operational knowledge, emphasizing the communicative approach, the link between theoretical and practical issues in management of protected areas.			
Learning outcome: Management of protected areas emphasizes learning in the field with special emphasis on practice and action. Allows students to professionally work with local communities and various stakeholders and other experts in protected areas. Preparation of management plans for protected areas.			
Subject content <i>Theoretical lectures:</i> Theoretical basis of management of protected areas. The role and importance of protected areas. Categorization of protected areas. Evaluation of protected areas. Governance of protected areas. Process of Management. Tourism and Recreation. The role of local communities in the management of protected areas. Examples of good practice management of protected areas. Management plans for protected areas. Financing protected areas. <i>Practical lectures:</i> Field work - case studies and seminar papers.			
1. Tomićević-Dubljević, J., Pavlović, M., Vujčić, M. (2018) The role of local communities for managing natural resources in the area of the Besna Kobilica Mountain, Serbia. In: Zlatić, M., Kostadinov, S. (Ed.) Soil and water resources protection in the changing environment, <i>Advances in Geoecology</i> , 45 pp.323-334. Soil Sciences, Schweizerbart Science Publishers. 2. Tomicevic-Dubljevic, J. (2017) Managing protected areas: new approach to protected area management - the role of the local people, Plenarno predavanje International Conference "Ecological Truth" (25;2017; Vrnjačka Banja), Proceedings/XXV, Eco-Ist'17, 12-15 June 2017, Vrnjačka Banja, Serbia, Ed. Pantovic, R., Markovic, Z. University of Belgrade, Technical Faculty, Bor, pp.53-74 3. Lockwood, M., Worboys, G., Kothari, A. (eds.) (2006) Managing protected areas, a global guide, IUCN, Earthscan in the UK and USA. 4. Tomićević, J., Bjedov, I., Obratov-Petković, D., Milovanović, M. (2011) Exploring the park-people relation: collection of <i>Vaccinium myrtillus</i> L. by local people from Kopaonik National park in Serbia, <i>Environmental management</i> , 48 (4):835-846. 5. Tomićević, J. (2005) <i>Towards Participatory Management: Linking People, Resources and Management</i> . A Socio-Economic Study of Tara National Park. <i>Culterra</i> , Schriftenreihe des Instituts für Landespflege der Albert-Ludwigs-Universität Freiburg, Heft 43, p.186.			
Number of classes of active teaching		Lectures: 3	Practice: 2
Type of teaching method: The course is designed to be participatory, interactive, and engaged. I will use different teaching methods: lectures and discussion, cooperative group work, students' presentations. Students are expected to actively participate in discussions and other work forms.			
Assessment (maximum 100 points)			
Pre-exam requirements	points	Final exam	points
Activities during lectures	10	Oral exam	50
Practical	10		
Seminar papers	30		

Course title: Soil Degradation and Climate Changes			
Teachers: dr Snežana B. Belanović Simić, full. prof, dr Jelena Beloica assistant professor, dr Vesna Nikolić Jokanović, assistant professor			
Course type: elective			
Credits: 5 ECTS			
Requirement: What courses & programmes must have been taken before this course? None			
Purpose of course: Understanding and mastering knowledge in the field of soil degradation processes that are the result of changes in the environment caused by human activities and which are superimposed on basic biogeochemical processes, potentially irreversible, comprehensive effects on current and future social, economic and ecological structures.			
Course outcome Students are able to define the causes, factors and connection of soil degradation processes that are the result of climate change. They are able to explain types and indicators of degradation and soil resistance; to define and describe the basic processes and components within certain classification systems, using modern information technologies; to carry out analyzes and selection of methods and models for adopting strategies for sustainable use and protection of land/soil resources.			
Contents of the course <i>Lectures:</i> Sustainable development; The 2030 Agenda for Sustainable Development with its 17 SDGs (<i>Sustainable Development Goals</i>) adopted at the UN Sustainable Development Summit. The distribution and speed of degradation of soil and land; Structures, processes, and soil degradation; Transforming our world: the 2030 Agenda for Sustainable Development; Chemical degradation; Physical degradation; Causes of soil degradation; Soil degradation indicators. The impact of climate change on soil; The dynamics of organic matter in the soil; Carbon bonding to mitigate climate change and combat land degradation; Possible consequences of the impact of climate change on the soil erosion process; Types of air pollutants; Long-range transboundary air pollution and international protocols; Acidification and conservation of nature; Heavy metals in the soil; Soil salinization; Application of mineral and organic fertilizers. Forms of soil degradation in R of Serbia. Desertification. Soil quality and soil security, Soil quality indicators, Soil quality assessment, Processes, factors and causes of soil resistance; Soil resistance indicators. Monitoring, measurement, and evaluation of the status and trends of soil degradation (current databases at European and global level). The Land Ethic. <i>Practical:</i> Practical lectures focus on analyses of soil degradation indicators, resistance indicators, and soil quality indicators. Preparation of maps and databases for analyzes of individual soil degradation processes based on internationally recognized methodologies and databases. Attention is paid to the application of certain soil degradation classification systems. Students present their results through seminar papers and final projects.			
Literature Adriano, D.C. (2001): Trace Elements in the Terrestrial Environment, Biogeochemistry, Bioavailability and Risk of Metals, second edition Springer, New – York, Inc. 867 p. ISBN 0-387-98678-2. Kabata-Pendias A., Pendias H. (2000): Trace Elements in Soils and Plants. CRC Press, Boca Raton, 413p. Lal, R. (1997): Degradation and resilience of soils, Phil. Trans.R.Soc.Lond.B 352, p. 997–1010 Lal, R., Socbecki, T.M., Iivari, T., Kimble, J (2004) Soil degradation in the United States, Extent, Severity and Trends, Lewis Publisher, A CRC Press Company, 221 p., ISBN 1-56670-534-7 Lal, R., Safriel, U., Boer, B. Zero Net Land Degradation (2012): A New Sustainable Development Goal for Rio+ 20, A report prepared for the Secretariat of the United Nations Convention to combat Desertification, May Tóth, G., Stolbovoy, V. and Montanarella, L. 2007. Soil Quality and Sustainability Evaluation - An integrated approach to support soil-related policies of the European Union. EUR 22721 EN. 40 pp. EC, Luxembourg, ISBN 978-92-79-05250-7 World Meteorological Organization. Climate and Land Degradation, WMO-No. 989, 2005			
Hourse of active teaching		<i>Lectures:</i> 30	<i>Practical:</i> 30
Methods of teaching: Lectures, practical teaching, students presentations			
Mark (max. Of poens 100)			
in-course assessment	point	Exam	point
Activity in learning	60	Written exam	40
<i>Presentations seminar papers</i>			
<i>Report /final projects</i>			

Course title: Conservation of Forest Genetic Resources			
Наставник/наставници: Dr. Mirjana Šijačić-Nikolić, full prof. and Dr. Marina Nonić, assis. prof.			
Course type: elective			
Број ЕСПБ: 5			
Услов: /			
Циљ предмета: Gaining knowledge about the importance and methods of conservation and directed utilization of forest genetic resources.			
Исход предмета: Acquired knowledge in the field of conservation and directed use of forest genetic resources.			
Садржај предмета: Теоријска настава <ol style="list-style-type: none"> 1. Biological diversity: Definition; Threats to biodiversity (2) 2. Genetic diversity: Importance of genetic diversity; Sources of genetic diversity; Genetic diversity determination; Threats to genetic diversity (2) 3. Forest genetic resources: Definition; Forest Genetic Resources Conservation Methods (2) 4. State of forest genetic resources conservation in Europe (2) 5. <i>In situ</i> conservation case studies (2) 6. <i>Ex situ</i> conservation case studies (2) 7. Linking Forest Genetic Resources with People (1) 8. Climate change aspects in forest genetic resources conservation (2) Практична настава <ol style="list-style-type: none"> 1. Biological diversity and genetic diversity: Sources, Threats, and Conservation (2) 2. Forest genetic resources: Definition; Forest Genetic Resources Conservation Methods (2) 3. <i>In situ</i> and <i>ex situ</i> conservation case studies (2) 4. Writing the seminar paper about conservation of the gene pool of rare and endangered species - an introduction (2) 5. The selection of areas for the conservation of the gene pool of rare and endangered species (2) 6. Writing a proposal for a program of conservation and directed utilization of specific species - independent student work (3) 7. Oral defense of seminar paper (2) 			
Литература: <ol style="list-style-type: none"> 1. Šijačić-Nikolić, M., Milovanović, J., Nonić, M. (2014): <i>Conservation of Forest Genetic Resources</i>. In: Ahuja M.R., Ramawat K.G. (eds.) "Biotechnology and Biodiversity" (Series: <i>Sustainable Development and Biodiversity</i>, Vol. 4). Springer: 103-129 2. Šijačić-Nikolić, M., Milovanović, J., Nonić, M. (2018): <i>Forests of Southeast Europe Under a Changing Climate: Conservation of Genetic Resources</i>. eBook ISBN 978-3-319-95267-3; Hardcover ISBN 978-3-319-95266-6; DOI 10.1007/978-3-319-95267-3; Springer International Publishing: 486 pages 3. Šijačić-Nikolić M. and Nonić M. (2019): <i>Biological Diversity: Global Threats</i>. In: Encyclopedia of the UN Sustainable Development Goals, Walter Leal Filho et al. (Eds): Life on Land (<i>in press</i>) 4. Nonić M. and Šijačić-Nikolić M. (2019): <i>Genetic Diversity: Sources, Threats, and Conservation</i>. In: Encyclopedia of the UN Sustainable Development Goals, Walter Leal Filho et al. (Eds): Life on Land (<i>in press</i>) 5. Šijačić-Nikolić M. and Milovanović J. (2019): <i>Conservation of Plant Species</i>. In: Encyclopedia of the UN Sustainable Development Goals, Walter Leal Filho et al. (Eds): Life on Land (<i>in press</i>) 			
Број часова активне наставе: 60 (30+30) = 2+2		Теоријска настава: 2 (15)	Практична настава: 2 (15)
Методе извођења наставе: During the lectures and practical classes, modern visual teaching tools are used to present the past and current activities on the conservation and directed utilization of forest genetic resources, both <i>in situ</i> and <i>ex situ</i> . During the practical classes, students work on a seminar paper.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
практична настава	10	усмени испит	60
семинар-и	30		

Course title: Dendrology			
Professor/professors: Dr Marko Perović			
Course type: elective			
ESPB number: 5			
Condition: -			
Goal of the subject: The goal of subject is that student learn characteristics of important woody plant species, considering their ecological and phenological characteristics, practical use and to be capable of recognize these species by their vegetative and generative parts.			
Result of the subject: The knowledge obtained in this course is a foundation for various forestry and environmental disciplines and has multiple implications in practice.			
Content of the subject <u>Theoretical part:</u> Important woody plant species are discussed on lectures, including their distribution, description of vegetative and generative parts (growth pattern and dimensions, bark, twigs, leaves, flowers and fruits), their ecological requirements and phenology and their current and potential practical use. <u>Practical part:</u> Students learn how to recognize and differentiate species on the basis of morphological analysis of their twigs, leaves, needles, fruits and cones. Apart from laboratory study, practical teaching in Arboretum of Forestry faculty is included.			
References: 1. Hardin, J., Leopold, D., White, F. (2000): Textbook of Dendrology. McGraw Hill International Editions 2. Eckenwalder, J. (2009): Conifers of the World. Timber Press. Portland-London 3. Bishop, P. (2006): 100 woods: A guide to popular Timber of the World. Crowood Press 4. Johnson, O. (2004): Tree guide. Collings books. London 5. Krussmann, G. (1986): Manual of Cultivated Broad/leaved trees and shrubs, Vol. 1-3. Timber press			
Number of active teaching lessons: 2+2		Theoretical part of teaching: 2	Practical part of teaching: 2
Methods of giving lectures: Theoretical part of teaching includes modern references using video-presentations with numerous practical examples. Practical part of teaching is organised in a laboratory, as well as outside at the Arboretum of the Forestry Faculty.			
Knowledge evaluation (max 100 points)			
Before exam obligations:	points	Final exam:	points
Activity during lectures	5	Oral exam	50
Activity during practicals	5		
Seminary	10		
Writing test	30		

Course title: Wildlife Management and Conservation			
Наставник: Dragan Gačić, D.Sc., Associate Professor			
Course type: elective			
Број ЕСПБ: 9			
Услов:			
Циљ предмета: The aim is to familiarize students with the need and importance of complex planning and organization of hunting grounds management, and various measures of conservation of wildlife populations and their sustainable use.			
Исход предмета: The result is that students are trained to successfully develop and implement hunting management plans, and that they can prevent (or significantly mitigate) damages and economic losses in forestry, hunting industry and agriculture.			
Садржај предмета General characteristics and specifics of management of natural resources; Similarities and differences in planning in forestry, agriculture and hunting. Biological and ecological basics of planning of cultivation, protection and rational use of wildlife populations. Legal and regulatory basics of hunting planning and wildlife conservation; Organization of management of hunting grounds and hunting industry (eg Serbia, Slovenia, Hungary); Establishment of management objectives; Measures and means for achieving the planned goals (eg reintroduction, reinforcement). Spatial and functional arrangement of hunting grounds; Damages from wildlife and current legislation; Opportunities and measures for removing or reducing damage from wildlife; Types of damage to wildlife and their suppression; Influence of lined channels for irrigation on wildlife and their habitats.			
Literature Apollonio M., Andersen R., Putman R. (2010): European Ungulates and Their Management in the 21 st Century, Cambridge, UK : Cambridge University Press. Deinet S., Ieronymidou C., McRae L., Burfield I.J., Foppen R.P., Collen B., Böhm M. (2013): Wildlife comeback in Europe: The recovery of selected mammal and bird species. <i>Final report to Rewilding Europe by ZSL</i> , BirdLife International and the European Bird Census Council, London, UK: ZSL. Putman R., Apollonio M. (2014): Behaviour and management of European ungulates, Whittles Publishing, Scotland, UK.			
Број часова активне наставе		Теоријска настава: 2	
Практична настава: 2			
Методе извођења наставе Teaching is done using modern presentation equipment. Creation and presentation of seminar work in consultation with the teacher. During the theoretical classes, examples of best practice will be presented, as well as lectures of guest lecturers from practice.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе	поена	Завршни испит	поена
активност у току предавања	10	усмени испит	50
семинарски рад	40		

Course title: Entrepreneurship and Management in Forestry			
Teacher(s): Dr. Jelena Nedeljković			
Course type: elective			
Number of ECTS: 5			
Condition: /			
Course objective: Students will learn skills and concepts that enable the use of expert practices when solving problems in entrepreneurship process and management in forestry			
Learning outcome: By the end of this course, successful students will: describe the characteristics of enterprises, and entrepreneurship in forestry; recognize and evaluate the nature, the impact of and the concepts of management functions in forestry; identify and apply the appropriate methods and tools to solve contemporary business challenges; be able to apply stakeholders, SWOT, PESTLE and similar analysis in their work; evaluate and determine responsible business decisions that influence organizational performance; communicate effectively in a professional environment both in written and oral formats; develop an appropriate strategy for their business enterprise			
Subject content <i>Theoretical lectures:</i> Enterprise (definition, classification, characteristics of enterprises in forestry, cooperation); Entrepreneurship and entrepreneurs (definition, theoretical background, principles); Business idea development; EU and national regulatory and institutional frameworks related to the entrepreneurship; EU and national business support measures; Supply chain in forestry; Management (definition, theoretical background, functions, characteristics of management in forestry); Strategic management; Organizational structure and design; Leadership; Human resource management; Controlling; Stakeholders in entrepreneurship and management in forestry. <i>Practical lectures:</i> Case study analysis (best practice examples); Stakeholders' analysis, SWOT, PESTEL, GAP, analysis, Benchmarking			
Literature 1.Schmithüsen F., Kaiser B., Schmidhauser A., Mellinghoff S., Perchthaler K., Kammerhofer A.W. (2014): <i>Entrepreneurship and Management in Forestry and Wood Processing: Principles of Business Economics and Management Processes</i> . Routledge, Oxon. (496) 2.Niskanen A. (ed.) (2006): <i>Issues affecting enterprise development in the forest sector in Europe</i> , Research Notes 169, University of Joensuu, Faculty of Forestry, Joensuu. (406) 3.Niskanen A., Sleen B., Ollonqvist P., Pettenella D., Bouriaud L., Rametsteiner E. (2007): <i>Entrepreneurship in the forest sector in Europe</i> , Silva Carelica 52, University of Joensuu, Faculty of Forestry, Joensuu. (127) 4.Weiss G., Pettenella D., Ollonqvist P., Sleen B. (2011): <i>Innovation in Forestry: Territorial and Value Chain Relationships</i> , CABI, Oxfordshire (331) 5.Rametsteiner E., Weiss G., Kubezcko K. (eds). (2005): <i>Innovation and Entrepreneurship in Forestry in Central Europe</i> , European Forest Institute Research Report 19, Brill Academic Publishers, Leiden. (179) 6.Hill C., McShane S. (2008): <i>Principles of management</i> , McGraw-Hill Irwin, Boston (511) 7.(2015): <i>How business works</i> , Dorling Kindersley (DK), London. (352)			
Number of classes of active teaching		Lectures: 2	Practice: 2
Type of teaching method: The course is designed to be participatory, interactive, and engaged. We will use different teaching methods: lectures and discussion, problem-based learning, cooperative group work, students' presentations, on-line quizzes. Students are expected to actively participate in discussions and other work forms.			
Assessment (maximum 100 points)			
Pre-exam requirements	points	Final exam	points
Activities during lectures	10	Written exam	50
Seminar papers	40		

Course title: Wood Drying			
Наставник/наставници: Goran R. Milić			
Course type: elective			
Број ЕСПБ: 5			
Услов:			
Циљ предмета: The aim of the course is to provide knowledge that will enable a scientific approach to technology of wood drying			
Исход предмета: Ability to independently be the chief technologist in the field of wood drying and heat treatments; Acquire knowledge of the mechanisms of drying stresses in wood and to apply this knowledge to wood drying practice; To be able to use different drying technologies and to understand significance of specific drying phases; To be able to assess the drying quality			
Садржај предмета: <i>Теоријска настава</i> <i>Wood structure - from the point of drying; Transport processes in wood; Drying phases, movement of water and shrinkage; Developing of stresses during wood drying; Modifications of drying schedules; Drying quality assesment</i> <i>Практична настава</i> <i>Work in the laboratory with instruments (temperature, relative humidity, equilibrium moisture content); Kiln schedules; Industrial kilns visit</i>			
Литература: W.T. Simpson. Dry kiln operator's manual. 1991. Madison, WI: Forest Products Laboratory Cividini R. Conventional kiln-drying of lumber. 2001. Nardi S.p.A. Siau, J.F. 1995. Wood: Influence of Moisture on Physical Properties. Department of Wood Science and Forest Products, Virginia Polytechnic Institute and State University. 227 pages. ISBN 0-9622181-0-3.			
Број часова активне наставе: 60 (30+30) Теоријска настава: 30 Практична настава: 30			
Методе извођења наставе: Lectures, experimental work, interactive learning			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	писмени испит	40
практична настава	20		
семинар-и	30		

Course title: Pests of Woody Plants			
Professor: Prof. Milka M. Glavendekic, D. Sc.			
Course type: elective			
ECTS: 5			
Condition: no			
Objective: This course aims to introduce students to arthropods pests of woody plants of concern in forest industry and on green infrastructure. During the course they develop their skills to identify insect pests and mites and become familiar with their symptoms. They also learn to distinguish between pests and beneficial insects trophically related to them. Students gain knowledge about pathways of introduction of pests and how to manage pathways of introduction of alien species.			
Course outcome: Students are fully able to identify certain emerging pests of woody plants of current concern in forest industry and at green infrastructure. They understand life cycle of pests and beneficial insects related to them. Students gain knowledge about early warning and integrated management of pests of woody plants.			
Content of the course: <i>Theory teaching:</i> Students will be presented with general characteristics of arthropods affecting health of woody plants. The classification of insects will highlight the most important representatives of native pests species and non-native insect pests. Their life cycle and trophical relations with beneficial insects will be explained in detail. In the special part will be presented the most important emerging pests in changed climate conditions. Their ecology and methods of integrated control will be highlighted. <i>Practical classes:</i> Practical work is focused on developmental stages of insects, their morphology and growing in the laboratory. Specimens of insects and/or symptoms of damage will be studied in detail for currently the most important pests in forests and on green infrastructure. Corridors and pathways of introduction will be presented and the main strategies and tools used for monitoring and integrated pest control. Students independently work on projects and write report to gain skills of writing expertise.			
Literature: Glavendekić M., 2011: Arthropod Diversity in the Forests of the Area of Obodarska bara. Monograph, J.P. „Vojvodinašume“, Petrovaradin. Tenow O., A. C. Nilssen, H. Bylund, R. Pettersson, A. Battisti, U. Bohn, F. Carouille, C. Ciornei, G. Csoka, H. Delb, W. DePrins, M. Glavendekic, Y. I. Gninenko, B. Hrasovec, D. Matosevic, V. Meshkova, L. Moraal, C. Netoiu, J. Pajares, V. Rubtsov, R. Tomescu and I. Utkina, 2013: Geometrid outbreak waves travel across Europe. Journal of Animal Ecology, vol. 82 br. 1, str. 84-95 Glavendekić M., B. Ivanov, M. Džinović, B. Arsović, D. Mandić, Educational Technology in Developing Public Awareness of Tree Pests and Pathogens, Sumarski List, Croatian Forestry Society, 139, 9-10, pp. 455 - 463 Roques A., ed., 2015: Processionary Moths and Climate Change: An Update, Quae Rat M, Simonović P, M. Glavendekić, Momir Paunović, Stojanović V, Maja Karaman, Radišić D, Anačkov G., Overview of the invasive alien species in Serbia, ESENIAS Report 2016 - State of the Art of Invasive Alien Species in South-Eastern Europe, ESENIAS Report 2016 - State of the Art of Invasive Alien Species in South-Eastern Europe, pp. 95 - 118, 978-86-7031-331-6, 2016. Marzano M., Dandy N., I. Papazova-Anakieva, Avtzi D, Connolly T., Eschen R., Glavendekić M., Hurley B., Lindelow A., D. Matosevic, R. Tomov, A. Vettraino, Assessing awareness of tree pests and pathogens amongst tree professionals: A pan-European perspective, FOREST POLICY AND ECONOMICS, ELSEVIER SCIENCE BV, 70, pp. 164 – 171 Roques A., Cleary M., Matsiakh I., Eschen R. eds., 2017: Field Guide for the Identification of Damage on Woody Sentinel Plants, CABI			
Number of classes of active teaching:		Theoretical teaching: 30	Other forms of teaching: 30
Methods of teaching: use of modern presentation equipment: beamer, stereo microscope with camera for teaching and practical work. Individual work of students, project presentation and interactive teaching in the class.			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	10	Written exam	25
Practical teaching	10	Oral exam	30
colloquium	15		
Seminar	10		

Course title: Agroforestry Systems			
Наставник/наставници: Lukić S. Sara; Beloica R. Jelena; Nikolić Jokačić M. Vesna; Miljković M. Predrag			
Course type: elective			
Број ЕСПБ: 5			
Услов:			
Циљ предмета: The main objective of this course is to enable students to acquire knowledge about agroforestry land use systems where forests develop in communities with agricultural production in a specific spatial distribution based on the principles of ecological and economic interactions between components: forests and agricultural crops and/or animals in system.			
Исход предмета: Full ability to apply knowledge in this field in practice, as well as preparation for doctoral studies.			
Садржај предмета: <i>Теоријска настава</i> The role and significance of the agroforestry systems as sustainable land use in land management; Agroforestry systems (Level I) (different combinations of land use patterns in agriculture and forest (forest plantations)); Spatial and temporal components of agroforestry; Social and economic aspects; Ecological basics of agroforestry; Land degradation processes and agroforestry systems; Modeling and development of agroforestry systems. Agroforestry regional and national policies. Agroforestry future strategies. <i>Практична настава</i> Processes of soil degradation and agroforestry systems and practices (all types of protective forest belts – field shelterbelts belts, farm shelterbelts, shelterbelts for snow and noise control, biomass plantation, medicinal plants plantation, fish farming, bee-keeping, livestock shelterbelts etc.); the application of certain agroforestry systems and practices in the given conditions through exercises. Modeling and development of agroforestry systems. Application of information technology and GIS in agroforestry.			
Литература: Young., A. (1991): <i>Agroforestry for soil conservation</i> , CAB International, International Council for Research in Agroforestry Nair P.K.R. (1993): <i>An Introduction to Agroforestry</i> . Kluwer Academic Publishers, ICRAF Schnabel, S., Ferreira, A. (2004): <i>Sustainability of Agrosilvopastoral Systems – Dehesas</i> , Montados-, A Cooperating Series of the International Union of Soil Science (IUSS) Riguero-Rodriguez A., McAdam J., Mosquera-Losada M.R. (2009): <i>Agroforestry in Europe</i> . Current State and Future Prospects. Advances in Agroforestry. Springer			
Број часова активне наставе:		Теоријска настава:	Практична настава:
Методе извођења наставе: Lectures with introduction to the literature from this discipline. Practical knowledge and skills for planning and application of appropriate agroforestry systems and practices in order to achieve ecological and economic benefits. Through the preparation of seminar papers, students should demonstrate a personal initiative in solving the problem of the application of the agroforestry practices.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	усмени испит	45
практична настава	20		
семинар-и	25		

Course title: Field Trip			
Teacher/teachers: Teachers and assistants on study course			
Course type: elective			
ECTS number: 5			
Condition: None			
Goal of the subject Field trip aims that students master practical knowledge from various subjects on the course Forestry and natural resources management. During field trips praxis is acquired through several on-ground classes in the area of the city of Belgrade, as well as throughout the territory of Serbia.			
Result of the subject Knowledge acquired on the field trip possess practical significance and use as a basis for the array of professional disciplines in the field of Forestry and natural resources management.			
Content of the subject Subject content is adjusted to professional profile of master students of the course Forestry and natural resources management, the level of knowledge they acquire during studies and the importance of certain subjects for successful solving of tasks and problems, occurring in practice.			
Number of classes of field trip: 8			
Teaching methods Field trip is conducted with the help of teachers and assistants			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	20	Oral exam	60
Seminar	20		

Course title: Climate Adaptive Forest Establishment			
Наставник/наставници: Vladan Ivetić, Jovana Devetaković			
Course type: elective			
Број ЕСПБ: 5			
Услов: /			
Циљ предмета: The graduate knows and understands: <ul style="list-style-type: none">the methods and techniques of forest establishment, with particular emphasis on afforestation, reforestation and forest restoration on the principles of forest sustainability and productivity,the methods and techniques of maintaining the necessary level of genetic diversity (on species, population, and individual level) in new forests, including the basics of evolution, adaptation, and migration dynamics of trees,the principles of forest reproductive material (at species, provenances, family, and individual level) to planting site matching according to the predicted future environment conditions,the history and importance of planted forests, with particular emphasis on role of planted forests in sustainable development from ecological and socio-economic aspects.			
Исход предмета: The graduate is able to prepare a plan of establishment of new forest according to the management goals and current and predicted environment conditions, as a part of afforestation, reforestation, and forest restoration programs.			
Садржај предмета: <i>Теоријска настава</i> Definitions – The Frame A requirements and needs for forest establishment – The stage Climate change – The challenge Range, space, and time vs. evolution, adaptation, and migration – The race Long term strategies – Theoretical and practical actions Short term tactics – Field actions Measuring success and/or facing the failure – Taking responsibility <i>Практична настава</i>			
Литература: Ivetić V. 2019. Forest establishment [on Serbian with summary for each section and all tables and figures, as well as their captions on English] University of Belgrade – Faculty of Forestry. 358 p. Siyag PR. 1998. Afforestation, Reforestation and Forest Restoration in Arid and Semi-arid Tropics. Springer-Verlag. 400 p. Fournier MV. 2009. Forest Regeneration: Ecology, Management and Economics. Nova Science.198p. Ivetić V, & Devetaković J. 2016. Reforestation challenges in Southeast Europe facing climate change. Reforesta 1, Pp. 178-220.			
Број часова активне наставе:		Теоријска настава:	Практична настава:/
Методе извођења наставе: Lectures and seminars.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	усмени испит	60
семинар-и	30		

Course title: Silviculture			
Teacher and teaching assistant: Dr. Milun Krstić, full professor, dr Branko Kanjevac, teaching assistant with doctorate			
Course type: elective			
Number of ECTS: 5			
Subject aim: Introducing students with the nature of the forest, influence of basic ecological factors (climate, edafic, orographic and biotic) on the forest, influence of forest on ecological factors, the importance of these factors to the silviculture and application of natural regeneration and forest tending; introducing students with the causes of forest degradation, criteria for defining the state and degree of degradation of forests and methods of conversion of degraded and devastated forests into forests of better quality.			
Subject outcomes: Training students for: knowledge of the nature of the forest, ecological importance of forest; for making ecological studies and the application of natural regeneration and forest tending methods; defining causes of forest degradation, criteria for defining the state and degree of degradation of forests and forest land based on the easily recognizable parameters; to conversion of degraded and devastated forests into forests of better quality; adjustment the silvicultural treatments to the actual state of the forest.			
Content of the subject: <i>Active (theoretical) lectures:</i> Natural regeneration of forest, conditions for successful regeneration of forest, basic methods of natural regeneration of forest (Clearcut system, Shelterwood system, Selection system), combined methods of natural regeneration, auxiliary treatments for natural regeneration of forest. Development phases of stand, basic methods of forest tending - aim of tending, classification of tending operations, forest thinning, classification of trees in stands in thinning, basic methods of thinning, rationalization of forest tending, pruning. Natural regeneration and tending of pure and mixed forests of our most important tree species - the basics of natural regeneration and forest tending, tree marking for cutting, making silvicultural plan. Degraded and devastated forests and deforested land. Causes of forest degradation. Conversion of degraded forests into higher quality forests, regenerative (vegetative) ability of forest trees; vegetation forms of degraded and devastated forests; criteria for defining the state and degree of degradation of forests - stand characteristics, state conditions. Methods of conversion of degraded and devastated forests into forests of better quality - melioration and reconstruction: indirect conversion of degraded forests into forests of better quality, direct conversion of degraded forests: restitution, substitution, combined method; artificial regeneration of forests; tending and maintenance of newly established forest plantations. Reclamation of forest land. <i>Practical lectures:</i> Defining environmental conditions (climate, orographic, edafic, characteristics of the locality, local heat potential); analysis and processing of ecological factors as decisive factors in order to select appropriate methods of natural regeneration and tending of certain types of forests. In concrete examples students simulate silvicultural treatments, make elaborates - silvicultural plans within a forest management plan; defining degree of degradation of forests and forest state; defining methods and silvicultural treatments based on the state of forest; cost calculation according to the existing norms.			
Literature: Puettmann K., Coates D., Messier C. (2009) A critique of Silviculture: Managing for Complexity. Island Press .Washington • Covelo • London. Nicolescu V.N. et al. (2018) Silvicultural guidelines for European Coppice forests. In eds: Coppice forests in Europae, Freiburg, Germany. Matthews J. (1989): Silvicultutal systems, Clarendon press, Oxford; Döbbeler H, Spellman H. (2002) Methodological approach to simulate and evaluate silvicultural treatments under climate change. Forstwissenschaftliches Centralblatt 121:52-69. *** (2003) Silvicultural Systems Handbook for British Columbia. Ministry of Forests Forest Practices Branch. Victoria, British Columbia. For. Pract. Br., BC. Min. For., Victoria, BC. http://www.publications.gov.bc.ca . Krstić, M., Kanjevac, B. (2017): Silviculture II - practicum. University of Belgrade Faculty of Forestry (examples on English language). Krstic, M. (2008) Effect of the local heat potential on the distribution of sessile oak forests. Biotechnology & Biotechnological Equipment, Volume 22, No 3, pp. 804-809. Publisher: Diagnosis Press, Sofia, Bulgaria. ISSN 1310-2818. Krstić, M., Stojanović, Lj., Rakonjac, Lj. (2006) Silviculture yesturday, today and tomorow. International Stientific Conference: Sunstable use of Forefst Ecosystems, the Challenge of the 21 st Century, 8-10 November, Donji Milanovac, Serbia. Proceedings, pg 161-171.			
Number of classes per week:	Lectures:	Exercises:	Other forms of teaching:
Method of teaching: Active (theoretical) lectures in the classroom; Exercises - examples about simulation of appropriate silvicultural works. Other forms of teaching: <u>colloquium</u> , individual seminar work of students by processing some specific topics; practical simulation of silvicultural works-creating elaborates and working in the computer laboratory of the Faculty of Forestry; making silvicultural plan; 4 days of one-day field lessons on the experimental plots around Belgrade.			
Rating of knowledge (maximum score 100)			
Pre-exam obligations	points	Final exam	points
activity during the lectures	5	oral exam	65
practical lectures	10		
elaborate	20		

Course title: Sustainable Forest Utilization			
Teacher (s): Milorad Danilović, Vladimir Ćirović			
Course type: elective			
ECTS: 5			
Condition: Bachelor's degree			
Subject aim: Provision of necessary technical, technological, organizational, economic and other professional knowledge that will enable students to successfully solve tasks and problems in the field of forest utilization (within the forestry profession).			
Subject outcomes: The student will be able to properly select adequate technology for forest utilization and create planning documents for forest production.			
Contents of the course: Theoretical teaching: Introduction to the content of the subject. Constructive and exploitative characteristics of work tools and their importance for the emission of harmful gases, as well as the impact on soil. Forest certification. The selection of work methods and work systems according to the ergonomic, energy, environmental and economic aspects. Damages to standing trees, young trees and the root system caused by forest machinery. Planning of road infrastructure in forests. Construction of road infrastructure in forests with a special protection regime. Technical and structural characteristics of work tools in steep and low capacity terrains. The choice of optimal technologies of forest utilization, considering the damage to the stand on the ground and the reduction of CO ₂ emissions. Methods of repairing damage caused by mechanization in special-purpose forests. The technology of utilization of forest biomass for energy. The use of special fuels for the purpose of reducing the emission of harmful gases. Soil compaction and soil erosion as a result of the movement of vehicles for wood assortments transport. The possibilities of reducing vehicle contact pressure on forest ground. The efficiency of transporting wood by using wire-rope systems, spools and animals in areas under special protection regimes. Practical teaching: Cost calculation of logging. Work norms in forest utilization jobs: calculation of recording lists, processing of recorded data and norm calculation. Planning the primary network of forest roads using geographical information systems(GIS-a), digital terrain model and other modern tools. The determination of the mean transport distance of skidding in lowland and mountainous areas. The calculation of costs for the construction and maintenance of forest roads and transportation of wood assortments. Drafting of operational plans.			
Literature: MacDonald, A.J. (1999): Harvesting Systems and Equipment in British Columbia; Forest Engineering Research Institute of Canada Längin, D. et. al. (2010): The South African Ground Based Harvesting Handbook Lan, Z., 2001: A cost model for forest machine operation in wood cutting and extraction. University of Helsinki, Finland, 1-15.			
Number of lessons of active teaching:		Theoretical lessons: 2	Practical lessons: 2
Teaching methods: The course consists of lectures and consultations. In order to provide students with a better understanding of the subject matter, theoretical presentations are combined with video presentations, demonstrations, discussions and fieldwork.			
Grading scale (maximum number of points 100)			
Pre-exam duties:	поена	Final examination:	points
Activity during the lessons	10	Oral examination	50
Practical teaching	20		
Test	10		
Term paper	10		

Course title: Furniture Design			
Наставник/наставници: Jelena Matic, Full Professor			
Course type: elective			
Број ЕСПБ: 5			
Услов: only general, not specific			
Циљ предмета: Enabling students to create furniture projects and design ideas according to given production and market conditions and to be able to value furniture design professionally.			
Исход предмета: Fulfilled goal of the subject after the completed course and knowledge test.			
Садржај предмета: <i>Теоријска настава</i> Introduction to Furniture Design, A Brief Historical Overview, Classifications Based on Function, Classifications Based on Social Use, Furniture Design Theory, Basic Design Factors (Function, Form, Spatial Organization and Typological Orders, Anthropometrics and Ergonomics, Economic factor), Design Principles, Design Phases, Materials for Wood Furniture Design Professionals, Processes and Methods of Fabrication, Professional Practice and Marketing <i>Практична настава</i> Design Processes, Project Brief , Type of drawings, Dimensional Analysis, Technical Description, Furniture Case Studies, Studio projects in Furniture Design, Seminar 1 - Author and Work, Seminar 2 – Furniture Company			
Литература: Postell J. (2007), <i>Furniture Design</i> , Wiley Matic J. (2018): <i>Design of furniture and wood products – realisations</i> , University of Belgrade – Faculty of Forestry, Belgrade Panero J., Zelnik M. (2009): <i>Human Dimension and Interior Space</i> , Whitney Library of Design Thompson R. (2007): <i>Manufacturing Processes for Design Professionals</i> , Thames & Hudson Thompson R. (2017): <i>The Materials Sourcebook for Design Professionals</i> , Thames & Hudson			
Број часова активне наставе: 4 Теоријска настава: 2 Практична настава: 2			
Методе извођења наставе: oral lectures, graphic presentations, video material, practical studies, insight into examples of good practice, consultations;			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	писмени испит	15
практична настава - елаборат	40	усмени испит	15
колоквијум-и	10		
семинар-и	10		

Course title: Sustainable Land Management			
Teachers: dr Mirjana Todosijević; Assistant: Katarina Lazarević			
Course type: elective			
ECTS: 5			
Condition: none			
Subject objective Introducing students to methods and ways of studying sustainable land resource management, with a review of issues, approaches and techniques			
Outcome of the subject Ability of students to choose adequate models of sustainable land resource management in the specific conditions of the investigated area.			
Content of the subject Levels of intervention and activities in the multiple approach of participatory groups in sustainable land management; Community based natural resources management; International Legal and Institutional Regimes for Soil; Initiatives Relevant to Soil (Forest Principles; International Covenant on Environment and Development; Selected legal and institutional elements for disadvantaged people); Management procedures for sustainable use of soil; Education/training in the sustainable use of soil; Concretisation of sustainable land management in a particular area: (1) sociological principle: satisfying the needs of the population for certain production lines (surveys, interviews); (2) economic principle: achieving profitability and long-term economic effects (application of "benefit cost" analysis); (3) ecological principle: the established production, or the way of land use is sustainable if land losses are below tolerant boundaries. Practical work: development of a model of sustainable land resource management in a specific area			
Proposed literature 1. Grazia Borrini-Feyerabend, M. Taghi Farvar, Jean Claude Nguinguiri and Vincent Awa Ndangang (2007): Co-management of Natural Resources, Kasperek Verlag, Heidelberg 2. Ilić, B., Mihajlović, D. (2017): Upravljanje prirodnim resursima, održivost i zaštita, Megabiznis 1/1. 3. World Bank (2008): Sustainable Land Management – Source book, Agriculture and Rural Development 4. Editor: Zlatic, M. (2010): Global Change - Challenges for Soil Management, <u>Advances in Geoecology</u> , Volume 41, Catena Verlag, Reiskirchen. 5. Editors: Zlatic, M. and Kostadinov, S. (2014): „Challenges: Sustainable Land Management – Climate Change“, ADVANCES IN GEOECOLOGY 43, A Cooperating Series of the International Union of Soil Science (IUSS), ISBN 978-3-923381-61-6, US-ISBN 1-59326-265-5, CATENA VERLAG GMBH, Reiskirchen.			
Number of classes of active teaching:		Theoretical teaching:	
Methods of teaching:			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	20	Oral exam	60
Seminar	20		

Course title: Forest Plantations			
Наставник/наставници: Jovana Devetaković			
Course type: elective			
Број ЕСПБ: 5			
Услов: /			
Циљ предмета: The graduate knows and understands: <ul style="list-style-type: none">the methods and techniques of forest plantations establishing for different purposes (production of technical wood, short rotation coppice, phytoremediation plantations, agroforestry systems, seed orchards and plantations of non-wood forest products).the selection of species and clones and knowlegde about most common species for this purpose,the history and importance of forest plantations, with particular emphasis on role of planted forests in sustainable development from ecological and socio-economic aspects.			
Исход предмета: The graduate is able to prepare a plan of establishment of forest plantation according to the management goals, produce planting material and implement appropriate cultural practices.			
Садржај предмета: <i>Теоријска настава</i> Importance of forestry plantations Poplar plantations Willow plantations Short rotation coppice (SRC) Walnut and hazelnut plantations Black locust plantations Plantations of non-wood products Phytoremediation plantations Agroforestry systems Seed orchards <i>Практична настава</i>			
Литература: Ivetić V. (2013): Praktikum iz Semenarstva, rasadničarstva i pošumljavanja. Šumarski fakultet, Beograd. 213 strana [on Serbian] Stilinović S. (1991): Pošumljavanje. Naučna knjiga, Beograd. [on Serbian]			
Број часова активне наставе:		Теоријска настава:	Практична настава: /
Методе извођења наставе: Lectures and seminars.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	усмени испит	60
семинар-и	30		

Course title: Forest Growth and Yield			
Наставник/наставници: Dr. Branko Stajić, MSc Marko Kazimirović			
Course type: elective			
Број ЕСПБ: 20			
Услов: -			
Циљ предмета: Training for the theoretical and quantitative assessment, analysis and prediction of forest tree and stands growth in order to acquire capacities for solving practical tasks and creating optimal solutions in the field of growth and silviculture of forests, bio-indication of the action of exogenous and endogenous factors on trees and forests vitality. Acquired knowledge should empower students for innovation and technological advancement in the process of producing wood volume and wood biomass as well as ensuring the vitality and stability of forest ecosystems.			
Исход предмета: The ability to quantitatively and qualitatively analyze and describe the growth of trees and stands and create optimal solutions in field of silviculture and forest management planning in order to insure the appropriate level of production and vitality of trees and forests as a natural resource of special economic and ecological importance.			
Садржај предмета: <i>Теоријска настава</i> Terminology and definitions in <i>Forest growth and yield</i> science. Importance of <i>Forest growth and yield</i> for forestry and ecology. Methods of <i>Forest growth and yield</i> research. Diameter, height, basal area and volume growth and increment of forests trees and stands. Growth and structure of tree crown and relations to trees and forest growth. Trees and forest growth depending on site (soil, community, climate etc.) and stand factors (density, competition). The effect of thinning on the growth and productivity of the stands. Increment of trees as a bio-indicator of the impact of stimulating and disturbing factors on forests and forest ecosystems. Forest growth models. <i>Практична настава</i> Includes field work and laboratory data processing. Laboratory work includes qualitative and quantitative analysis of the growth of trees and stands and effects of the action of exogenous and endogenous factors on growth and vitality, creation of models and their application in a process of gaining a comprehensive picture of the overall forest ecosystem and to develop sustainable management plans for forests.			
Литература: Assmann E (1970). The Principles of Forest Yield Study. Pergamon Press, pp. 506. Pretzsch, H. (2009): Forest dynamics, growth and yield. Springer, Germany Stajić B. et al. (2015): Preliminary Dendroclimatological Analysis of Sessile Oak (<i>Quercus petraea</i> (Matt.) Liebl.) in "Fruška Gora" National Park, Serbia. Baltic Forestry 21(1): 83-95. Stajic, B. et al. (2017): Growing space efficiency of European ash (<i>Fraxinus excelsior</i> L.) in the region of Majdanpečka domena. Bulletin of Faculty of Forestry Belgrade 115, 112-125			
Број часова активне наставе: 60 Теоријска настава: 30 Практична настава: 30			
Методе извођења наставе: lectures, practical lectures, laboratory work			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
Lectures presence and activity	5	Laboratory work	10
Seminar	15	Exam	50
Colloquium	20		

Course title: Wood-Based Composite Panels			
Наставник/наставници: Mladjan Popović			
Course type: elective			
Број ЕСПБ: 5			
Услов:			
Циљ предмета: To acquire the knowledge of particleboards, fibreboards, wood-cement boards and wood-plastic masses, concerning their manufacturing, technological process and applications. To master the characteristics of these materials in accordance with their unique properties and purpose.			
Исход предмета: The student becomes familiar with the composition of particleboards, fibreboards and wood-cement boards and understands the basic technological procedures, processes and equipment used in their production. The student is familiar with the properties and testing methods used to evaluate the quality these materials. The student is qualified to work in real processing conditions.			
Садржај предмета: <i>Теоријска настава</i> Terms and definitions of wood-based composites, their classification and the general flow-charts of technological processes. Preparation of wood raw materials (wood particles and fibres). Transport and storage. Preparation of adhesives and blending operations for various types of raw material and different production processes. Mat formation, pre-pressing, pre-heating and moisture treatment of mat. Hot-pressing, extruding and moulding operations in the production of wood-based composite materials. Final processing, conditioning, formatting, sanding, coating. Standard requirements for the quality of produced wood-based composites. Factory control and standard test methods. <i>Практична настава</i> Materials balances and capacity calculations for processing operations. Laboratory work: characterisation and preparation of wood raw materials (particles and fibres); Blending and hot pressing operations in controlled laboratory conditions. Laboratory testing of wood-based composites.			
Литература: 1. Thoemen, H., Irle, M., Sernek, M. (2010). Wood-Based Panels - An Introduction for Specialists. London, England: Brunel University Press. 2. Malony, M.T. (1993). Modern Particleboard and Dry Process Fiberboard Manufacturing, Miller Freeman Publ. San Francisco. 3. Suchsland, O., Woodson, G.E., (1986). Fiberboard Manufacturing Practices in the United States. Agric. Handb. 640. Washington, DC: U.S. Department of Agriculture			
Број часова активне наставе:		Теоријска настава:	Практична настава:
Методе извођења наставе: Lectures, laboratory work, project work.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	5	усмени испит	50
практична настава	5		
колоквијум-и	20		
семинар-и	20		

Course title: Sustainable Utilization of Water Resources in Protected Areas			
Teachers: dr Ratko Ristić, (saradnik: Siniša Polovina, asistent)			
Course type: elective			
ESPB: 5			
Condition:			
Subject objective Introduction to the methods and techniques used to manage land and water resources in protected areas, in accordance with the category and dominant conditions in the protected area.			
Outcome of the subject Acquired knowledge on ways of managing land and water resources in protected areas.			
Content of the subject <i>Theoretical study:</i> Introduction to the categorization of protected areas and the criteria that are defining (strict and special nature reserve, national park, natural monument, protected habitat, landscape of outstanding features, nature park); analysis of risk for land and water resources degradation in protected areas; level of acceptable spatial pressure in protected areas; methods and techniques for managing land and water resources in protected areas. <i>Practical work:</i> Defining the risk of land and water resources degradation in protected areas; impact of natural and anthropogenic factors; examples of sustainable management based on case study analyzes; determination of the optimal management technique in accordance with the category of protected area.			
Proposed literature Ristić, R. (2013): Management of soil and water resources in protected areas (in preparation) , Faculty of Forestry, Belgrade; Worboys G., Lockwood M., De Lacy T. (2001): Protected area management: principles and practice , Oxford University Press Australia & New Zealand; Lockwood M., Worboys G., Kothari A. (2012): Managing protected areas-a global guide , Routledge.			
Number of classes of active teaching:		Theoretical teaching:	
Methods of teaching:			
Knowledge rating (maximum points 100)			
Pre-exam obligations:	Points	Final exam:	Points
Activity during lectures	20	Oral exam	60
Seminar	20		

Course title: Forest Protection			
Наставник/наставници: Milanović D. Slobodan, Marković M. Čedomir, Dobrosavljević N. Jovan			
Course type: elective			
Број ЕСПБ: 5			
Услов: Not applicable			
Циљ предмета:			
Исход предмета: Ability of microscopical analysis; Ability of tree and forest health assessment; Identification of diseases and injuries of forest tree species; Identification of insects and injuries of forest tree species			
Садржај предмета: Теоријска настава- Introduction to Forest protection; Forest damaging agents. Snowthrows and Windthrows; Drought; Extreme events; Forest Fire-basics; Forest Fire-methods for risk assessment; Forest Fire-early detection; Forest Fire-suppression methods; Most important biotic damaging agents of broadleaved tree species; Most important biotic damaging agents of coniferous tree species; Oak decline; Beech decline; Spruce decline; Fir decline; Pine decline; Fir decline; Diseases and pests on willows, poplars, elms, hornbeams, maples, alders, cherries etc.; Invasive pests and diseases of woody species; Практична настава: Symptoms of forest damaging agents; Indirect and direct measures against forest fire. Types of leaf damage; Types of bark damage; Recognition of most important biotic damaging agents of broadleaved tree species; Recognition of most important biotic damaging agents of coniferous tree species; Methods for insect population density estimation;			
Литература: Edmonds RE, Agee JK, Gara RI (2011) Forest Health and Protection. Waveland Press, Inc			
Број часова активне наставе: 60 (15x(2+2))	Теоријска настава: 30	Практична настава: 30	
Методе извођења наставе: Theoretical teaching, laboratory work, practical research under the supervision of teachers			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	писмени испит	55
практична настава	10		
колоквијум-и	15		
семинар-и	10		

Course title: Bioeconomy in Forestry			
Teacher: Ljiljana Keča , assistant: Nedeljković Jelena			
Course type: elective			
ESPB points: 5			
Condition: /			
The aim of course The main goal is to provide the necessary knowledge in the part of bioeconomy and circular economy. The special emphasis is on natural resources, especially on forests, and monitoring of dynamic changes in the bioeconomy of different regions (resulting from the effects of natural and anthropogenic factors, especially in the conditions of globalization of the world economy important for the field of forestry (especially wood) products.			
The outcome of the subject Disposing of knowledge that will enable to successfully assess elements related to bioeconomy from the point of view of economic value in forestry. Special emphasis is on the concepts related to the circular economy, the factors and the context of the development of bioeconomics: dependence on resources, endurance, properties and use with a special emphasis on forestry (from "spin-off" to mature business patterns), commercialization of forest products and creation of value chain.			
Content of the course <i>Theoretical teaching</i> 1. Introduction to the concept of bioeconomy, historical development and its trans-interdisciplinary orientation; 2. Ecoclimate regions on the Earth and vegetation (climatic zones and their arrangement on the planet); 3. Ecoclimatic zone and vegetation relationship and their relationship with bioeconomy; 4. Schedule of vegetation according to ecoclimatic bands, natural resources, schedule and structures of forest resources on Earth and their relationship to the value chain; 5. Stakeholders related to bioeconomy in forestry; 6. Primary production (sources of wood raw materials in the world, commercial types of trees by regions); 7. Production related to natural resources (economic significance of forests, forests as a source of raw material of wood, forests as sources of other types of raw materials and products) 8. Use of wood and other products from the forest, forestry as economic area, economic importance of forestry and forest; 9. Market and sustainability, bioeconomic modeling and resources related to bioeconomics (implementation of scenarios) 10. Environmental economy (ecological significance of forests) and link to bioeconomy; 11. Examples of good practice for individual countries (wood producers, regions of the largest consumption of wood and consumption patterns, individual countries - consumers of wood and other forest products); 12. Possibility for development of the concept of bioeconomy in Serbia (commercial types of trees in Serbia, contribution of forestry to the Serbian economy), examples related to PES analysis; 13. Import and export of wood and other forest products from Serbia; 14. production and consumption of wood (natural expression of production by assortments and types of trees, value expression of production by assortments and types of trees, natural expression of wood consumption, value expression of wood consumption, production balance and consumption of wood); 15. Economic growth, development and innovation (transformation through bioeconomy) and link to forestry. <i>Practical teaching</i> /			
Literature Kea, Elk., Kea N., Marčeta M. (2015): Nedrvni šumski proizvodi, Socio-ekonomski i ekološki aspekti, Univerzitet u Beogradu, Šumarski fakultet (ISBN 978-86-7299-232-8), (270) Lewandowski I. (eds.) (2017): Bioeconomy, Shaping the Transition to a Sustainable, Biobased Economy, University of Hohenheim, Stuttgart, Germany Springer, Cham, p. 2, https://doi.org/10.1007/978-3-319-68152-8_4 (358) Pešić R. (2012): Ekonomika životne sredine i prirodnih resursa, Zavod za udžbenike, Beograd (165) Ранковић Н. (1996): Економика шумарства, Шумарски факултет Универзитета у Београду, Београд Кеча Јб. (2014): Економика шумарства, Практикум са изводима из теорије и решеним задацима, Универзитет у Београду, Шумарски факултет, Планета принт, Београд (142) Leal F. W., Pociovălișteanu, D. M., de Brito, P. R. B., De Lima, I. B. (Eds.). (2018): Towards a Sustainable Bioeconomy: Principles, Challenges and Perspectives. Springer International Publishing (564).			
Number of active lectures		Theoretical classes: 2	Practical teaching: 2
Methods of teaching Lectures and independent work of students (creating and oral presentation of presentations).			
Оцена знања (максимални број поена 100)			
Pre-exam obligations:	Points	Final exam	Points
activity during lectures	15	oral exam	50
seminar(s)	35		

Course title: Applied Ecoclimatology in Silviculture			
Teacher and teaching assistant: Dr. Violeta P. Babić, associate professor; dr Vukan Lavadinović, assistant professor			
Course type: elective			
Number of ECTS: 5			
Subject aim: Introducing students to the microclimatic characteristics of forest stands and mesoclimatic characteristics of forest areas, as well as to the methods for studying mesoclimatic characteristics of forest areas and forest stands for the purpose of silviculture.			
Subject outcomes: Training students for the application of basic methods for studying the microclimatic characteristics of forest stands in order to define factors important for the development of forest trees and the application of silvicultural measures.			
Content of the subject: <i>Active (theoretical) lectures:</i> Significance and application of ecoclimatology in silviculture, defining the most important climate elements important for the functioning of forest ecosystems. Climate and water resources. Calculation of the volume of the fallen water in the forest, runoff water volume, the influence of interception on the runoff water and coefficient of the runoff water, maximum amount of precipitation, rainy periods and periods without rain, precipitation probability, precipitation regime, amplitude of annual fluctuation of monthly rainfall, precipitation density. Calculation of the amount of active temperatures for the development of plants, for vegetation period, for the beginning and the end of the vegetation period. Determining the possibility of frost, date of the first and last frost, the possible duration of the frosty period. Determination of climatic characteristics of specified area, bioclimatic classifications. Light in the forest, changes in the intensity of illumination in the free space and in the vegetation, methods for measurement of the light regime in forest associations. Mesoclimatic and microclimate conditions of forest habitats. Changes in microclimate conditions in relation to the orographic factors and relation between forest belts with microclimate. Microclimate characteristics at the edge of the forest, at the upper border of the forest, wind border. Changes of microclimate due to certain tending treatments. The influence of forest and vegetation on the climate of the area. Forest as a filter system of the ground air layer. <i>Practical lectures:</i> On concrete examples, students define the environmental conditions of forest area through the mentioned basic climate factors important for the functioning of forest ecosystems, define climate-geographical characteristics and use climate classifications, simulate specific methods for measurement of the light on examples.			
Lietarture: Babić V., Krstić M., Govedar Z., Todorčić J., Vuković N., Milošević Z. (2015): Temperature and other microclimate conditions in the oak forests on Fruška Gora (Serbia), Thermal Science, Vinča Institute of Nuclear Sciences, Belgrade, Vol. 19, Suppl. 2; Babić V. (2010): Contribution to the study of light regime in sessile oak stands on Fruška Gora. Proceedings of the International Scientific Conference: Forest ecosystems and climate changes, Belgrade, Serbia; Jarčuška, B. (2008) Methodical overview to hemispherical photography, demonstrated on an example of the software GLA. <i>Folia Oecologica</i> 35; Babić V., Galić Z.,Rakonjac LJ., Stajić S. (2011): Microclimate conditions in the stands of sessile oak on acid brown and lessive acid brown soils in Fruska Gora, International Scientific Conference: First Serbian Forestry Congress – Future with forest, Proceedings, University of Belgrade, Faculty of Forestry, November 11-13th, Belgrade, Serbia; Krstić, M., Kanjevac, B., Babić, V. (2018): Effects of extremely high temperatures on some growth parameters of sessile oak (<i>Quercus petraea</i> /Matt./Liebl.) seedlings in northeastern Serbia, Archives of Biological Sciences, Vol. 70, No. 3, pp. 521-529, Serbian Biological Society, Beograd; Milenković M., Babić V., Ducić V., Krstić M., Lazić B (2016): The water temperature trends of the Sava river in Serbia, XXIV International Conference “ Ecological Truth” EcoIst’16, University of Belgrade Technical faculty Bor, Proceedings, June 12-15th,Vrnjacka Banja, Serbia(792-798)			
Number of classes: 60 classes (30+30)	Active (theoretical) lectures: 28 classes 30-2*1 class of the field lectures = 28	Practical lectures: 32 classes -Exercises=30 classes -Field lectures 1 day*2 = 2 classes	
Teaching methods: Active (theoretical) lectures in the classroom on PowerPoint presentations; Exercises - examples about simulation of concrete measurements on examples. Practical lectures - individual work of students by creating seminary papers - practical display of climate characteristics on concrete examples, creating elaborates of practical simulation of light measurement on examples; one-day field lessons on the experimental plots around Belgrade or in the educational bases of the Faculty of Forestry.			
Rating of knowledge (maximum score 100)			
Pre-exam obligations	points	Final exam	points
activity during the lectures	5	oral exam	65
practical lectures	10		
seminary paper (elaborate)	20		

Course title: River Basin Management			
Professor/Professors: dr Vesna D. Đukić, dr Tijana Vulević, dr Nenad Marić, Katarina Lazarević			
Course type: elective			
ESPB Number: 5			
Condition:			
<p>Purpose of subject: The participants will acquire knowledge about integrated approach to river basin management and ways of protecting of surface water, groundwater and soil within basins.</p> <p>The purpose of the subject is also to inform students about proper usage of various techniques and tools such as optimisation and multicriteria analysis in river basin management</p>			
<p>The outcome of the subject:</p> <p>Good knowledge of the condition and behaviour of the natural resources of the basin and good knowledge about the strategies and policies of protecting and improving the status of natural resources of river basins including soil, surface water and groundwater resources. Students will gain knowledge of useful methods and tools for supporting river basin management and knowledge of how to use decision support techniques.</p>			
<p>Course content:</p> <p><i>Theoretical part of course</i></p> <p>Hydrological cycle and estimation of different components of water balance. Hydrological model as a tool of environmental planning and management of river basins. Review of various types of models used in different case studies. Development and applications of hydrological and hydraulic rainfall - runoff and river basin models. Application of hydrological models for estimation of the size of runoff from the basin. Application of hydraulic models for determination of water surface profiles. Sediment transport in river basins. Application of tools and concepts of Geographical Information Systems to analyze water resources in river basins. Presentation and critical analysis of the results of river basin hydrological and hydraulic models. Analysis and quantification of multiple uses of water for: agriculture, hydropower, domestic, environment and other uses. Assessment of interactions between groundwater and surface water.</p> <p><i>Practical part of the course:</i></p> <p>Application of different hydraulic and hydrological models for different case studies. Analysis of case studies for groundwater over-exploitation and pollution. Development of soil and water resource protection strategies, and their comparison and evaluation by applying multicriteria analysis and other techniques used in decision.</p>			
<p>Literature:</p> <ol style="list-style-type: none"> 1. US Army Corps of Engineers, Hydrologic Engineering Center (2009): HEC-GeoRAS GIS Tools for Support of HEC-RAS using ArcGIS, User's Manual 2. US Army Corps of Engineers, Hydrologic Engineering Center (2016): HEC-RAS User's Manual 3. US Army Corps of Engineers, Hydrologic Engineering Center (2018): Hydrologic Modeling System HEC-HMS, User's Manual 4. Đukić, V., Radić, Z. (2016) Sensitivity analysis of a Physically Based Distributed Model. Water Resources Management 30: 1669-1684. DOI 10.1007/s11269-016-1243-8. http://link.springer.com/article/10.1007/s11269-016-1243-8 5. Đukić, V., Radić, Z. (2014): GIS Based Estimation of Sediment Discharge and Areas of Soil Erosion and Deposition for the Torrential Lukovska River Catchment in Serbia, Water Resources Management 28 (13), p.4567-4581. http://link.springer.com/article/10.1007/s11269-014-0751-7 6. Vulevic, T., Dragovic, N., Kostadinov, S., Belanovic Simic, S., Milovanovic, I. (2015): Prioritization of Soil Erosion Vulnerable Areas Using Multi - Criteria Analysis Methods. Polish journal of environmental studies 24 (1), 317-323. 			
Number of hours of active classes		Theoretical part of course: 2	Practical part of the course: 2
Methods of teaching Lectures, exercises, seminar papers			
Assessment of knowledge (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
Activities during lectures	10	Written exam	25
Practical lectures	10	Oral exam	20
Tests	15		
Seminar papers	20		

Course title: Forest Mycology			
Professor: Ivan Milenković, lecturer			
Course type: elective			
ECTS: 5			
Condition: No			
Objective: This course aims to introduce students to mushrooms as organisms. To get a notion of a Kingdom that is different from plants and animals, to get acquainted with edible and toxic mushrooms, to present the metabolites of mushrooms and the possibility of using these organisms in forestry and human nutrition.			
Course outcome: Students are fully able to identify and use the most important fungi and recognise contemporary trends in the use of mushrooms as biological systems.			
Contents of the course			
<i>Theory teaching:</i>			
Students will be presented with general characteristics of mushrooms and their historical significance, as well as possibilities for future use. It will be presented the place of mycology in the living world system. Morphological characteristics will be presented with a special review of the mushroom cell, the occurrence and development of colonies, as well as ways of multiplying and colonising different substrates. The ecology of mushrooms and their spread, as well as pleomorphism, will be presented in detail. The classification will highlight the most important Phylum, classes, rows, and families, etc. In a special part, the most important representatives of different systematic categories, which occur in forest ecosystems, will be presented.			
<i>Practical classes:</i> During practical work, students will work on the general characteristics of the mushrooms kingdom. They will learn about the methods of sporulation of mushrooms, as well as preparations of artificial substrates for isolation and manipulation of mushrooms. They will study ways to sift and cultivate fungi cultures. After learning about the basic characterisation of the systematic categories, it will be possible to study the most important saprophytic, parasitic, and edible and poisonous mushrooms. Ecological characteristics that affect the occurrence and fruiting of mushrooms will be studied. Students will be introduced to the most important fungi they can find in forests and ecosystems that lean on the forest.			
Literature:			
Alexopoulos, C.J., Mims, C.W., Blackwell, M., 1996. Introductory mycology. Wiley & Sons., New York, USA, pp. 869.			
Gerrit J.K., 1998. The Complete Encyclopedia of Mushrooms. International v.b., Lisse, The Netherlands, pp.286. ISBN 90 366 1598 4.			
Aurora, D., 1986. Mushrooms Demystified. Ten Speed Press. pp. 959.			
Number of classes of active teaching	Theoretical teaching: 30	Practical teaching: 30 other forms of teaching	
Methods of teaching: Use of the most modern presentation equipment; use of microscopes, work in phytopathological laboratories (making nutrients, isolating fungi on various nutrients and identifying them).			
Knowledge rating (maximum points 100)			
Pre-exam obligations	Points	Final exam	Points
activity during lectures	10	written exam	25
practical teaching	10	oral exam	30
colloquium	10		
seminars	15		

Course title: Forest Machinery			
Наставник/наставници:			
Course type: elective			
Број ЕСПБ: 5			
Услов: Нема услова			
Циљ предмета: The main aim of the course is to increase the necessary technical knowledge of forest machinery used in technology of forestry utilization process.			
Исход предмета: On completion of this course students will know basic principles of machine functioning, classification of forestry machines, their working capacities and the other specific technical characteristic which are necessary for decision making.			
Садржај предмета: <i>Теоријска настава</i> Technical characteristics of: Modern internal combustion small petrol and diesel engines, Mechanical, hydrostatic and electric transmission, Ground based harvesting equipment: felling equipment (drive to tree and swing to tree machines; harvesters; harvester heads; cutting mechanism; boom cranes), extraction equipment (skidders and forwarders), processing equipment (de-limbers, de-barkers, chippers) and handling equipment (self-loaders, log-loaders), Cabell extraction systems (high-lead; sky line) and Site preparation equipment (mounders and disk trenchers). Specifics of forestry base machines – carriers and tractors. <i>Практична настава</i> Examples of practical tasks and calculations of: force, moment of force, simple machines (lever, inclined plane and pulley), work and power, gear kinematics, centrifugal clutch, parameters of hydraulic system components, tractor performance, tractor and forest machines stability.			
Литература: <ol style="list-style-type: none"> 1. Heisler, H.: Vehicle and engine technology, Elsevier Butterworth-Heinemann publications, Second edition, 2007. 2. MacDonald, A. J. Harvesting systems and equipment in British Columbia, FERIC handbook, ISSN 0701-8355 3. Shigley J. E, Uicker J. J, Theory of Machines and Mechanisms, International Student Edition, McGRAW-HILL International Book Company, 1980, ISBN 0-07-056884-7. 4. Ćuprić, N., Bajić, V.: Cut-to-Length machines, (key note paper) XIX International Conference on Material Handling, Constructions and Logistics, Faculty of Mechanical Engineering, University of Belgrade, 2009, pp. 109-118. 5. Mitrović, B., Ćuprić, N., Danilović, M.: Skyline systems for wood extraction and possibility of application in forest utilization in Serbia, XX International Conference on Material Handling, Constructions and Logistics, Faculty of Mechanical Engineering, University of Belgrade, 2012, pp. 185-190. 6. Dedić, A., Stanojević, M., Ćuprić, N.: Selection of wood-chipper for logging residue woodchip production from wood waste after timber harvest, XX International Conference on Material Handling, Constructions and Logistics, Faculty of Mechanical Engineering, University of Belgrade, 2012, pp. 191-194. 7. Ћупрић, Н.: Механизација у шумарству, практикум са изводима из теорије и решеним задацима, Универзитет у Београду, Шумарски факултет, 2014. 			
Број часова активне наставе: 4 Теоријска настава: 2 Практична настава: 2			
Методе извођења наставе: Lectures, video presentations, video animations and examples for solving practical tasks.			
Оцена знања (максимални број поена 100)			
Предиспитне обавезе:	поена	Завршни испит:	поена
активност у току предавања	10	писмени испит	40
семинар-и	30		
колоквијум-и	20		

Course title: Forest Management Planning			
Teacher(s): Dr Nenad Petrovic, Dr Biljana Šljukić,			
Course type: elective			
Number of ECTS credits: 5			
Conditions: No conditions			
Subject goal A forest management plan outlines owner's vision for their forest, describes the current forest condition, and outlines a plan of action to achieve owner's management goals. Forests owner's goals have to be adapt to changing environmental conditions in order to remain stable and retain the vitality to continuously provide multiple ecosystem goods and services such as biodiversity, wood products, landscape protection and carbon sequestration potential. Adaptive forest management aims to preserve and develop the functionality of forests as a prerequisite for fulfilling the future need for forest ecosystem services. Forest management play important role in long-term planning of resilient tree species and their management strategies that can provide in future all ecosystem goods and services in change climate scenarios.			
Outcome of the subject Students after they pass this course should understand different climate scenarios, be able to propose adequate forest management plans in changed climate scenarios. They should be able to prepare list of activities to achieve owner's forest management objectives. They should incorporate concept of close to nature forest management in owner objectives and be able to create adequate monitoring mechanism in changed environmental conditions.			
Subject content <i>Theory</i> Students should be informed about new climate scenarios and actual climate change international policy initiative (COP 21...). Students should be informed about role of forest and forestry in mitigation and adaptation impact to the climate change. It should be presented concept of close to nature forest management and instruments for their implementation into practical forest management. Students should get overview about guidelines and instruction for forest management planning from several selected European countries. <i>Practical learning</i> Students should be able to prepare forest management plan for small scale forest lot taking in consideration close to nature forest management approach. They should prepare plan based on owners objectives. They should be able to assess proper tree species and propose adequate forest management strategy that should be integral part of the new plan. Students will be divided into small group and at the end of their tasks they should present their plan with critically overview of other groups			
Literature 1. John Houghton, Global Warming: The Complete Briefing, 5th Edition, 2015, Cambridge Univ. Press. 2. The US National Climate Assessment (nca2014.globalchange.gov/), 3. http://www.fao.org/3/i1960e/i1960e00.pdf 4. https://www.researchgate.net/publication/235427552_Close-to_Nature_Forest_Management_in_Europe_Does_It_Support_Complexity_and_Adaptability_of_Forest_Ecosystems 5. https://www.intechopen.com/books/sustainable-forest-management-current-research/sustainable-forestry-through-close-to-nature-management			
Number of active teaching classes 2+2		Theoretical teaching: 2	Practical teaching: 2
Method of carrying out the teaching Oral presentation, video presentations, group work in the classroom and in the forest			
Evaluation of knowledge (maximum number of points 100)			
Pre-exam obligations	Points	Final exam	Points
Activity during lectures	10	Oral exam	50
Practical teaching	20		
Seminar(s)	20		

Course title: Decision Making in Soil and Water Resources			
Professor: dr Tijana Vulević, lecturer			
Course type: elective			
ECTS: 5			
Condition:			
Purpose of subject: The aim of the subject is to give knowledge of methods for successful protection of land and water resources in river basin. The course is focused on the developing competence in the formulation of decision making problems related to the soil and water resources protection and implementation of different tools and methods such as multi-criteria decision analysis.			
The outcome of the subject: Students will acquire the skills necessary for proper formulation of decision making problems related to the soil and water resource protection. They will gain knowledge of process, phases and methods handling multi-criteria decision making problems.			
Course contents: <i>Theoretical part of course</i> Analysis of decision-making problems, decision-making process and phases, types of decisions, decision-making models and methods, methods and techniques selection, decision-making in the protection of soil and water resources; Analysis of decision-making: basics of decision making, decision-making without sampling, analysis of decision-making with sampling; Utility theory: single-attribute and multi-attribute utility theory; Multi-criteria decision analysis: basics of Multi-criteria decision analysis, Multi-attribute decision making, Multi-objective decision making, Multi criteria decision analysis methods, Analytic hierarchy process method (AHP), ELECTRE, PROMETHEE method. <i>Practical part of the course:</i> Application of multi-criteria decision analysis methods for soil and water resource protection. Application of AHP method, application of ELECTREE method, Application of PROMETHEE method.			
Literature: <ol style="list-style-type: none"> 1. Tzeng, G-H., Huang, J-J. (2011): Multiple Attribute Decision Making, Methods and Applications. CRC Press, Taylor & Francis Group, Boca Raton, London, New York. 2. Belton, V., Stewart, T.J. (2001): Multiple Criteria Decision Analysis: An Integrated Approach, Kluwer Academic Publishers. 3. Vulevic, T., Dragovic, N., Kostadinov, S., Belanovic Simic, S., Milovanovic, I. (2015): Prioritization of Soil Erosion Vulnerable Areas Using Multi-Criteria Analysis Methods. Polish journal of environmental studies 24 (1), 317-323 4. Dragovic, N. Vulevic, T. (2015): Wahl des besten Angebots zur projektplanung im bereich der wasserwirtschaft mittels der AHP-Methode, Bauingenieur, 90 (09), 420-426. 			
Number of hours of active classes		Lectures: 2	Exercises: 2
Methods of teaching Lectures, exercises, seminar papers			
Assessment of knowledge (maximum number of poens 100)			
Предиспитне обавезе	поена	Завршни испит	поена
активност у току предавања	5	усмени испит	45
практична настава	20		
колоквијум-и	15		
семинар-и	15		

Course title: Professional Practice			
Teacher/teachers: Teachers and assistants on study course			
Course type: required			
ECTS number: 5			
Condition: required			
Goal of the subject: Acquiring of practical knowledge and skills in area of forestry and natural resources management, in the aim that students got practical experience and competence to work in practice.			
Result of the subject Students acquire practical knowledge from area of forestry and natural resources management on the basis of the sustainable development. Students join previously adopted theories and skills with their own practical exprience acquired through practical work necessary for work in practice equivalent to master academic studies.			
Content of the subject Active students involvement in all phases of productional, technical-organisational and working practice.			
References:			
Number of active teaching lessons:		Theoretical part of teaching:	Practical part of teaching:
Teaching methods: Professional practice is conducted as a block teaching in following divisions of Forestry faculty: teaching bases, laboratories, production capacities; than in institutions, organizations and companies with whom Forestry faculty signed contracts (in Serbia and abroad), and professional national and international field trips. Students are obliged to make diary of professional practice.			
Knowledge evaluation (max 100 points)			
Pre-exam obligations:	points	Final exam:	points
diary of professional practice	60	defense of diary of professional practice	40

Course title: Master Thesis Subject			
Teacher/teachers: All teachers on study course			
Course type: required			
ECTS number: 25			
Conditions: passed all exams required by study plan of the course and approved title of master thesis by the Scientific-teaching Council of the Faculty of Forestry, as anticipated by the Rule book about producing of master thesis.			
Goal of the subject: Qualifying of students to appropriately depicts relevant data on the basis of collected literature and conducted research, as well as to explain the importance of research conducted through research work.			
Result of the subject By producing master thesis, students individually and creatively apply theoretical and practical knowledge acquired during studies as well as using scientific and professional literature.			
Content of the subject Based on conducted research (collecting of data) students prepare master thesis in form that contains following chapters: Title, Content, Abstract with key words in English and Serbian language, Introduction, Working task and aim of research, Description of applied methodological treatment, Description of research object, Theoretical part and experimental part, Results of research and Discussion, Conclusion, Summary in Serbian language (up to 3 pages), References and Appendices.			
References:			
Number of active teaching lessons:		Theoretical part of teaching:	Practical part of teaching: 20
Teaching methods: Consultations with mentors and members of commission			
Knowledge evaluation (max 100 points)			
Pre-exam obligations:	points	Final exam:	points
evaluation of thesis structure	50	evaluation of technique of thesis making	50

Course title: Master Thesis			
Teacher/teachers: All teachers on study course			
Course type: required			
ECTS number: 10			
Condition: passed all exams required by study plan of the course and approved title of master thesis by the Scientific-teaching Council of the Faculty of Forestry, as anticipated by the Rule book about producing of master thesis.			
Goal of the subject: Goal of master thesis is the final verification of students for solving the problems from various fields of forestry. Master thesis is designed as students individual research work in chosen field within study course. During production of master thesis, students capability to judge, observe, analyze and solve problems dealing with the broadest concept of forestry and natural resources management, has been checked and evaluated, which is the closest correlation with education during basic academic studies.			
Result of the subject By producing of master thesis, students acquire knowledge, as well as subject-specific qualifications in function of quality finishing the reseach tasks, proffesional and scientific achievements in the area of foresty and natural resources management. On the basis of defined goals, expected outcomes are selection and solution appliance, based on scientific-research approach and knowledge of natural, biological-ecological and technical sciences in the area of forestry, as well as natural resources connected to them.			
Content of the subject Master thesis is students research work where they get to know with research methodology in the area of forestry and natural resources management. By producing of master thesis, student has a task to synthetize theoretical, research and applicative aspect of chosen topic. The complexity of subject and content of work should respond to level and set goals of master thesis, and thesis should be in the frame of the study program. After finished research (collecting of data) students prepare master thesis in form which contains the following chapters: Title, Content, Abstract and key words in English and Serbian language, Introduction, Aim and content of research, Description of applied methodological treatment, Description of research object, Theoretical and experimental part, Results and discussion, Conclusion, References and Appendices. Master thesis should be incorporated and realized within appropriate scientific and development projects.			
References:			
Number of active teaching lessons:		Theoretical part of teaching:	Practical part of teaching:
Teaching methods Student conducts theoretical, practical and scientific research under supervision of mentor. Students apply appropriate methods in producing of master thesis (applied mathematical-statistical methods and models from area of ecology, biometric, economic, normative and standardization), depending on thesis topic. Master thesis topic is determined in consultation with subject teachers and students announce in accordance to Statute and rulebooks of the Faculty. After finished research, students systematize results and produce written thesis. Defense of thesis is public, in oral way, with appropriate presentation.			
Knowledge evaluation (max 100 points)			
Pre-exam obligations:	points	Final exam:	points
evaluation of quality of thesis content (evaluation of research and results, offered problem solution, conclusions etc.)	60	evaluation of defended thesis and presentation	30
evaluation of written thesis (quality of text, annexes etc.)	10		