



SVEUČILIŠTE U ZAGREBU, FAKULTET ŠUMARSTVA I DRVNE TEHNOLOGIJE
UNIVERSITY OF ZAGREB, FACULTY OF FORESTRY AND WOOD TECHNOLOGY

Graduate Study Urban Forestry, Nature Conservation and Environmental Protection

Syllabus

from Acad. Year 2022/23



LIST OF COMPULSORY AND ELECTIVE COURSES WITH CLASS HOURS
AND ECTS CREDITS

Year of study: I							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Soil Management	Prof. Nikola Pernar, PhD Prof. Darko Bakšić, PhD Assist. Prof. Ivan Perković, PhD	45	15	8		6	Compulsory
Computer modeling of landscape architecture	Assoc. Prof. Hrvoje Nevečerel, PhD Assist. Prof. Kruno Lepoglavec, PhD	15	30	8		6	Compulsory
Phytopharmacy in Urban Areas	Prof. Danko Diminić, PhD doc.dr.sc Jelena Kranjec Orlović	30	30	8		6	Compulsory
Water management and protection	Prof. Ivica Tikvić, PhD Assoc. Prof. Damir Ugarković, PhD	30	15	8		6	Compulsory
Succession and monitoring of vegetation	Assist. Prof. Irena Šapić, PhD	30	0	0		2	Elective
Applied photointerpretation	Prof. Renata Pernar, PhD Assist. Prof. Jelena Kolić, PhD	15	15	0		2	Elective
Laboratory Methods in Phytopathology	Prof. Danko Diminić, PhD	15	15	0		2	Elective
Applied Zoocology	Assist. Prof. Marko Vucelja, PhD	30	0	0		2	Elective
Breeding of Woody Plants	Prof. Saša Bogdan, PhD Assist. Prof. Ida Katičić Bogdan, PhD	30	0	0		2	Elective
Birds of Urban Forests and Parks	Assist. Prof. Kristijan Tomljanović, PhD	30	0	0		2	Elective
Animal behavior	Assist. Prof. Marko Vucelja, PhD	30	0	0		2	Elective
Innovation and entrepreneurship	Prof. Mario Šporčić, PhD Assist. Prof. Matija Landekić, PhD	30	0	0		2	Elective
Inventory of greenhouse gases in forestry	Assist. Prof. Mislav Vedriš, PhD	15	15	0		2	Elective
Plant nutrition in urban environment	Assist. Prof. Krunoslav Sever, PhD	30	0	0		2	Elective
Game Management	Prof. Krešimir Krapinec, PhD Assist. Prof. Kristijan Tomljanović, PhD	15	15	0		2	Elective
In total							



Year of study: I							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Horticultural Dendrology	Prof. Marilena Idžoić, PhD Assist. Prof. Igor Poljak, PhD	30	15	24		6	Compulsory
Environmentally sound techniques and technologies	Prof. Tomislav Poršinsky, PhD Prof. Marijan Šušnjar, PhD Assist. Prof. Kruno Lepoglavec, PhD Assoc. Prof. Hrvoje Nevečerel, PhD Assist. Prof. Andreja Đuka, PhD	30	30	24		6	Compulsory
Knowledge of vegetation	Prof. Dario Baričević, PhD Assist. Prof. Irena Šapić, PhD	30	15	16		6	Compulsory
Nursery production of ornamental plants	Assoc. Prof. Damir Drvodelić, PhD Assist. Prof. Vinko Paulić, PhD	30	15	16		6	Compulsory
Forest Mycorrhizae	Prof. Danko Diminić, PhD doc.dr.sc. Jelena Kranjec Orlović	30	0	0		2	Elective
Waste management	Prof. Damir Barčić, PhD	30	0	0		2	Elective
Zoonoses in natural habitats and urban areas	Assist. Prof. Marko Vucelja, PhD	30	0	0		2	Elective
Typological classifications of vegetation	Assist. Prof. Irena Šapić, PhD	30	0	0		2	Elective
Invasive plants	Prof. Željko Škvorc, PhD Prof. Božena Mitić, PhD	15	15	0		2	Elective
Analysis of management plans of park objects	Prof. Jura Čavlović, PhD Assist. Prof. Krunoslav Teslak, PhD	15	15	0		2	Elective
Multipurpose trails in urban and protected areas	Assoc. Prof. Hrvoje Nevečerel, PhD Assist. Prof. Kruno Lepoglavec, PhD	15	15	0		2	Elective
Environmental Chemistry	Assoc. Prof. Vibor Roje, PhD	30	0	0		2	Elective
Selection and use of ornamental trees and shrubs in the landscape design	Prof. Marilena Idžoić, PhD Assist. Prof. Igor Poljak, PhD	30	0	0		2	Elective
Rare and protected autochthonous woody plants	Assist. Prof. Igor Poljak, PhD Prof. Marilena Idžoić, PhD	15	15	0		2	Elective



Collection and processing of 3D data	Prof. Ante Seletković, PhD Prof. Renata Pernar, PhD	30	0	0		2	Elective
In total							

Year of study: II							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Remediation of degraded land	Prof. Nikola Pernar, PhD Academic Igor Anić Academic Goran Durn	30	15	16		5	Compulsory
Spatial analysis and valorisation	Prof. Renata Pernar, PhD Prof. Ante Seletković, PhD Assist. Prof. Jelena Kolić, PhD	30	15	0		4	Compulsory
Ecotourism	Prof. Stjepan Posavec, PhD Assist. Prof. Karlo Beljan, PhD	30	15	8		4	Compulsory
Statistical methods and modelling in forestry	Prof. Anamarija Jazbec, PhD	15	30	0		4	Compulsory
Conservation of genetic diversity of forest trees	Prof. Saša Bogdan, PhD Assist. Prof. Ida Katičić Bogdan, PhD	30	30	16		5	Compulsory
Preparation and management of ecological projects	Prof. Ivan Martinić, PhD	15	15	0		2	Elective
Protected nature parts	Prof. Željko Španjol, PhD Assoc. Prof. Daniel Krstonošić, PhD	30	0	0		2	Elective
Virgin forests and forest reserves	Academic Igor Anić Assoc. Prof. Stjepan Mikac	30	0	0		2	Elective
Organizational culture	Prof. Mario Šporčić, PhD Assist. Prof. Matija Landekić, PhD	30	0	0		2	Elective
Utilization of forest biomass	Assist. Prof. Dinko Vusić, PhD	15	15	0		2	Elective
Mobile applications in forestry	Assist. Prof. Kruno Lepoglavec, PhD Assoc. Prof. Hrvoje Nevečeral, PhD	15	15	0		2	Elective
Species distribution models	Assist. Prof. Martina Temunović, PhD	15	15	0		2	Elective
Safety and organization of work in urban and protected forests	Assist. Prof. Matija Landekić, PhD Prof. Mario Šporčić, PhD	15	15	0		2	Elective
Forest roads in protected areas	Prof. Tibor Pentek, PhD doc.dr.sc. Ivica Papa	15	15	0		2	Elective



Tree sanitation and conservation	Assist. Prof. Vinko Paulić, PhD	15	15	0		2	Elective
In total							

Year of study: II							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Integrated Forest Protection in Protected Areas	Prof. Danko Diminić, PhD Prof. Boris Hrašovec, PhD Assist. Prof. Marko Vucelja, PhD	30	15	16		4	Compulsory
Ecological Monitoring	Prof. Ivica Tikvić, PhD Assoc. Prof. Damir Ugarković, PhD	15	30	16		4	Compulsory
Master thesis						20	Compulsory
Professional practice						4	Compulsory
In total							

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Nikola Pernar, PhD Prof. Darko Bakšić, PhD Assist. Prof. Ivan Perković, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Soil Management	1.8. Number of hours in semester (L+E+F+e-learning)	45+15+8
1.3. Course code	225968	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1	1.12. Possibility of instruction in English	NO



2. COURSE DESCRIPTION	
2.1. Course objectives	The aim is to provide a student the complete picture of soil roles in the terrestrial ecosystem, about characteristics of different soil types, soil valorization in the management of terrestrial ecosystem, on sources and possibilities of soil degradation, on methods of improving soil properties and on methods of prevention of soil degradation processes.
2.2. Enrolment requirements and/or entry competences required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide</p> <p>B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection</p> <p>B7. organise and manage professional works on the soil and water management and protection</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p> <p>B11. apply knowledge related to ecologically friendly techniques and technologies of forestry works used in urban areas and protected natural areas</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p> <p>D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection</p>
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Analyze soil functions. Critically evaluate the functions of soil. Identify the importance of soil in forestry and environmental protection.</p> <p>2. Soil classification system. Comparative the soil to the national and WRB classification system. Comparative the properties of different type of soils. Evaluate the soil properties essential to the fertility. Evaluate the soil properties crucial for the sensitivity to harmful influences</p> <p>3. Soil geography. Present the method to make soil map. Presentation the application of soil maps. Soil map using.</p> <p>4. Explain the diversity of soil functions and his position in terrestrial ecosystem management.</p> <p>5. Evaluate a different soil type within the soil quality system. Selecting the methods to increase soil fertility. Selecting the methods for meliorating chemical and physical soil properties.</p> <p>6. Compare the geogenic and limit of harmful values in the soil. Valorization of soil considering with his degradation. Review harmful effects on soil (managment influenes, influence of forest fire on the soil, multipurpose uses of forest land, conversion of forest land) and present measures for its protection.</p> <p>7. Organize soil monitoring of forest ecosystems. Compare the state of soil protection at a global, regional and national level. The implementation and regulations on the soil protection.</p>
2.5. Course content (syllabus)	<p>Lectures:</p> <p>1. The functions and importance of soil in the terrestrial ecosystems.</p> <p>2. Soil classification system. History of development and principles of soil classification. Soil classification in Croatia. American Soil Classification. WRB soil classification.</p> <p>3. Automorphic soil. Physiographic and ecological-management characteristic of undeveloped and humus-accumulation soils.</p> <p>4. Physiographic and ecological-management characteristic of cambic, eluvial-illuvial, anthropogenic and technogenic soils.</p> <p>5. Hydromorphic soils; Physiographic and ecologicalmanagement characteristics of pseudogley, fluvial, fluvial-humus and gley soils.</p>



	<p>6. Physiographic and ecological management characteristics of peats and anthropogenic hydromorphic soils. Physiographic and ecological management characteristics of halomorphic and subaquatic soils.</p> <p>7. Soil geography. Pedon and elementary soil areal. Soil mapping. Pedogeographic features of Croatia. Pedogeographic units of Croatian forest ecosystems. Soil zonation on Earth.</p> <p>8. Soil in terrestrial ecosystems management. Soil in spatial planning. Forest soil management. Soil for agricultural production. Soil in landscaping, sports and recreational areas.</p> <p>9. The productivity of forest soils and land. The rating of soils and land.</p> <p>10. Increasing land productivity – soil treatment and water regime</p> <p>11. Increasing land productivity – meliorating of chemical soil properties; Fertilization – soil fertilizers and soil improvers.</p> <p>12. Soil degradation and protection measures – Anthropogenic soil erosion - introduction.</p> <p>13. Soil degradation and protection measures – Gravitational erosion, erosion by water, aeolian soil erosion and harvesting soil erosion.</p> <p>14. Soil degradation and protection measures – Degradation of chemical soil properties.</p> <p>15. Soil degradation and protection measures – Soil compaction. Fire influence on soil. Soil protection and regulations. Soil monitoring.</p> <p>Laboratory exercises:</p> <p>1. Determination of the particle size distribution in mineral soil material (according to ISO 11277)</p> <p>2. Determination of stability of soil micro-aggregates (according to Škorić, 1982)</p> <p>3. Determination of liquid limit, plastic limit and plasticity index of soil (according to ASTM D4318-10, 2010)</p> <p>4. Determination of organic and total carbon (according to ISO 10694, 1995) and total nitrogen (according to ISO 13878, 1998) by dry combustion</p> <p>5. Determination of effective cation exchange capacity and base saturation level using barium chloride solution (according to ISO 11260)</p> <p>6. Extraction of trace elements soluble in aqua regia (according to ISO 11466, 1995)</p> <p>7. Determination of macro- and micronutrients in soil by Mehlich-3 method.</p> <p>8. Determination of the water-retention characteristic (according to ISO 11274, 1998)</p> <p>9. Determination of the water permeability</p> <p>Field work:</p> <p>1. Characteristic soil associations and their properties in integrated area management (eg forest administrations, management units, catchment area, protection of natural resources etc.)</p>								
	2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		



2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.		
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and fieldwork, preparation and presentation of seminar work (compensation for, for example, absence from exercises). Taking the exam in the form of a partial and / or complete exam.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Pernar, N., 2017: Tlo; nastanak, značajke, gospodarenje. Sveučilište u Zagrebu, Šumarski fakultet, 799 p.	YES	
	Pernar, N., D. Bakšić, I. Perković, 2013: Terenska i laboratorijska istraživanja tla. Sveučilište u Zagrebu, Šumarski fakultet, 192 p.	YES	
2.12. Optional literature	1. Mesić, H., D. Bakšić, F. Bašić, A. Čidić, G. Durn, S. Husnjak, I. Kisić, D. Klaić, B. Komesarović, M. Mesić et al., 2008. 2. Program trajnog motrenja tala Hrvatske (priručnik). Agencija za zaštitu okoliša, Zagreb, 135 p.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Hrvoje Nevečerec, PhD Assist. Prof. Kruno Lepoglavec, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Computer modeling of landscape architecture	1.8. Number of hours in semester (L+E+F+e-learning)	15+30+8
1.3. Course code	98209	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	To acquire an overview of contemporary concepts in computer landscape modeling. To obtain skills and experience in using current software solutions for landscape modeling. To gain an understanding of the computer methods on offer in all phases of the design process from production of technical documentation, through visualization, to the presentation of the project.		
2.2. Enrolment requirements and/or entry competences required for the course	-		



<p>2.3. Learning outcomes at the level of the programme to which the course contributes</p>	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B5. apply knowledge related to horticultural dendrology and recommend and choose tree species in urban areas B14. develop current technologies as well as implement new technologies</p>
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<p>1. Analyze information technologies and tools for Urban design (systematization of IT and software technologies, expectations of application development and IT equipment, impact on the design of the built environment, data exchange, organization of professional work, geographic information systems, data collection and management). 2. Present the development of computer graphics for computer landscape modeling and visualization of the environment (computer visualization, scene elements, criteria for selecting display modes, landscape visualization, simulations, creation of virtual worlds, scientific visualization). 3. Formulate digital production (subjective and additive production technologies, application of technologies). 4. Present a responsible environment (development of the idea of a computer as a consultant, review of technologies, collection and processing of information from the environment).</p>
<p>2.5. Course content (syllabus)</p>	<p>Lectures: 1. Post-industrial society, modern urban development, the impact of ICT technologies on urban development, the development of digital technologies, the impact on human development, the projection of social change due to technological development (1 hour). 2. Development of information technologies, definitions, explanation of modern concepts, systematization of software tools on operating systems, development tools, service and application programs, development of expectations and application of IT equipment, influence on the design of the built environment (2 hours). 3. Systematization of concepts, CAD, BIM, development of 2D and 3D models, 4D and 5D modeling, data exchange, organization of professional work, Geographic Information Systems, data collection and management. Field data collection (4 hours). 4. Development of human perception, computer visualization, scene elements, shading algorithms, photo-realistic display algorithms, animation, QTVR, real-time animation, augmented reality virtual reality, display mode selection criteria, landscape visualization (2 hours). 5. Review of the development of computer graphics in the field of art, science and technology, technology (raster, vector, video, interactive, animation, games), simulations, creation of virtual worlds, development of new artistic sensibility, scientific visualization (2 hours). 6. Computer model and digital production; Development of digital production technologies; Substrate and additive production technologies; Development of personal production (desktop 3D printing); 3D printing materials (2 hours). 7. Development of the idea of a computer as a consultant, review of technologies, definition of terms, interactive multimedia, WWW, development of the Internet, social networks, Big Data, basic concepts, review of data, state of development of BD, artificial intelligence, development and basic concepts, knowledge bases, problems systematization of knowledge (range in problem solving approach, heuristic procedure, mechanisms of rules and constraints), technologies (expert systems and neural networks), deep learning examples, further development, impact on urban design (smart and sustainable cities) (2 hours).</p> <p>Exercises: 1. Spatial data and application of software tools for their processing (work with GIS tools) (2 hours). 2. Preparation of input data. Working with landscape modeling tools in the landscape. Working with tools for modeling vegetation in the landscape. Development of a computer model of the subject location (work with GIS tools) (2 hours). 3. Modern technologies and their possibilities of application in the design of park spaces in urban units (2 hours).</p>



	<p>4. Computer mapping and documentation (working with GIS tools) (2 hours). 5. Field data processing with raster data conversion and vice versa (vectorization and rasterization) (work with GIS tools) (2 hours). 6. Application of space design software tools (work with Landscape tools) (2 hours). 7. Data processing and work with 2D computer graphics (2D raster and vector graphics) (work with GIS and CAD tools) (6 hours). 8. 2D basics of CAD tools for the needs of technical drawing on a computer (work with CAD tools) (2 hours). 9. 3D creation of a conceptual solution on the example of a landscape project (work with Landscape tools) (6 hours). 10. Basics of landscape visualization and computer representations. Landscape visualization tools. Visualization of landscape components (terrain and water surfaces, cover and vegetation). Making computer displays (visualizations) of the subject location (working with Landscape tools) (4 hours).</p> <p>Field work: 1 day (8 hours) - Consideration of spatial factors. Use of recording and mapping devices in the field. Checking the computer model of landscape components in the field.</p>							
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES
	Experimental work		NO	Report		NO	(other)	
	Essay		NO	Seminar paper	YES		(other)	
	Preliminary exam	YES		Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking two colloquia with a minimum of 60% correct answers, taking an exam with a minimum of 60% correct answers on the written part of the exam and the oral part of the exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Lectures in Computer modeling of landscape architecture in .pptx and .pdf format			NO		YES, Merlin		
	Brian Davis, Jamie Vanucchi, 2014: Urban Forests as Landscape Artifacts. SCENARIO 04: Building the Urban Forest			NO		YES, Merlin https://scenariojournal.com/article/urban-forests-as-landscape-artifacts/		
Urban Forests and Trees 2005: selected chapters in the book.			NO		YES, Merlin			
2.12. Optional literature	1. Rebecca M., 2018: How to Bring Great Landscaping to Your Home. https://groomandstyle.com/how-to-bring-great-landscaping-home/							



	<p>2. 3D Nature: „Visual Nature Studio/World Creation Set“, korisničke upute, 3D Nature, 2003/2004</p> <p>3. Brail, K.R.:“Planning Support Systems: Integrating Geographic Information Systems, Models, and Visualization Tools“, ESRI, 2001, ISBN 1-58948-011-2</p> <p>4. Desimini J., 2014: To Multiply or Subdivide: Futures of a Modern Urban Woodland. SCENARIO 04: Building the Urban Forest</p> <p>5. Vdović, R., 2000: „Digitalni krajolik – elementi vizualizacije“, magistarski rad, Arhitektonski fakultet</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Danko Diminić, PhD Valentina Lovrić, mag. ing. silv.	1.7. Number of ECTS credits	6
1.2. Course title	Phytopharmacy in Urban Areas	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+8
1.3. Course code	33839	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire basic knowledge in the field of phytopharmacy, protective measures of urban trees and shrubs using various chemical preparations, with an emphasis on environmentally friendly. Furthermore, students acquire practical knowledge and skills in manipulating chemical preparations and the means of their application.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B9. Implement integrated protection of woody species in urban areas and in protected nature objects.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Present legal regulations and basic concepts in phytopharmacy (plant protection products, legal regulations, product registration, general instructions for marketing and application of plant protection products) (active substance, concentration, dose, phytotoxicity).</p> <p>2. Valorize various plant protection products - zoocides, group of biotechnical insecticides, fungicides, herbicides (chemical, biotechnical, biological insecticides, acaricides, limacids, rodenticides, corvifuges, attractants, pheromones,</p>		



	<p>monitoring and control of pheromone pests, repellent, insect development regulators, fungicide division, plant and seed treatment agents, herbicide division (based on mechanism of action, chemical affiliation, according to time and method of application).</p> <p>3. Present endotherapeutic methods of tree protection in urban areas (macro and micro injection method - efficiency, advantages and disadvantages, method of using BITE Tool - efficiency, advantages and disadvantages).</p> <p>4. Recommend ecologically acceptable plant protection measures against pests (ecologically acceptable plant protection measures, possibilities and restrictions of application, quarantine, mechanical, physical, biological measures).</p> <p>5. Present instructions for safe handling and transport of pesticides, and emergency measures in case of pesticide contamination (instructions for safe handling and transport of pesticides, measures for safe handling of pesticides, storage, instructions for basic emergency measures for people contaminated with pesticides).</p>
<p>2.5. Course content (syllabus)</p>	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Consumption of plant protection products in the world and in Croatia. Importance / need for plant protection; plant protection measures. 2. Plant protection products: legal regulations; asset registration; general instructions for marketing and application of plant protection products (active substance, concentration, dose, phytotoxicity). Toxicity of plant protection products. Division of plant protection products by toxicity groups. 3. Introduction: insecticides. Plant treatment products. Group (s) chemical insecticides: chlorinated hydrocarbons, organophosphorus insecticides (non-systemic, systemic), carbamates, synthetic pyrethroids, neonicotinoids. Group (ii) biotechnical insecticides (general). Group (iii) biological insecticides. 4. Attractants: food attractants; sexual attractants. 5. Aggregation pheromones. Repellents (biotechnical insecticides / zoocides). Phagorepelents - antifiding plant protection products. Combining methods with attractants. Insect development regulators: chitin formation inhibitors; juvenile hormones; anti-juvenile hormones. 6. Introduction: fungicides. Classification of fungicides according to: chemical composition; mode of action; place of application. 7. Plant treatment products. Inorganic fungicides (according to chemical composition): based on copper; sulfur-based. Organic fungicides (according to chemical composition). 8. Herbicides. Division of herbicides based on mechanism of action. Classification of herbicides based on chemical affiliation. Division of herbicides according to time and method of application. 9. Endotherapeutic methods of tree protection in urban areas. Macro and micro injection method. Method of using the BITE Tool. 10. Ecologically acceptable plant protection measures. Quarantine measures. Mechanical measures. Physical measures. Biological measures; biopesticides. <p>Exercises:</p> <ol style="list-style-type: none"> 1. Plant protection products and their application; instructions for marketing and application of funds. Formulation of plant protection products; application of plant protection products; methods and devices for application of plant protection products; calculations of doses and concentrations in the application of plant protection products. 2. Examples of the use of pest control measures (defoliators) of trees in urban areas with insecticidal preparations. 3. Preparation and method of using aggregation and sexual pheromones with examples of traps for monitoring and pest control. 4. Examples of the use of measures to control diseases of needles and tree leaves in urban areas with fungicidal preparations. 5. Preparation, method and use of the BITE Tool method. 6. Preparation, manner and use of mechanical (mechanical capture of pests, mechanical obstacles) and physical measures (paints and visual attractants and repellents, adhesives). 7. Precautions; protection when working with plant protection products.



	<p>Field work:</p> <p>1. Preparation and application of precautionary and protective measures when working with plant protection products. Preparation of plant protection products on the example of outdoor insecticide application (in the nursery), calculations of required doses and concentrations.</p> <p>2. Methods and devices for application of plant protection products: back sprayer (spray method) and back atomizer (hot fogging method).</p> <p>3. Setting and control of aggregation and sexual pheromones with examples of traps for monitoring and pest control.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and fieldwork. Taking colloquia and exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Maceljski, M., 1992: Metode i aparati za primjenu pesticida. Sveučilište u Zagrebu, Agronomski fakultet, Zagreb.			YES					
	Cvjetković, J. Igrc Barčić i Z. Ostojić, 1997: Priručnik iz zaštite bilja, Zavod za zaštitu bilja u poljoprivredi i šumarstvu RH, Tiskara MD, Zagreb, 187 str.			YES					
	Glavaš, M., 2004: sredstva za zaštitu bilja u šumarstvu. Zavod za zaštitu šuma i lovstvo, interna skripta, 54 str.						2nd level of application of e-learning		
	Diminić, D., 2013-2020: Fitofarmacija u urbanim područjima (prezentacije svih predavanja u PDF formatu).						2nd level of application of e-learning		
	Kolar, A. & D. Diminić, 2020: Učinkovitost endoterapije u suzbijanju bolesti i štetnika ((Phytopharmacy in urban areas - presentations of lectures in PDF).						2nd level of application of e-learning		
2.12. Optional literature	<p>1. Igrc-Barčić, J. & M. Maceljski, 2001: Ekološki prihvatljiva zaštita bilja od štetnika. Zrinski d.d., Čakovec, 247 str.</p> <p>2. Montecchio, L., 2013: A Venturi Effect Can Help Cure Our Trees. J. Vis. Exp. (80), e51199 http://www.jove.com/video/51199 http://dx.doi.org/10.3791/51199</p>								



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivica Tikvić, PhD Assoc. Prof. Damir Ugarković, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Water management and protection	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+8
1.3. Course code	225970	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduction to forest hydrology, water resources in Croatia, water management, water condition in forest ecosystems, lowland forest hydrology, mountain forest hydrology, Mediterranean and sub-Mediterranean forest hydrology and water protection regulations. To learn the methods of mitigating hydrological problems in forests, the method of ecological irrigation of forest trees, methods of protection from water in forests and methods of improving non-market forest functions and forest ecosystems services related to water.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B7. organise and manage professional works on the soil and water management and protection B9. organise and manage integrated protection of plants and trees in urban areas and protected natural areas B10. prepare ecological studies and forestry parts of spatial plans B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Interpret the hydrology of forests (processes of water circulation in the biosphere, the relationship of organisms in forests and water, water problems in forest ecosystems, water as an ecological factor, hydrological processes in forest ecosystems, ecological status of water in forest trees, use of water for transpiration, drought - ecological drought, physiological drought) 2. Determine water resources and water areas in Croatia (division of water resources, catchment areas, water balance, renewable water supplies, characteristics of water areas,		



	<p>natural features of water areas / physiography, geomorphology, relief, land cover, weather characteristics, climate types, precipitation, weather, climate change, river basin management / plans)</p> <p>3. Analyse the hydrology of lowland forests, hilly and mountain forests, and Mediterranean and sub-Mediterranean forests (distribution of major tree species, natural features of forest habitats, changes in forest habitats, consequences of habitat changes on forest condition, factors affecting hydrological features of the basin (natural, anthropogenic), hydrological disturbances in forest ecosystems, the impact of forest management on hydrological processes in forest ecosystems)</p> <p>4. Present water management and protection in forestry and urban forestry (forests and water ecology, forest management / in floodplains and wetlands, along watercourses, on sloping terrain, in water protection areas, in protected nature areas, changes and disturbances of soil water, irrigation in forestry, water protection in forest management, indicators of pollution quality, morphology, disturbances of naturalness, functions of forests and trees in urban areas, disturbances of habitat conditions in urban areas)</p> <p>5. Determine the impact of forests on water (non-wood forest functions (OKFŠ), division of OKFŠ in relation to water: according to Sabadi, according to B. Prpić, according to the Ordinance on forest management, according to the EU Standing Forestry Committee, assessment and evaluation of OKFŠ)</p> <p>6. Assess the state of protected aquatic ecosystems, the impact of forests on waters in protected areas (the state of protected aquatic ecosystems, the impact of forests on waters in protected areas, the impact of forest management on waters in protected areas, national and international regulations on water management and wetlands, areas of special water protection, areas of protection of organisms and habitats, water pollution, water pollution indicators, sources of water pollution)</p>	
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Introduction to forest hydrology. General principles of forest hydrology. 2. Water management, administration and protection. 3. Characteristics and forms of water. Water division. 4. Water resources in Croatia. 5. Importance of water for organisms. 6. Hydrology of lowland forests 7. Hydrology of hilly and mountainous forests 8. Hydrology of sub-Mediterranean and Mediterranean forests 9. Non-market forest functions and forest ecosystem services in relation to water 10. Water management in forestry. Ecological irrigation in forestry and urban forestry 11. Erosion and torrents in forest ecosystems 12. Water protection in forest ecosystems 13. Water management in urban forestry 14. Importance of water in forests in nature protection 15. Forest water management and environmental protection <p>Exercises</p> <ol style="list-style-type: none"> 1. Methods of calculating potential evapotranspiration 2. Calculation of soil water balance 3. Analysis of drought and drought periods 4. Analysis of river and flood water levels 5. Ecological irrigation of trees and urban woody greenery 6. Water quality analysis <p>Field work</p> <ol style="list-style-type: none"> 1. Water management in forestry and urban forestry 	
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning	<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory
		2.7. Comments:



	<input checked="" type="checkbox"/> field work		<input type="checkbox"/> work with mentor <input type="checkbox"/> (other)							
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES		
	Experimental work		NO	Report	YES		(other)			
	Essay		NO	Seminar paper		NO	(other)			
	Preliminary exam	YES		Practical work		NO	(other)			
	Project		NO	Written exam	YES		ECTS credits (total)			
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.									
2.10. Student responsibilities	Regular attendance and active participation in lectures and fieldwork. Taking tests and oral exam.									
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media				
	Branimir Prpić – Ekologija šuma i šumarstvo, 2018., Hrvatsko šumarsko društvo, Šumarski fakultet Sveučilište u Zagrebu, str. 430.			YES						
	Darko Mayer, 1993., Kvaliteta i zaštita podzemnih voda, Hrvatsko društvo za zaštitu voda i mora, str. 151.			YES						
	S. Tedeschi , 1997., Zaštita voda, HDGI, Zagreb, str. 287			YES						
	Šimunić, I., 2013. Uređenje voda. Hrvatska sveučilišna naklada, Zagreb, str. 260			YES						
	Poplavne šume u Hrvatskoj, 2005., Akademija šumarskih znanosti (selected chapters - related to forest hydrology).			YES						
	Šume hrvatskog sredozemlja, Akademija šumarskih znanosti, 2011. (selected chapters - related to water protection in forests).			YES						
2.12. Optional literature	Compendium of Forest Hydrology and Geomorphology in British Columbia, Vol 1, str. 456, 2010. Compendium of Forest Hydrology and Geomorphology in British Columbia, Vol 2, str. 446, 2010. Forest and water UK Forestry Standard Guidelines, Forestry Commission Edinburgh, str. 88, 2011. Stormwater to Street Trees - Engineering Urban Forests for Stormwater Management, US Environmental Protection Agency, USA, str. 34.									



1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Irena Šapić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Succession and monitoring of vegetation	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225985	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of the course is to acquaint students with the dynamics and laws of vegetation development, ie. to able them to independently monitor and determine the state in which a vegetation is in view of its developmental stage and degree of disturbance. Using knowledge and methods of monitoring and determining the state of vegetation and habitats, they will be able to make conclusions regarding the management and governance, ie. protection and conservation of natural and anthropogenic ecosystems.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1.independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>A3.apply simpler methods of operation research</p> <p>B9.prepare ecological studies and forestry parts of spatial plans</p> <p>B14.manage forest, human resource, and technical potential during performance of forest works</p> <p>B15.develop current technologies as well as implement new technologies</p> <p>D1.conduct businesses of scientific and professional associate in scientific-research institutions in the field of forestry</p> <p>D2.conduct courses in professional secondary and other similar schools</p> <p>D4.professionally and scientifically upgrade through different educational ways and postgraduate study</p> <p>D5.gather, process and interpret reference sources and prepare simpler written professional or scientific paper.</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>Present the types of vegetation change (progressive and regressive succession).</p> <p>Interpret the need for monitoring the conservation status of species and habitat types (in accordance with the provisions of the Directive).</p> <p>Interpret syndynamic units (stage, phase, successive sequence, climax) and succession processes.</p> <p>Explain and analyze the content of habitat and species monitoring programs.</p> <p>Explain the syndynamic character of plant communities by defining mutual differences.</p> <p>Analyze the role of phytosociology and floral composition in estimation of vegetation and habitat conditions.</p> <p>Valorize the degree of succession, ie the plant community with regard to the origin and duration.</p> <p>Present the state of vegetation and ecosystems by basics of floral composition.</p> <p>Present the role and importance of vegetation research in the preparation of environmental studies, spatial plans and management plans.</p>		
2.5. Course content (syllabus)	Lectures		



	<p>1. Dynamics and laws of vegetation development (syndynamics). Basic types of dynamic changes. Progressive succession. Regressive succession. Examples.</p> <p>2. Endodynamic and exodynamic successions. Examples.</p> <p>3. Succession processes (syngenetic, ecogenetic and phylogenetic shift). The role of edifiers in the process of succession.</p> <p>4. Syndynamic units (stage, phase, successive sequence, climax, paraclimax). Examples.</p> <p>5. Initial, transitional, permanent and climatogene phytocoenosis. Examples.</p> <p>6. Successions of vegetation of the planar belt of the continental region.</p> <p>7. Successions of vegetation of the Choline and Montan belt of the continental region.</p> <p>8. Successions of vegetation of the altimontan and subalpine belts of the continental region.</p> <p>9. Successions of vegetation of the Mediterranean region.</p> <p>10. Ways of researching successions. New methods for monitoring successions and vegetation conditions.</p> <p>11. Floral composition as an indicator of the state of the ecosystem.</p> <p>12. Monitoring the state of conservation of species and habitat types (in accordance with the provisions of the Directives). Monitoring programs.</p> <p>13. Influence of climate change on vegetation successions.</p> <p>14. Anthropogenic causes of successive changes.</p> <p>15. Practical importance of syndynamics and its application in practice.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Vukelić, J., Đ. Rauš, 1998: Šumarska fitocenologija i šumske zajednice u Hrvatskoj. Udžbenik, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb, 310 str.			YES					
	Glavač, V., 1996: Vegetationsökologie - Grundfragen, Aufgaben, Methoden. Gustav Fischer, Jena, Stuttgart, 385 str.			YES					
	Van der Maarel, E., 1996: Vegetation dynamics and dynamic vegetation science. Acta Botanica Neerlandica, 45(4): 421-442.					Web			



	Walker, L., Del Moral, R., 2003: Primary Succession and Ecosystem Rehabilitation. Cambridge: Cambridge University Press, 442 p.p.		Web
2.12. Optional literature	<p>1. Rauš, Đ., 1990: Sukcesija šumske vegetacije u bazenu Spačva u razdoblju od 1970. do 1989. godine. Šum. list CXIV (9–10): 341–356, Zagreb.</p> <p>2. Vukelić, J., Baričević, D., 1998: Sukcesija šumskih zajednica na području sušenja hrasta lužnjaka u Hrvatskoj. Zbornik radova Međunarodne konferencije: Održivo gospodarsko korištenje nizinskih rijeka i zaštita prirode i okoliša, Zagreb, str. 23–37.</p> <p>3. Vukelić, J., Kajba, D., Baričević, D., 1999: Succession in riparian forests of the Croatian Danube region. In: Report of 5th EUFORGEN Populus nigra Network, 5–8 May 1999, Kyiv, Ukraine, IPGRI, Roma, Italy: 64–69.</p> <p>4. Belčić, B., 2002: Strukturne osobine i prirodna sukcesija ritskih šuma vrba i topola u gornjoj Podravini. Magistarski rad, Šumarski fakultet Sveučilišta u Zagrebu, 102 str.</p> <p>5. Baričević, D., Pernar, N., Vukelić, J., Mikac, S., Bakšić, D., 2009: Floristic composition as an indicator of destabilisation of lowland forest ecosystems in Posavina. Periodicum Biologorum 111(4): 443-451.</p> <p>6. Vukelić, J., Pilaš, I., Baričević, D., Medak, J., Šapić, I., 2020: Promjena areala obične bukve (<i>Fagus sylvatica</i> L.) od zadnje interglacijacije (120 000 – 140 000 godina pr.n.e.) do druge polovice 21. stoljeća. U : Gospodarenje šumama u uvjetima klimatskih promjena i prirodnih nepogoda (Anić, Igor ur.), Hrvatska akademija znanosti i umjetnosti, 17-35.</p> <p>7. Walker, L. R., Walker, J., Hobbs, R. J., 2007: Linking Restoration and Ecological Succession. Springer-Verlag New York, 188 p.p.</p> <p>8. Walker, L. R., et al., 2010: The Use of Chronosequences in Studies of Ecological Succession and Soil Development. Journal of Ecology, vol. 98, no. 4, pp. 725–736.</p> <p>9. Glenn-Lewin, D.C., Peet, R.K., Veblen, T.T. (eds.), 1992: Plant Succession: Theory and Prediction. Chapman and Hall, New York, 352 pp</p> <p>10. Emery, S., 2010: Succession: A Closer Look. Nature Education Knowledge 3 (10):45. Retrieved from https://www.nature.com/scitable/knowledge/library/succession-a-closer-look-13256638</p> <p>11. Habitats Directive reporting, 92/43/EEZ</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Renata Pernar, PhD Assist. Prof. Jelena Kolić, PhD Assist. Prof. Mario Ančić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Applied photointerpretation	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	33957	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature	1.10. Level of application of e-learning (level 1, 2, 3)	2



	Conservation and Environmental Protection		
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students will get to know the latest achievements in the field of photointerpretation in our country and in the world, theoretical fundamentals, types of photographing systems and methods of photographing, and possibilities for application of aerial and satellite images in forestry, nature conservation and environment protection.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p> <p>B14. develop current technologies as well as implement new technologies</p> <p>D4. professionally and scientifically upgrade through different educational ways and postgraduate study</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Pronounce the definition of photo interpretation. Explain the visual, measured and digital interpretation. Observe the influence of individual factors on the readability of the images.</p> <p>2. Prepare and describe the image components. Present procedures for image analysis.</p> <p>3. Describe the types and characteristics of the Photo Interpretation Keys. Describe the application of CIR images to monitor vegetation damage. Analyze the possibilities of applying photointerpretation in urban forestry, nature protection and the environment.</p> <p>4. Specify types and conditions for stereoscopic observation of images. Define scale of aerial photographs. Show aerial photographs orientation. Explain the methods of measurement interpretation to determine the constituent and structural parameters.</p> <p>5. List the methods of digital image processing. Explain the digital interpretation. Identify and compare a controlled and uncontrolled classification. Explain the accuracy of the classification</p>		
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction of photointerpretation, definitions, basic concepts 2. Methods of interpreting images (visual, measurement, digital) 3. The influence of certain factors on the legibility of shots (shadows, clouds, scale, image quality, recording time, type of photo layer), photointerpretation tools for photo interpretation 4. Photointerpretation of various types of aerial photographs 5. Image components important for photointerpretation (color, tone, size, pattern, shape ...) 6. Image analysis procedures (detection, delineation, measurement, differentiation, classification, coding...) 7. Success of photointerpretation and possible errors 8. Types and characteristics of Photointerpretation keys; ways of creating 9. Assessment of tree damage on multispectral images 10. Establishment of a cadastre of trees in parks, tree lines, ... 11. Visual interpretation of images (CORINE land use/cover) 12. Inventory of the situation and monitoring of changes in urban areas 13. Measurement of photointerpretation (height of trees, crown width, area, number of trees, ...) 14. Digital interpretation, classifications, vegetation indices, determining the accuracy of classification 		



	<p>15. Application of image interpretation results in urban forestry and nature protection and the environment</p> <p>Exercises:</p> <ol style="list-style-type: none"> 1. Visual, measurement, digital interpretation (images from drone, aerial or satellite images) 2. Image components (color, tone, size, pattern, shape ...) 3. Image analysis procedures (detection, delineation, measurement, differentiation, classification, coding...) 4. Production of photointerpretation keys for damage assessment 5. Assessment of tree damage on multispectral images 6. Mapping the trees on the digital orthophoto (DOP) 7. Linking the results of images interpretation in GIS (creating a database or updating existing databases) 8. Establishment of a cadastre of trees in parks, trees line 9. Visual interpretation of images (land use, biodiversity, biotopes of wetlands and urban habitats, ...) 10. Inventory of the situation and monitoring of changes in urban areas (construction, reduction of green areas,...) 11. Photointerpretation by measuring (height of trees, crown width, area, number of trees, ...) 12. Measurement of parameters in a stereomodel (photogrammetric workstation) 13. Measurement of parameters on LIDAR (altitudes, heights of objects of interest,...) 14. Digital interpretation of satellite images (assessment of damage, land use, biodiversity, ...) 15. Comparison of the results of visual and digital interpretation of images 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation on lectures and exercises, preparation and presentation of seminar work. Taking an exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Braum, F.(1989): Fotogrametrija u urbanizmu i prostornom planiranju, Geodetski fakultet, Sveučilište u Zagrebu,			YES					
	Oluić, M. (2001): Snimanje i istraživanje Zemlje iz svemira, HAZU, Zagreb, 580 str.			YES					
	Pernar, R. (2019): Prezentacije s predavanja						YES		



	Tomašegović, Z., (1986): Fotogrametrija i fotointerpretacija u šumarstvu, Zagreb, 154 str.	YES	
	Donassy, V. (1987.): Fotogrametrija II, Geodetski fakultet, Sveučilište u Zagrebu,	YES	
2.12. Optional literature	1. Lillesand T.M., Kiefer R.W. and j. W. Chipman (2004): Remote sensing and image interpretation, Wiley & Sons, 763 str. 2. Konecny, G. (2002): Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems. CRC Press. 280 str. 3. Oštir, K. Mulahusić, A. (2014): Daljinska istraživanja. Građevinski fakultet, Univerzitet u Sarajevu, 343 str. 4. Huss, S., (1984): Luftbildung und Fernerkundung in der Forstwirtschaft, Karlsruhe, 375 str		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Danko Diminić, PhD Valentina Lovrić, mag. ing. silv.	1.7. Number of ECTS credits	2
1.2. Course title	Laboratory Methods in Phytopathology	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	33959	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire basic knowledge of various methods of manipulating phytopathogenic fungi in laboratory conditions, from isolation from diseased tissues to their identification and confirmation of their pathogenicity.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B9. Implement integrated protection of woody species in urban areas and in protected nature objects.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning	1. State and explain the basic importance of laboratory methods in phytopathology from the aspect of urban forestry, nature protection and environment. 2. Plan, prepare, conduct procedures and evaluate the results of the implemented method of identification of pathogenic organisms in / on plant organs.		



outcomes)	<p>3. Plan, prepare, conduct procedures and evaluate the results of the implemented method of identification of pathogenic organisms by the isolation procedure. Describe and explain the procedures for the preparation of nutrient media (substrate) for the isolation and cultivation of pathogens. Describe, interpret and distinguish procedures for the preparation of organ and / or tissue samples for the purpose of isolating pathogens from diseased cells / tissues.</p> <p>4. Explain the basic settings and list the procedures for the identification of pathogenic organisms by molecular methods. Identify and select cases of diagnosing plant pathogens in which molecular methods are necessary.</p>								
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> Fundamentals and significance of laboratory methods in phytopathology. Field collection of samples from diseased trees. Sample preparation and analysis. Preparation of nutrient media for isolation and cultivation of pathogenic fungi, preparation of organ and / or tissue samples; methods of obtaining and growing pure cultures of pathogenic fungi; sporulation methods. Analyzes of isolated cultures of pathogenic fungi under stereolup and light microscope. Making conclusions about the results of the isolation, identification and inoculation, the conclusion about the cause of a certain pathological phenomenon / disease. Inoculation procedures and adherence to Koch postulates for the purpose of confirming the pathogenicity of isolated fungi. Making conclusions about the results of the performed isolation, identification and inoculation, conclusions about the cause of a certain pathological phenomenon / disease. <p>Exercises:</p> <ol style="list-style-type: none"> Preparation and analysis of organ and / or tissue samples under stereolup and light microscope. Field collection of samples from diseased trees, preparation of organ and / or tissue samples for the process of isolating pathogens from diseased cells / tissues. Preparation of nutrient media for isolation and cultivation of pathogenic fungi; preparation of organ and / or tissue samples for the process of isolating pathogens from diseased cells / tissues; methods of obtaining and growing pure cultures of pathogenic fungi; sporulation methods. A method of extracting cellular DNA of an isolated pathogen and amplifying the target sequences by PCR; analysis of agarose gel electrophoresis results and sequencing. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work	<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)	2.7. Comments:						
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Preparation of seminars and exams.								



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Johnston, A. & C. Booth, 1983: Plant Pathologist Pocketbook. Second Edition. CAB, Kew, Surrey, 439 str.		2nd level of application of e-learning
2.12. Optional literature	1.Strouts, R.G. & Winter, T.G., 1994: Diagnosis of ill-health in trees. HMSO, London, 307 str. 2.Diminić, D., Kajba, D. & Bezjak, J., 2002: Gljive uzročnici hipertrofija i rak-rana na topolama u klonskom arhivu "Podturen". Rad. Šumar. inst. 37(2): 169–183. 3.Diminić, D., van Dam, B. C. & Hrašovec, B., 2004: Sphaeropsis sapinea: The Cultural Characteristics of Isolates in Relation to Various Impacts on Pines in Croatia. Acta Phytopathologica et Entomologica		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assit. Prof. Marko Vucelja, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Applied Zoecology	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	73827	1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	<p>The course objective is teaching students the basic principles of ecology as a science that studies interactions between animals and their environment, ie living and non-living things. By gaining knowledge about organization levels of biological systems (individual, population, biocenosis...) and their constant dynamics and variability through numerous abiotic and biotic interactions, students will gain perception about the importance of respecting the complex relationships in which wildlife participates in maintaining the stability of numerous and diverse ecosystems (from tundra to tropical rainforest). Students will study the basic attributes of populations (density, spatial distribution, birth rate, mortality, age structure, growth potential, etc.), living communities (composition, types, structure, stratification, food chains and networks, periodism) and ecosystems (types ecosystems, autotrophic and heterotrophic components, energy flow and the circulation of matter) so that ultimately they are able to use their acquired knowledge, critically and constructively, to preserve the stability and biodiversity of Croatian ecosystems.</p>		
2.2. Enrolment requirements and/or	-		



entry competences required for the course			
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection</p> <p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p> <p>B8. organise and manage wildlife management in protected natural areas</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Describe the specifics of Croatian biodiversity, especially in the context of fauna (invertebrates, fish, amphibians, reptiles, birds, mammals) 2. Name the IUCN categories of threatened species (from EX: extinct to DD: data deficient) 3. Illustrate the differences between the organization levels of biological systems (individual, population, biocenosis, ecosystem, biome, biosphere). 4. Discuss the importance and historical and current role of ecology, or zoecology, in understanding the complexity of the relationship between living and non-living things 5. Distinguish numerous roles of abiotic and biotic factors in changing dynamics of animal populations, biocenoses and ecological systems 6. Explain the matter cycling and energy flow through the ecosystem from primary producers, through primary to secondary, tertiary and other higher levels of consumers. 7. Explain the importance of the relationship stability between production (autotrophic) and consumer (heterotrophic) components of different ecosystems 8. Give examples of animal species (autochthonous, allochthonous, invasive) according to different habitat types in Croatia 		
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. What is zoecology? Definition and division of ecology. Who were the founders of ecology, or zoecology? Levels of biological systems by size and function 2. Environmental factors. Limiting factors. Ecological valence. Life form. Ecological niche. Abiotic and biotic factors. Homotypic and heterotypic relationships. The struggle for self-preservation 3. Abiotic factors: light, temperature, water, air 4. Biotic factors: intraspecific and interspecific relationships. Neutralism, competition, amensalism, parasitism, predation, commensalism, mutualism 5. Trophic factors. Type of animal diet. The amount of food. Food quality. Autotrophic and heterotrophic organisms. Food chains and networks 6. Ecology of the population. Basic attributes of the population: density, spatial distribution, birth rate, mortality, age structure, growth potential, growth and maintenance flow 7. Population dynamics. Biotic potential and fluctuations in population density. Oscillations and fluctuations. Types of fluctuation curves. Pest groups according to fluctuation type. Phases of pest gradation. Spatial aspect of population dynamics 8. Population theories. Physical, biotic, trophic theory, gradocene theory, constitutional, synthetic theory 9. Biotic community or biocenosis. Composition and structure. Nutritional relationships. Ecotones and periodism 10. Ecological systems and biomes. Diversity and types of ecosystems. Matter and energy in the ecosystem. Successions. Producers, consumers, interpreters. Energy flow in the ecosystem 11. Evolutionary ecology. Evolution. Adaptation. Selection 12. Behavioral ecology. Territoriality. The search for food. Migration optimization. Group life 13. Biological diversity of Croatia: fauna: invertebrates 14. Biological diversity of Croatia: fauna: vertebrates 15. Biological diversity of Croatia: invasive species 		
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> independent	2.7. Comments:



	<input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work		assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)						
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, online forums. Taking preliminary exam, writing seminar, individual task, taking exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Ecology: The Experimental Analysis of Distribution and Abundance, 6th edition, Charles J. Krebs, Pearson 2009., 569 pp.			NO		Merlin			
	Elton, C, 1968: Animal Ecology, Methuen & Co. LTD and Science Paperbacks, London, 207 pp.			NO		Merlin			
	Priroda Hrvatske: Riznica za bolju budućnost, DZZP, Zagreb 2015., 50. str.			NO		Merlin			
	Biološka raznolikost Hrvatske, DDZP, 2009., Zagreb, 43. str.			NO		Merlin			
	Androić, M., 1970: Osnovi zoekologije s osobitim osvrtom na entomofaunu, Izdavačko-tiskarsko poduzeće «A. G. Matoš», Samobor, 152 str.			NO		Merlin			
	Šafarek, G., 2014: Životinje Hrvatske, Mozaik knjiga, Zagreb, 330. str.			NO		Merlin			
2.12. Optional literature	1. Uhlenbroek, C., 2009: Svijet životinja, Profil, 512. str. 2. Antolović, J., Frković, A., Grubešić, M., Holcer, D., Vuković, M., Flajšman, E., Grgurev, M., Hamidović, D., Pavlinić, I. i Tvrtković, N., 2006: Crvena knjiga sisavaca Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode, Zagreb, 128. str. 3. Tutiš, V., Kralj, J., Radović, D., Čiković, D., Barišić, S. (ur.), 2013: Crvena knjiga ptica Hrvatske, Ministarstvo zaštite okoliša i prirode, Državni zavod za zaštitu prirode, Zagreb, 258 str. 4. Jelić, D., Kuljerić, M., Koren, T., Treer, D., Šalomon, D., Lončar, M., Podnar-Lešić, M., Janev Hutinec, B., Bogdanović, T., Mekinić, S. i Jelić, K., 2015: Crvena knjiga vodozemaca i gmazova Hrvatske. Državni zavod za zaštitu prirode, Zagreb, 232. str. 5. Mrakovčić, M., Brigić, A., Buj, I., Čaleta, M., Mustafić, P. i Zanella, D., 2006: Crvena knjiga slatkodvodnih riba Hrvatske. Ministarstvo kulture i Državni zavod za zaštitu prirode, Zagreb, 256. str.								



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Saša Bogdan, PhD Assist. Prof. Ida Katičić Bogdan, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Breeding of Woody Plants	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	73829	1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Interpretation of the woody plant breeding theoretical settings. Selection and application of classical methods of the breeding (selection, controlled generative and vegetative reproduction, genetic testing, mass production of reproductive material).		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B6. organize and carry out ornamental plant production tasks B8. carry out professional tasks of nurseries and seedings B9. collaborate on environmental and spatial plans C1. plan and organize integrated environmental management C2. plan and organize professional tasks of implementing economic programs of protected nature facilities D1. perform the duties of scientific and professional associate in scientific research institutions in the field of urban forestry, nature protection and the environment D2. lead teaching courses in vocational secondary and related schools D4. professionally and scientifically improve through various educational forms and postgraduate studies D5. collect, process, and interpret sources of literature and prepare a simpler written professional or scientific work.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To explain the process of classical breeding of woody species, methods of selection; To choose suitable candidates in the process of mass selection; to evaluate individual candidates and choose plus individuals. 2. To perform basic cloning techniques. To explain and compare basic traditional as well as modern methods and cloning techniques of woody species. 3. To explain the process of genetic testing of plus individuals and the choice of elite individuals; To calculate genotypic and additive values of individuals, heritability and genetic gain based on data from a genetic test; To choose elite individuals based on genetic testing results.		



	4. To explain the role of controlled crossing and the activities necessary for the implementation of controlled crossing in the breeding cycle; To choose an option and devise a plan for controlled crossings of elite specimen; To design mass production of genetically improved varieties.							
2.5. Course content (syllabus)	Lectures: 1. Polygenic inheritance, quantitative traits, and the environment. 2. Modifications, mutations, extranuclear inheritance. 3. Basics of breeding of woody species. General terms, historical development. 4. Techniques of cloning of woody species. 5. The breeding cycles. Creation of starting plant material, a mother population. 6. Mass selection methods. The selective population. 7. The reproductive and breeding populations. 8. Genotypic selection based on genetic testing. 9. Development of a breeding strategy. 10. Controlled crossing in breeding; Design and techniques. 11. Breeding by hybridization (intraspecies and interspecies hybridization). 12. Breeding for resistance to abiotic factors. 13. Breeding for resistance to biotic factors. 14. Methods of macro-propagation and micro-propagation in the breeding. 15. Methods of biotechnology in the breeding							
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES
	Experimental work		NO	Report		NO	(other)	
	Essay		NO	Seminar paper		NO	(other)	
	Preliminary exam		NO	Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Bogdan, S. i I. Katičić Bogdan, 2016. Genetika s oplemenjivanjem drveća i grmlja. Interna recenzirana skripta. 224. str. (odabrana poglavlja)			NO		YES, Merlin		
2.12. Optional literature	White, T. L., W. T. Adams, D. B. Neale, 2007: Forest Genetics. Wallingford, UK, Cambridge, CAB International. p682.							



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Kristijan Tomljanović, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Birds of Urban Forests and Parks	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	73830	1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students learn about the most important segments of bird ecology, and the relation of ornithophones to relevant abiotic and biotic ecological factors. Teaching is performed using modern sources of knowledge (original reality, multimedia, video, etc.).		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>A3. apply simpler methods of operation research</p> <p>B1. organise and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas</p> <p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p> <p>B8. organise and manage wildlife management in protected natural areas</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p> <p>B14. develop current technologies as well as implement new technologies</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Get acquainted with the ecology, biology, ethology, etc. of birds that find habitat within urban areas, their requirements and limiting factors of arrival.</p> <p>2. Analyze bird protection opportunities within urban areas.</p> <p>3. Explain monitoring and taking measures to protect birds in urban areas.</p> <p>4. Present the ways and conditions of elaboration, studies, risk assessment, etc. related to the ornitho fauna within urban areas and protected nature objects.</p>		
2.5. Course content (syllabus)	<p>Students get acquainted with the most important segments of bird ecology, and the relationship of ornithofauna to relevant abiotic and biotic ecological factors.</p> <p>1. L - Introduction to ornithology (2 h)</p> <p>2. L - Systematics of birds important for urban areas (2 h)</p> <p>3. L - Basics of anatomical structure, physiology and biology (2 h)</p> <p>4. L - Ecology and ethology of birds of urban areas (2 h)</p>		



	<p>5. L - Species significant for urban areas (2 h) 6. L - Intra-species and inter-species relations (2 h) 7. L - Significance of birds for urban areas (2 h) 8. L - Preference and ecological niches (2 h) 9. L - Negative effects on birds (2 h) 10. L - Negative impacts on habitat (2 h) 11. L - Protection of birds (2 h) 12. L - Climate change - positive and negative impacts (2 h) 13. L - Negative impacts of birds on urban areas (2 h) 14. L - Dynamics of bird populations in urban areas (2 h) 15. L - Legislation, European Union directives and red books (2 h)</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:	
	Teaching is performed with the use of modern sources of knowledge (original reality, multimedia, video, etc.).								
2.8. Monitoring student work	Class attendance	YES		Research	YES		Oral exam	YES	
	Experimental work		NO	Report	YES		(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Ptice Hrvatske i Europe, priručnik 2018			YES					
	Gill, F. 2000: Ornithology. W. H. Freeman and Company, New York.			YES					
2.12. Optional literature	<p>Sutherland, W.J., Newton, I, Green, R. E. 2008: Bird Ecology and Conservation. Oxford University Press, Oxford. Sterry, P. 2004: Birds of Mediterrean. C. Helm, London Perrins, C.M., Birkhead, T. R. 1983: Avian Ecology. Chapman and Hall, New York.</p>								



1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Marko Vucelja, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Animal behavior	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225987	1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	This course should familiarize the students with central features of animal behaviour and importance of different behavioral patterns in different environments. The course should provide students with sufficient knowledge for better understanding the importance of behaviour in wildlife management and species conservation.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Identify the main scientists and their work that set the foundations of ethological research. 2. Identify the difference between the ultimate and proximal causes of animal behavior 3. Identify innate behaviors in animals. 4. Identify different animal learning mechanisms. 5. Identify examples of natural and sexual selection and the impact of both on the development and behavior of animal species. 6. Link the behavior of animals in nature depending on their reproduction or survival 7. Classify different reproductive strategies of animals with emphasis on monogamy and polygamy. 8. Identify sexual dimorphism and identify intrasexual and intersexual selection. 9. Identify various mechanisms in females and males responsible for their own offspring. 10. Recognize different types of animal behavior in nature depending on their habitats. 		
2.5. Course content (syllabus)	<ol style="list-style-type: none"> 1. Introduction to animal behavior: the historical basis of ethological studies 2. Natural selection; Charles Darwin 3. Gender selection 4. Proximal and distal behavioral mechanisms 5. Evolution of the mating system 6. Evolution of feeding behavior, habitat selection 7. Learning in animals: operant and classical conditioning, non-associative learning, imprinting 8. Behavioral control: neural mechanisms 9. The role of aggressive and territorial behavior; intra- and inter-specific interactions 10. Behavioral organization: Neurons and hormones 11. Adaptation and behavior against predators 12. Conservation biology 13. Effects of habitat disturbances, species conservation 		



	14. The importance of behavioral studies in science with emphasis on ecology, neurobiology, sociology, and psychology. 15. Short summary of lectures 1-12; consultations for students with lecture-related questions							
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES
	Experimental work		NO	Report		NO	(other)	
	Essay		NO	Seminar paper		NO	(other)	
	Preliminary exam	YES		Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Alcock J. Animal Behavior: An Evolutionary Approach. Seventh Edition. Sunderland (MA): Sinauer Publishers, 2001.			NO		Yes, e-learning platform "Merlin"		
2.12. Optional literature	1. Bolton, M. Conservation and the Use of Wildlife Resources. Chapman & Hall, 1997. 2. Caro, T., ed. Behavioral ecology and conservation biology. Oxford University Press, New York, 1998. 3. Pullin, A. S. Conservation Biology. Cambridge University Press, 2002. 4. Matoničkin, I., Klobučar, G., Kučinić, M., 2010: Opća zoologija, Školska knjiga, Zagreb, 467. str. 5. Uhlenbroek, C., 2009: Svijet životinja, Profil, 512. str. 6. Pavičić, Ž., Ostović, M., 2019: Dobrobit životinja, Jastrebarsko, 2018. (2020), 456. str. 7. Šolić, M., 2005: Ekologija ponašanja životinja, interna skripta, Sveučilište u Splitu, 80. str.							

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Mario Šporčić, PhD	1.7. Number of ECTS credits	2



	Assist. Prof. Matija Landekić, PhD		
1.2. Course title	Innovation and entrepreneurship	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225988	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Develop knowledge and skills that will encourage and enhance innovativeness, creativity and entrepreneurial competencies of the students. Develop the ability to creatively solve problems, produce ideas, evaluate and choose ideas, master techniques to induce creative thinking and provide insight into how many entrepreneurial opportunities and new solutions can be achieved in different areas of forestry. Recognize innovation and entrepreneurship as key factors of growth and development of modern companies but also of personal professional development.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide B2. manage and make independent professional (business) decisions from the field of urban forestry, nature conservation and environmental protection B14. develop current technologies as well as implement new technologies C3. perform jobs of professional manager and supervisor in environment and nature protection areas D4. professionally and scientifically upgrade through different educational ways and postgraduate study		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Critically assess the state and level of innovation and entrepreneurship in forestry. 2. Apply individual and group techniques of creative thinking. 3. Solve problems creatively, generate and evaluate ideas for solving problems and / or starting a business venture. 4. Assess the conditions for starting an entrepreneurial venture and compile a business plan.		
2.5. Course content (syllabus)	1. Innovation - the concept and definition, kinds and types of innovation, innovation processes, influencing factors, the role and significance of innovation. 2. Innovation systems - regional and sectoral innovation system, innovative milieu, functions, components and participants of innovation systems, specifics of forestry. 3. European and Croatian innovation policy - position of forestry, innovation monitors (EIS, GEM), initiatives, projects and actions related to innovations in forestry (COST E51, Innforce), strategy for encouraging innovation in Croatia 4. Innovation and creativity - features and process of creative thinking, characteristics of innovators and creatives, techniques of creative thinking, obstacles to creativity. 5. Ideas - production of ideas, aha-effect, serendipity, encouragement of creative ideas and solutions, evaluation and selection of ideas, mistakes in decision-making and choice of ideas. 6. The state of innovation in forestry of European countries - framework conditions for innovation, innovative behavior of forest owners and enterprises, number and type of innovations, degree of innovation, support, incentives and barriers, the most successful innovations.		



	<p>7. Innovations in Croatian forestry - perception of innovations and level of innovation in state forest company, attitude towards knowledge and innovation, types of innovations and their implementation, comparison with European countries.</p> <p>8. Selected examples from European and Croatian forestry - examples of innovations and entrepreneurial ventures in the field of products and services, processes, technologies and organization in forestry, description, outcome and results of innovation projects.</p> <p>9. Entrepreneurship - the concept and goals of entrepreneurship and entrepreneurs, the nature and importance of entrepreneurship, theories, principles and schools of entrepreneurship, prejudices about entrepreneurship.</p> <p>10. Legal framework of entrepreneurial and innovative activity - copyright, patent, intellectual and industrial property, Ordinance on inventive activity of state forest company, legislation in the field of entrepreneurship.</p> <p>11. Insight into some aspects of entrepreneurship in forestry in Europe - the position and role of forest entrepreneurs, the number and forms of organization, training and education, safety and health, associations of entrepreneurs.</p> <p>12. Entrepreneurship in the performance of forest works in Croatia - number and structural characteristics of contractors, work means and employees, services, type, volume and value of works, licensing of forest entrepreneurs.</p> <p>13. Entrepreneurial characteristics and skills, discovering and creating favourable opportunities for entrepreneurship, risks, causes of failure, entrepreneurial environment, way of generating ideas for starting an entrepreneurial venture.</p> <p>14. Establishment and start of an entrepreneurial venture, elements and content of a business plan, investment study and financing, entrepreneurial strategy and entrepreneurial management.</p> <p>15. Good practice in forestry entrepreneurship - a guide and instructions for successful entrepreneurship in forestry, elements and presentation of 'best practice' solutions and examples from European and Croatian forestry practice.</p>									
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:			
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO	
	Experimental work		NO	Report		NO	(other)			
	Essay		NO	Seminar paper	YES		(other)			
	Preliminary exam		NO	Practical work		NO	(other)			
	Project		NO	Written exam	YES		ECTS credits (total)			
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.									
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking the exam.									
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media			
	Ribić, D., Pleša Puljić, N., 2020: Osnove poduzetništva. Školska knjiga, Zagreb.			NO			YES			
	Rametsteiner, E., Weiss, G., Kubeczko, K., 2005: Innovation and entrepreneurship in			NO			YES			



	forestry in central Europe. Brill Academic Publishers, Leiden-Boston.		
	Srića V., 2003: Kako postati pun ideja. M.E.P. Consult, Zagreb.	NO	YES
2.12. Optional literature	<p>Šporčić, M., Bakarić, M., Crnić, I., Landekić, M., 2018: Pregled dobre prakse u šumarskom poduzetništvu. Nova mehanizacija šumarstva 39: 67-82.</p> <p>Šporčić, M., Landekić, M., Ćosić, M., Bakarić, M., 2017: Inovacijske nagrade u šumarstvu. Nova mehanizacija šumarstva 38: 79-90.</p> <p>Lalić, I., 2017: Kako pokrenuti vlastiti biznis. Re-forma grupa d.o.o. Zagreb</p> <p>Posavec, S., Šporčić, M., Antoni, D., Beljan, K., 2011: Poticanje inovacija - ključ razvoja u hrvatskom šumarstvu. Šumarski list 135 (5-6): 243-256.</p> <p>Robert D. Hisrich, Peters, M.P., Shepherd, D.A., 2011: Poduzetništvo. Mate d.o.o. Zagreb</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Mislav Vedriš, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Inventory of greenhouse gases in forestry	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	225989	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Learn importance of forests and forestry in sequestration of atmospheric greenhouse gases. Get to know the components of reporting system for emission and removal of greenhouse gases. International agreements that regulate reporting on world and national level. Get to know procedures for data collection and calculation on state level and in forestry sector.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>A3. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p> <p>D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection</p>		



	D3. conduct businesses and tasks in publicist writing and media connected with urban forestry, nature conservation and environmental protection D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Appoint and describe basic terms in emission/removal of greenhouse gases, their monitoring and reporting 2. Relate and explain components of reporting system (activities, institutions, sources/sinks) 3. Recognize the importance of forests and forestry for reporting of greenhouse gases 4. Explain the role of forest inventory in collection of data on greenhouse gases 5. Calculate the level of greenhouse gases based on available data in forestry sector 6. Compare levels of greenhouse gas emission between states and in time series 7. Assess reporting system based on accessibility of data and calculation methods 8. Determine possibilities for improvement the emission reporting 9. Propose measures to sustain and increase the removals of greenhouse gases in forestry 								
2.5. Course content (syllabus)	<ol style="list-style-type: none"> 1. Atmospheric greenhouse gases, their sources, origin and influence on climate change (2L+0E) 2. Role of forests and forestry in removal of greenhouse gases (2L+0E) 3. Institutions appointed for reporting greenhouse gases on world, European and national level (UN, EU, Ministry) (2+0) 4. International, European and national agreements and regulations on greenhouse gases (2+1) 5. Definitions and methodology of reporting greenhouse gases (1+2) 6. Data collection – measurement and monitoring the factors for emission/removal of greenhouse gases (1+2) 7. Forest inventory as a source for greenhouse gases data (1+2) 8. Calculation and reporting an annual state of greenhouse gases in forestry sector on a state level (1+4) 9. Influence of emission/removal of greenhouse gases and regulations on forest management (1+2) 10. Possibilities of forest management practices to increase a sequestration of greenhouse gases 1+1) 11. Emission trading on international level – “carbon market” (1+1) 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities									



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Lecture materials	NO	e-learning system
	Ministarstvo zaštite okoliša i energetike, 2020. Izvješće o Inventaru stakleničkih plinova na području Republike Hrvatske za razdoblje 1990.-2018. (NIR 2020)	NO	pdf, free access via internet
	Pearson, T.R.H.; Brown, S.L.; Birdsey, R.A. 2007. Measurement guidelines for the sequestration of forest carbon. Gen. Tech. Rep. NRS-18. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 42 str.	NO	pdf, free access via internet
	Ravindranath, N.H., and M. Ostwald, M.2008. Carbon Inventory Methods. Handbook for Greenhouse Gas Inventory, Carbon Mitigation and Roundwood Production Projects. Springer, 315. str.	NO	pdf, free access via internet
	The Intergovernmental Panel on Climate Change (IPCC), 2006. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.	NO	pdf, free access via internet
	The Intergovernmental Panel on Climate Change (IPCC), 2014. 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol, Hiraishi, T., Krug, T., Tanabe, K., Srivastava, N., Baasansuren, J., Fukuda, M. and Troxler, T.G. (eds) Published: IPCC, Switzerland. 268 str.	NO	pdf, free access via internet
2.12. Optional literature	<p>Berndes, G., Abt, B., Asikainen, A., Cowie, A., Dale, V., Egnell, G., Lindner, M., Marelli, L., Paré, D., Pingoud, K., Yeh, S. 2016. Forest biomass, carbon neutrality and climate change mitigation. From Science to Policy 3. European Forest Institute. 28 str.</p> <p>Broekhoff, D., Gillenwater, M., Colbert-Sangree, T., and Cage, P. 2019. Securing Climate Benefit: A Guide to Using Carbon Offsets. Stockholm Environment Institute & Greenhouse Gas Management Institute. 60 str.</p> <p>GOFC-GOLD, 2010, A sourcebook of methods and procedures for monitoring and reporting anthropogenic greenhouse gas emissions and removals caused by deforestation, gains and losses of carbon stocks in forests remaining forests, and forestation. GOFC-GOLD Report version COP16-1, GOFC-GOLD Project Office, Natural Resources Canada, Alberta, Canada. 210 str.</p> <p>Iversen P., Lee D., Rocha M., 2014. Understanding Land Use in the UNFCCC. Climate and Land Use Alliance. 66 str.</p> <p>Sedjo, R.A., 2001. Forest Carbon Sequestration: Some Issues for Forest Investments. Discussion Paper 01–34. Resources for the Future. 26 str.</p>		



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Krunoslav Sever, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Plant nutrition in urban environment	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225991	1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduce students to the nutrient uptake and role of mineral nutrients in interaction with stressors specific to the urban environment. Introduce students to the symptoms of suboptimal level of mineral nutrients in urban areas. To enable students to independently apply the knowledge of fertilization when planting and maintaining urban green (individual trees, tree lines, flower beds, etc.).		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B1. organise and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas B6. organise and manage professional works on the production of decorative plants C2. perform and manage works in horticultural and communal services D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Valorize soil as a source of plant nutrients and their absorption mechanisms (soil nutrients, nutrients in helat form, nutrients in mineral and organic matter, dynamic equilibrium among nutrients forms in the soil). To determine the macronutrients (nitrogen, sulfur, phosphorus, potassium, calcium, magnesium; forms of nutrients and their availability, their assimilation in the plant, role in plant metabolism, symptoms of insufficiency) and micronutrients (iron, manganese, copper, zinc, molybdenum and chlorine, their forms in the soil and availability, their role and symptoms of insufficiency). Interpret redistribution of nutrients in the plant (transfer of nutrients among the roots, stems and leaves, the impact of nutrients on vegetative growth and reproductive cycle). Valorize plant nutrient status in interaction with stressors in urban environment. To determine the nutrient status of plants (absorption, efficiency of nutrients use in forest stands and loss of nutrients form plant and ecosystem). Plan soil fertilization (soil sampling for chemical analysis with the aim of determining appropriate fertilization treatments - mineral, organic or natural fertilizers).		
2.5. Course content (syllabus)	1. Historical development of plant nutrition as a scientific discipline, definition and classification and division of biogenic elements and plant nutrients. Soil as a source of plant		



	<p>nutrients; chemical composition of soil, colloidal properties of soil, pH reaction of soil, soil buffering capacity, forms of nutrients in soil, dynamics of nutrients in soil.</p> <p>2. Potential, uptake and transfer of nutrients through the plant; potential and availability of plant nutrients, root nutrient uptake, leaf nutrient uptake, nutrient transfer between cells.</p> <p>3. Factors affecting nutrient uptake in urban environment; plant species and genotype, mycorrhiza, soil fertility, soil moisture, root metabolism.</p> <p>4. Supply of plants with biogenic elements; antagonism and synergism of biogenic elements, retranslocation of mineral nutrients within the plant. Loss of nutrients from the plant organism and general symptoms of deficiency and excess elements of plant nutrition.</p> <p>5. Macronutrients and Nitrogen; forms of nitrogen in the soil and their accessibility to the plant, reduction of nitrates in the plant, the role of nitrogen in plant metabolism, signs of insufficient nitrogen nutrition.</p> <p>6. Phosphorus; forms of phosphorus in the soil and their accessibility to plants, the role of phosphorus in plant metabolism, signs of insufficient phosphorus nutrition.</p> <p>7. Sulfur and potassium; forms in the soil and their accessibility to the plant, their role in the plant and the symptoms of their deficiency on the plant.</p> <p>8. Calcium and magnesium; forms in the soil and their accessibility to the plant, their role in the plant and the symptoms of their deficiency on the plant.</p> <p>9. Trace elements and iron; forms in the soil and the availability of iron to the plant, its role in the plant and the symptoms of its deficiency on the plant.</p> <p>10. Manganese and boron; forms in the soil and their accessibility to the plant, their role in the plant and the symptoms of their deficiency on the plant.</p> <p>11. Zinc, copper, molybdenum, chlorine and nickel; forms in the soil and their accessibility to the plant, their role in the plant and the symptoms of their deficiency on the plant.</p> <p>12. Interactive influence of environmental stress in urban environment and suboptimal nutrition with mineral nutrients on the physiology and growth of forest trees.</p> <p>13. Sampling and chemical analysis in order to determine the concentration of mineral nutrients in soil and plant.</p> <p>14. Fertilizers in general, their classification and chemical analysis.</p> <p>15. Influence of different doses and formulations of mineral fertilizers on the physiology and growth of forest trees.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance at lectures. Passing preliminary and final exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			



	Sever, K. i Ž. Škvorc, 2018: Ishrana bilja. Interna skripta, Šumarski fakultet, Zagreb, 89 str.	YES	YES, Merlin
2.12. Optional literature	Vukadinović, V. i V. Vukadinović, 2011: Ishrana bilja, Poljoprivredni fakultet Osijek, 442 str. Brunetti, C., Fini A. 2017: Fertilization in urban landscape. U: Routledge Handbook of Urban Forestry. https://www.routledgehandbooks.com/doi/10.4324/9781315627106.ch29		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Krešimir Krapinec, PhD Assist. Prof. Kristijan Tomljanović, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Game Management	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	225992	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Enabling for hunter, hunting plan administrator and hunting plan maker		
2.2. Enrolment requirements and/or entry competences required for the course	Wildlife Management		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide</p> <p>A3. apply simpler methods of operation research</p> <p>B1. organise and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas</p> <p>B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection</p> <p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p> <p>B8. organise and manage wildlife management in protected natural areas</p>		



	<p>C1. manage most complex tasks in all forms of organizing the protection of nature areas; national, county, and municipal administration, including advisory services and inspection supervision</p> <p>C2. perform and manage works in horticultural and communal services</p> <p>C3. perform jobs of professional manager and supervisor in environment and nature protection areas</p> <p>D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection</p> <p>D2. conduct courses in professional secondary and other similar schools</p> <p>D3. conduct businesses and tasks in publicist writing and media connected with urban forestry, nature conservation and environmental protection</p> <p>D4. professionally and scientifically upgrade through different educational ways and postgraduate study</p> <p>D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper</p>	
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<p>1. REMEMBRANCE – Describing game species in Croatia.</p> <p>2. SYNTHESIZING – Develop procedures and protocols toward diseased animals including sampling and shipping for the autopsy.</p> <p>3. UNDERSTANDING – Describing particular breeding technique and specifically problems in production.</p> <p>4. REMEMBRANCE – Describing hunting techniques, hunting ethics an manners)</p> <p>5. IMPLEMENTATION – compute hunting facilities in individual hunting ground with normative</p> <p>6. IMPLEMENTATION –hunting plans conduction. Explain how to conduct hunting statistic and filling obligatory forms (according to legislative) at the level of hunting year.</p> <p>7. IMPLEMENTATION – Pick up appropriate part of hunting ground at the level of game (wildlife) species – growing areas, to know procedure for site class scoring.</p> <p>8. REMEMBRANCE – Describing procedure for capacity calculation according to growing status (hunting ground, breeding station or protected area).</p> <p>9. IMPLEMENTATION –handling with weapons and ammunition.</p>	
<p>2.5. Course content (syllabus)</p>	<p>LECTURES</p> <p>1. Introduction (/Croatian/ hunting history, hunting in arts, hunting magazines) – 1 hour</p> <p>2. Species describing and pathology – big game – 3 hours</p> <p>3. Species describing and pathology – small game – 3 hours</p> <p>4. Species describing and pathology – pathology – 2 hours</p> <p>5. Breeding and releasing techniques – 2 hours</p> <p>6. Managing hunting ground (facilities, hunting techniques, hunting ethics and manners) – 2 hours</p> <p>7. Planning in hunting management, hunting plan, hunting plan administration – 2 hours</p> <p>EXERCISES</p> <p>1. Preparation of hunting trophies – 2 hours</p> <p>2. Hunting museum visiting – 2 hours</p> <p>3. Growing area extraction – 2 hours</p> <p>4. Procedure for site class scoring – 2 hours</p> <p>5. Calculation of capacity and prediction of population structure – 2 hours</p> <p>6. Hunting weapons and ammunition – 3 hours</p> <p>7. Hunting weapons and ammunition-field instruction at the shooting range (practical shooting) – 2 hours</p>	
<p>2.6. Format of instruction</p>	<p><input checked="" type="checkbox"/> lectures</p> <p><input type="checkbox"/> seminars and workshops</p> <p><input checked="" type="checkbox"/> exercises</p> <p><input type="checkbox"/> <i>online in entirety</i></p> <p><input type="checkbox"/> partial e-learning</p> <p><input type="checkbox"/> field work</p>	<p><input checked="" type="checkbox"/> independent assignments</p> <p><input type="checkbox"/> multimedia and the internet</p> <p><input type="checkbox"/> laboratory</p> <p><input type="checkbox"/> work with mentor</p> <p><input type="checkbox"/> (other)</p> <p>2.7. Comments:</p>



2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Preparation of an individual task - calculation of habitat capacity for one species of large and small game and calculation of the required number of hunting technical and hunting facilities.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Dragišić, P., 1967: Lovački priručnik. Lovačka knjiga, Zagreb, 704 pp.			NO		NO			
	Darabuš, S.; Jakelić, I. Z., 2002: Osnove lovstva, Hrvatski lovački savez, Zagreb,			YES		YES			
	Anon., 1993: Egg production and Incubation. Game Conservancy Ltd., Fordingbridge, Hampshire, 135 pp.			YES		YES			
	Anon., 1994: Gamebird Rearing. Game Conservancy Ltd., Fordingbridge, Hampshire, 127 pp.			YES		YES			
	Anon., 1996: Gamebird releasing. Game Conservancy Ltd., Fordingbridge, Hampshire, 77 pp.			NO		NO			
	Andrašić, D., 1973: Uređivanje lovišta - Lovna privreda IV dio. Izdavački servis „Liber“, Zagreb, 252 pp.			YES		YES			
2.12. Optional literature	Recent hunting legislative								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marilena Idžojić, PhD Assist. Prof. Igor Poljak, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Horticultural Dendrology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+24
1.3. Course code	225971	1.9. Expected enrolment in the course	25



1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire theoretical and practical knowledge about ornamental woody taxa (genera, species, hybrids and cultivars) important for urban forestry in Croatia. Theoretical knowledge encompasses biological features, morphological characteristics, variability (with special emphasis on cultivars), distribution, special characteristics, as well as the horticultural importance of taxa. Students acquire practical skills to recognize ornamental woody taxa on the basis of different morphological characteristics: habit, bark, leaves, twigs of deciduous species in winter, flowers, cones and fruits. Students acquire skills to recognise the ornamental value of woody taxa in different vegetation periods and different ecological conditions. They also gain knowledge on the practical use of ornamental trees and shrubs in urban forestry.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>B5. apply knowledge related to horticultural dendrology and recommend and choose tree species in urban areas</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p> <p>C12. perform and manage works in horticultural and communal services</p> <p>D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection</p> <p>D2. conduct courses in professional secondary and other similar schools</p> <p>D3. conduct businesses and tasks in publicist writing and media connected with urban forestry, nature conservation and environmental protection</p> <p>D4. professionally and scientifically upgrade through different educational ways and postgraduate study</p> <p>D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>To use International Code of Nomenclature for Cultivated Plants;</p> <p>To define and explain horticultural importance, biological features and morphological characteristics of the genera of gymnosperms and angiosperms important for urban forestry in Croatia;</p> <p>To identify and describe the ornamental species and cultivars of gymnosperms and angiosperms important for urban forestry in Croatia according to: habit, bark, twigs in winter, leaves, flowers, cones and fruits;</p> <p>To categorise gymnosperms and angiosperms important for urban forestry in Croatia according to ornamental and phenological features;</p> <p>To identify and determine the applicability of ornamental gymnosperms and angiosperms important for urban forestry in Croatia in particular examples;</p> <p>To identify and distinguish ornamental gymnosperms and angiosperms important for urban forestry in Croatia in certain vegetation period; to identify, recognise and determine the ornamental value of taxa in different vegetation periods;</p> <p>To choose ornamental gymnosperms and angiosperms important for urban forestry in Croatia for various purpose in urban forestry;</p> <p>To argue the choice of ornamental taxa important for urban forestry in Croatia for horticultural use in urban forestry, especially in planning urban green spaces, taking into account the optimal variety of ornamental plants;</p>		
2.5. Course content (syllabus)	Lectures:		



1. International Code of Nomenclature for Cultivated Plants. Horticultural importance of genera in the families *Ginkgoaceae*, *Araucariaceae*, *Pinaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
2. Horticultural importance of genera in the families *Taxodiaceae*, *Cupressaceae* (part one). Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
3. Horticultural importance of genera in the family *Cupressaceae* (part two). Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
4. Horticultural importance of genera in the families *Cupressaceae* (part three), *Cephalotaxaceae*, *Taxaceae*, *Cycadaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
5. Horticultural importance of genera in the families *Magnoliaceae*, *Calycanthaceae*, *Lauraceae*, *Ranunculaceae*, *Berberidaceae*, *Lardizabalaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
6. Horticultural importance of genera in the families *Cercidiphyllaceae*, *Platanaceae*, *Hamamelidaceae*, *Ulmaceae*, *Moraceae*, *Juglandaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
7. Horticultural importance of genera in the families *Fagaceae*, *Betulaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
8. Horticultural importance of genera in the families *Nyctaginaceae*, *Chenopodiaceae*, *Polygonaceae*, *Paeoniaceae*, *Theaceae*, *Actinidiaceae*, *Clusiaceae*, *Tiliaceae*, *Sterculiaceae*, *Malvaceae*, *Cistaceae*, *Tamaricaceae*, *Passifloraceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
9. Horticultural importance of genera in the families *Salicaceae*, *Ericaceae*, *Ebenaceae*, *Styracaceae*, *Pittosporaceae*, *Hydrangeaceae*, *Grossulariaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
10. Horticultural importance of genera in the family *Rosaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
11. Horticultural importance of genera in the families *Mimosaceae*, *Caesalpinaceae*, *Fabaceae*, *Elaeagnaceae*, *Lythraceae*, *Thymelaeaceae*, *Myrtaceae*, *Punicaceae*, *Nyssaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.
12. Horticultural importance of genera in the families *Cornaceae*, *Celastraceae*, *Aquifoliaceae*, *Buxaceae*, *Rhamnaceae*, *Vitaceae*, *Sapindaceae*, *Hippocastanaceae*. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.



	<p>13. Horticultural importance of genera in the families <i>Aceraceae</i>, <i>Anacardiaceae</i>, <i>Meliaceae</i>, <i>Rutaceae</i>, <i>Araliaceae</i>, <i>Apocynaceae</i>, <i>Asclepiadaceae</i>. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.</p> <p>14. Horticultural importance of genera in the families <i>Solanaceae</i>, <i>Verbenaceae</i>, <i>Lamiaceae</i>, <i>Buddlejaceae</i>, <i>Oleaceae</i>, <i>Scrophulariaceae</i>, <i>Bignoniaceae</i>. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.</p> <p>15. Horticultural importance of genera in the families <i>Caprifoliaceae</i>, <i>Asteraceae</i>, <i>Arecaceae</i>, <i>Dracaenaceae</i>, <i>Ruscaceae</i>, <i>Aloaceae</i>, <i>Agavaceae</i>. Biological features, morphological characteristics and distribution of ornamental species within these genera not included in the Dendrology course, important for urban forestry in Croatia. Ornamental cultivars within these genera.</p> <p>Exercises:</p> <ol style="list-style-type: none"> 1. Determination - exercises using plant material and digital photos - species and cultivars of <i>Pinaceae</i>, <i>Taxodiaceae</i>, <i>Cupressaceae</i> (part one). 2. Determination - exercises using plant material and digital photos - species and cultivars of <i>Pinaceae</i>, <i>Taxodiaceae</i>, <i>Cupressaceae</i> (part one). 3. Comparative determination - exercises using plant material and digital photos - species and cultivars of <i>Cupressaceae</i> (part two), <i>Taxaceae</i>. 4. Comparative determination - exercises using plant material and digital photos - species and cultivars of <i>Cupressaceae</i> (part two), <i>Taxaceae</i>. 5. Determination - exercises using plant material and digital photos - species and cultivars of <i>Magnoliaceae</i>, <i>Calycanthaceae</i>, <i>Ranunculaceae</i>, <i>Berberidaceae</i>, <i>Hamamelidaceae</i>, <i>Ulmaceae</i>, <i>Moraceae</i>. 6. Determination - exercises using plant material and digital photos - species and cultivars of <i>Magnoliaceae</i>, <i>Calycanthaceae</i>, <i>Ranunculaceae</i>, <i>Berberidaceae</i>, <i>Hamamelidaceae</i>, <i>Ulmaceae</i>, <i>Moraceae</i>. 7. Determination - exercises using plant material and digital photos - species and cultivars of <i>Fagaceae</i>, <i>Betulaceae</i>, <i>Paeoniaceae</i>, <i>Theaceae</i>, <i>Malvaceae</i>, <i>Cistaceae</i>, <i>Tamaricaceae</i>. 8. Determination - exercises using plant material and digital photos - species and cultivars of <i>Fagaceae</i>, <i>Betulaceae</i>, <i>Paeoniaceae</i>, <i>Theaceae</i>, <i>Malvaceae</i>, <i>Cistaceae</i>, <i>Tamaricaceae</i>. 9. Determination - exercises using plant material and digital photos - species and cultivars of <i>Salicaceae</i>, <i>Ericaceae</i>, <i>Hydrangeaceae</i>, <i>Rosaceae</i>. 10. Determination - exercises using plant material and digital photos - species and cultivars of <i>Salicaceae</i>, <i>Ericaceae</i>, <i>Hydrangeaceae</i>, <i>Rosaceae</i>. 11. Determination - exercises using plant material and digital photos - species and cultivars of <i>Mimosaceae</i>, <i>Caesalpiniaceae</i>, <i>Fabaceae</i>, <i>Elaeagnaceae</i>, <i>Lythraceae</i>, <i>Cornaceae</i>, <i>Celastraceae</i>, <i>Aquifoliaceae</i>, <i>Buxaceae</i>, <i>Rhamnaceae</i>, <i>Vitaceae</i>, <i>Hippocastanaceae</i>. 12. Determination - exercises using plant material and digital photos - species and cultivars of <i>Mimosaceae</i>, <i>Caesalpiniaceae</i>, <i>Fabaceae</i>, <i>Elaeagnaceae</i>, <i>Lythraceae</i>, <i>Cornaceae</i>, <i>Celastraceae</i>, <i>Aquifoliaceae</i>, <i>Buxaceae</i>, <i>Rhamnaceae</i>, <i>Vitaceae</i>, <i>Hippocastanaceae</i>. 13. Determination - exercises using plant material and digital photos - species and cultivars of <i>Aceraceae</i>, <i>Anacardiaceae</i>, <i>Araliaceae</i>, <i>Apocynaceae</i>, <i>Buddlejaceae</i>, <i>Oleaceae</i>, <i>Bignoniaceae</i>. 14. Determination - exercises using plant material and digital photos - species and cultivars of <i>Aceraceae</i>, <i>Anacardiaceae</i>, <i>Araliaceae</i>, <i>Apocynaceae</i>, <i>Buddlejaceae</i>, <i>Oleaceae</i>, <i>Bignoniaceae</i>. 15. Determination - exercises using plant material and digital photos - species and cultivars of <i>Caprifoliaceae</i>, <i>Asteraceae</i>, <i>Arecaceae</i>, <i>Aloaceae</i>, <i>Agavaceae</i>. <p>Field work is held for three days in parks, botanical gardens and arboreta in the continental and Mediterranean regions of Croatia. During field work students collect learning material.</p>		
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> independent	2.7. Comments:



	<input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work		assignments <input checked="" type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)					
2.8. Monitoring student work	Class attendance	YES	Research		NO	Oral exam	YES	
	Experimental work		Report	YES		Homework	YES	
	Essay		Seminar paper		NO	(other)		
	Preliminary exam		Practical work	YES		(other)		
	Project		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance at lectures, exercises and field work. Writing exercise and field work reports. Collecting learning material. Doing and submitting homework. Passing final exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Idžojić, M., 2005: Listopadno drveće i grmlje u zimskom razdoblju. Šumarski fakultet Sveučilišta u Zagrebu. 256 pp.			YES				
	Idžojić, M., 2009: Dendrologija – List. Šumarski fakultet Sveučilišta u Zagrebu. 904 pp.			YES				
	Idžojić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp.			YES				
2.12. Optional literature	<ol style="list-style-type: none"> Bärtles, A., Schmidt, P.A., 2014: Enzyklopädie der Gartengehölze. Verlag Eugen Ulmer, Stuttgart. Brickell, C. (Ed.), 2003: RHS A-Z encyclopedia of garden plants, Vol. III. Dorling Kindersley, London. Brickell, C. D., C. Alexander, J. J. Cubey, J. C. David, M. H. A. Hoffman, A. C. Leslie, V. Malécot, W. L. A. Hettterscheid, X. Jin (Eds.), 2016: International Code of Nomenclature for Cultivated Plants (ICNCP). Ninth Edition. Scripta Horticulturae Number 18, ISHS, 190 pp. Cullen, J., Knees, S.G., Cubey, H.S. (Eds.), 2011: The European garden flora flowering plants: a manual for the identification of plants cultivated in Europe, both out-of-doors and under glass. Vol. I-V. Second edition. Cambridge University Press. Dirr, M.A., 2011: Dirr's encyclopedia of trees and shrubs. Timber Press. Farjon, A., 2010: A handbook of the world's conifers. Vol. I-II. Brill, Leiden. Fiala, J.L., 2008: Liliacs – a gardener's encyclopedia. Timber Press, Portland, London. Fitschen, J., 2007: Gehölzflora. Quelle und Meyer Verlag, Wiebelsheim. Fryer, J., Hylmö, B., 2009: Cotoneasters: a comprehensive guide to shrubs for flowers, fruit, and foliage. Timber Press, Portland & London. Galle, F.C., 1997: Hollies: the genus Ilex. Timber Press, Portland. Gooch, R., Gooch, J., 2011: Clematis – an essential guide. The Crowood Press Ltd., Wiltshire. Idžojić, 2019: Dendrology: Cones, Flowers, Fruits and Seeds. Elsevier – Academic Press, London, San Diego, Cambridge, Oxford. 							



	<p>13. Krüssmann, G., 1972: Handbuch der Nadelgehölze. Verlag Paul Parey, Berlin und Hamburg.</p> <p>14. Krüssmann, G., 1976: Handbuch der Laubgehölze. Band I-III. Verlag Paul Parey, Berlin und Hamburg.</p> <p>15. Lis-Balchin, M. (Ed.), 2002: Lavender: The genus Lavandula. Taylor & Francis, London.</p> <p>16. Quest-Ritson, C., Quest-Ritson, B., 2003: The Royal Horticultural Society encyclopedia of roses. Dorling Kindersley Ltd., London.</p> <p>17. Roloff, A., Bärtels, A., 2008: Flora der Gehölze. Bestimmung, Eigenschaften und Verwendung. Eugen Ulmer KG, Stuttgart.</p> <p>18. van Gelderen, D.M., de Jong, P.C., Oterdoom, H.J., 1994: Maples of the world. Timber Press, Portland, Oregon.</p> <p>19. van Gelderen, D.M., van Hoey Smith, J.R.P., 1996: Conifers: The illustrated encyclopedia. Timber Press, Portland, Oregon.</p> <p>20. Vertrees, J.D., 2001: Japanese maples. Timber Press, Portland.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Tomislav Poršinsky, PhD Prof. Marijan Šušnjar, PhD Assist. Prof. Kruno Lepoglavec, PhD Assoc. Prof. Hrvoje Nevečerel, PhD Assist. Prof. Andreja Đuka, PhD Assist. Prof. Dinko Vusić, PhD Marin Bačić, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Environmetally sound techniques and technologies	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+24
1.3. Course code	225972	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The development of competent knowledge for carrying out complex operative and environmentally acceptable professional solutions, independent decision-making and involvement in research tasks.		
2.2. Enrolment requirements and/or	-		



entry competences required for the course	
2.3. Learning outcomes at the level of the programme to which the course contributes	B11. apply knowledge related to ecologically friendly techniques and technologies of forestry works used in urban areas and protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>Analyse felling and tree processing (limiting and influencing factors of harvesting operations, procedures and phases of timber production, influence of society, terrain characteristics, harvesting mechanisation level, theory and procedures during tree felling, methods of timber processing, machines for mechanised felling and processing and their purpose, wood defects and irregularities, quality assortment structure of broadleaved and conifer timber for with respect to JUS and EN standards).</p> <p>Presentation of timber transport (division of timber transport, division of timber extraction in terms of mechanisation level and load-ground contact, limitations and suitability of individual timber transporting vehicles with regard to field and stand conditions, timber extraction distance and environmental acceptability, division and features of long distance timber transport, types of landing sites, features of timber transport by waterways and railway, long distance timber transport by trucks).</p> <p>Parse the planning and design of all forms of forest roads, primary and secondary opening of forest areas (the meaning of forest transport infrastructure for the entire forest management, forest road classes, phase of establishment and management of optimal forest roads network, parameters of assessment of quantity and quality of forest road network, primary and secondary opening of forest land – theoretical models, constructive elements of forest road, design of forest roads – basic stages of work).</p> <p>Present the construction and maintenance/reconstruction and closure of forest roads (procedure of the construction of forest roads – basic phases of work, construction technology in the lowland area and on sloped terrains, maintenance of forest roads, causes of damage, supervision of works, closure of roads).</p> <p>Determine the damage of forest soils and stands by forest machines (wheel ruts, measurement methods, estimation models for depth of ruts, soil layer transfer, soil disturbance area, soil compaction, methods for determining soil compaction due to forest vehicle passage, natural soil recovery, technical solutions for reduction of weight of forest machinery and vehicles, problem, knowledge and consequences of damage and actions for reduce the level of damaging trees).</p> <p>Analyse actions to reduce environmental pollution by exhaust gases and harmful substances from forest machinery (harmfulness of exhaust gases, technical actions to reduce the amount of harmful exhaust gases, remote monitoring systems for forest machinery and vehicles, biofuels, ecological properties of fuels and lubricants, energy consumption of forest vehicles, development of forest machinery).</p>
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Tree felling and timber processing 2. Timber extraction 3. Reduction of damages in harvesting operations 4. Harvesting operations in NATURA preservation areas 5. Long distance timber transport 6. Forest roads and their basic technical characteristics - Introduction, the meaning of forest roads for the overall management of forestland, the classes, and definitions of forest roads. Technical characteristics of primary, secondary, and tertiary forest roads. The phase of establishing an optimal network of forest roads. (2 hours) 7. Planning forest roads. Comprehensive forest opening - Basic phases of establishing an optimal network of forest roads in the field: planning, design, construction, maintenance/reconstruction, and closure. Parameters of the assessment of the quantity and quality of the network of forest roads. (2 hours) 8. Planning the opening of forest land with GIS technology - GIS as a basis for making the best possible decisions in the planning phase with special attention to the determination of



	<p>sensitive areas. A functional approach to a forest opening. Optimality assessment criteria. Environmental, sociological, and aesthetic aspects of forest road planning. (2 hours)</p> <p>9. Design of forest roads - Collection of general and field data. Types of tracks, methods, and procedures. Preparation of project documentation of forest roads. Constructive elements of forest roads. Horizontal (positional) and vertical (altitude) route development – basic rules and professional settings to be followed. (2 hours)</p> <p>10. Construction, maintenance/reconstruction, and closure of forest roads - Environmentally friendly technology for the construction of forest roads on different terrains. Damages in the processes of construction and maintenance/reconstruction of forest roads in protected stands and residential conditions. Options for reduction and remediation of damages. Legal substrates were necessary for the start of construction and reconstruction of forest roads. Supervision and control of works. Road closures in urban and protected forest areas. (2 hours)</p> <p>11. Fuel consumption and exhaust emissions at the forest machine works</p> <p>12. Energy balance of wood products (EROI)</p> <p>13. Biofuels and biooils</p> <p>14. The use of forest machines in damaged stands</p> <p>15. Development of forest machines</p> <p>Practical lessons – excercises</p> <p>1. Timber measurement</p> <p>2. Wood defects and irregularities</p> <p>3. Classification of deciduous and coniferous wood by purpose (JUS) and quality (EN)</p> <p>4. Checklist for environmental impact assessment in forestry</p> <p>5. Costs and productivity of skidding timber</p> <p>6. Computer models of optimization (working with GIS tools). Defining the phases of the forest road optimization process. Development of multifunctional computer databases (working in Excel). (2 hours)</p> <p>7. Designing GIS of the researched area. Connecting the subcompartment spatial unit to a computer database (working with GIS tools). (2 hours)</p> <p>8. Establishment of a Cadastre of forest roads. Recording forest roads with a GPS system (use of Mobile applications), data processing, and input data on digital backgrounds. Comprehensive optimization and identification of potential routes of future forest roads or road closures (working with GIS tools). (2 hours)</p> <p>9. Making a ground plan of forest road. Processing of field data and forming a digital terrain plan with a plotted building (working with CAD tools). (2 hours)</p> <p>10. Production of the longitudinal profile of the forest road. Computer development of vertical terrain development and plotting of road level for printing vertical profile (working with CAD tools). (2 hours)</p> <p>11. Preparation for the measurement exercise "Energy Balance - EROI"</p> <p>12. Measurement exercise "Energy balance - EROI"</p> <p>13. Processing and analysis of data from the measurement exercise "Energy Balance - EROI"</p> <p>14. Preparation for the measurement exercise "Analysis of exhaust emissions of internal combustion engines"</p> <p>15. Measurement exercise and data processing "Combustion engine exhaust gas analysis"</p> <p>Students acquire practical skills through three one-day field trips in the Medvednica Nature Park, Lonjsko Polje Nature Park and the Dotrščina special purpose forest.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	



	Experimental work		NO	Report	YES		(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work	YES		(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and fieldwork. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Prezentacije predavanja i vježbi iz kolegija Okolišno prihvatljive tehnike i tehnologije			NO			YES, Merlin		
	Zečić, Ž., Vusić, D., 2020: Katalog drvnih šumskih proizvoda. Šumarski fakultet Zagreb, 1–182.			YES					
	Pičman, D., 2007: Šumske prometnice. Šumarski fakultet Sveučilišta u Zagrebu, 1–460.			YES					
	Pandur, Z., Šušnjar, M., Zorić, M., Nevečerel, H., Horvat, D., 2015: Energy Return on Investment (EROI) of Different Wood Products (ed: M. Zlatić, In Tech, 165–184. ISBN 978-953-51-2175-6			YES			YES, web		
2.12. Optional literature	<ol style="list-style-type: none"> Krpan, A.P.B., Poršinsky, T., 2002: Proizvodnost harvesterata Timberjack 1070 pri proredi kulture običnoga bora. Šumarski list 126(11-12): 551–561. Poršinsky, T., Stankić, I., 2005: Prilog poznavanju iznošenja drva šumskim žičarama. Nova meh. šumar. 26: 39–54. Sabo, A., Poršinsky, T., 2005: Skidding of fir roundwood by Timberjack 240C from selective forests of Gorski Kotar. Croat.j. for. eng. 26(1): 13–27. Poršinsky, T., Stankić, I., Bosner, A., 2011: Ecoefficient Timber Forwarding Based on Nominal Ground Pressure Analysis. Croat. j. for. eng. 31(1): 345–356. Poršinsky, T., Ožura, M., 2006: Oštećivanje dubećih stabala pri izvoženju drva forvarderom. Nova meh. šumar. 27: 41–49. Lepoglavec K., 2014: Optimizacija primarne i sekundarne šumske prometne infrastrukture nagnutih terena. Disertacija, Šumarski fakultet, Zagreb, 1-341. Papa I., 2014: Modeli održavanja šumskih cesta na različitim reljefnim područjima. Disertacija, Šumarski fakultet, Zagreb, 1-284. Anon. 2002: Forest Road Engineering Guidebook, British Columbia, Ministry of Forests, p. 1-208. Pandur, Z., Poršinsky, T., Šušnjar M., Zorić, M., Vusić, D., 2014: Gaženje tla pri izvoženju drva forvarderom u sječinama hrasta lužnjka. Nova meh. Šumar. 35: 23-34. Zorić, M., Šušnjar, M., Pandur, Z., Mihaljević, K., 2014: Potrošnja goriva i emisija stakličkih plinova pri kamionskom prijevozu drva u hrvatskom šumarstvu. Nova meh. šum. 35: 89-97. 								



	<p>11. Pandur, Z., Šušnjar, M., Bačić, M., Lepoglavec, K., Nevečerel, H., Đuka, A., 2018: Fuel Consumption of Forwarder in Lowland Forests of Pedunculate Oak. SEEFOR - South-east European forestry. 9: 1; 73-80</p> <p>12. Lindroos, O., La Hera, P., Häggström, C., 2017: Drivers of Advances in Mechanized Timber Harvesting – a Selective Review of Technological Innovation. Croatian journal of forest engineering 38(2017) 2, 243-258.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Dario Baričević, PhD Assist. Prof. Irena Šapić, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Knowledge of vegetation	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	225973	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	<p>The objectives of the course are to introduce students with the vegetation of the Republic of Croatia, i.e. the basic patterns of vegetation distribution, synecological factors crucial for their arrival, floral composition, and its importance and value. The majority of the course is focused on acquainting the students with forest vegetation from the lowland to the subalpine belt of the Mediterranean and Euro-Siberian-North American vegetation regions. From other natural ecosystems, the vegetation of coastal and salt habitats, coastal and continental sand dunes, vegetation of heaths, bogs, rocky habitats and caves will be treated, non-forest vegetation of freshwater habitats and vegetation of natural and semi-natural grasslands. From anthropogenic ecosystems, anthropogenic forest ecosystems, anthropogenic grasslands, agroecosystems, weed vegetation and ruderal vegetation will be treated, which has recently taken an increasingly important place in the vegetation picture. With this knowledge, students will acquire the vegetation knowledge necessary for the preparation of all relevant ecological studies and other bases for the management of natural and pre-natural ecosystems, vegetation monitoring and analysis and valorization of area.</p>		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p>		



<p>contributes</p>	<p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas D2. conduct courses in professional secondary and other similar schools D4. professionally and scientifically upgrade through different educational ways and postgraduate study D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper</p>
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<ol style="list-style-type: none"> 1. Interpret the forest vegetation of Croatia from the ecological, floro-genetic, syntaxonomic and biogeographical point of view. 2. Interpret the non-forest vegetation of Croatia from the ecological, floro-genetic, syntaxonomic and biogeographical point of view. 3. Compare the most important forest communities of the Mediterranean region 4. Distinguish forest and non-forest vegetation of flood and non-flood lowland areas 5. Distinguish Illyrian from Central European forest communities 5. Analyze forest and non-forest vegetation of the Republic of Croatia 6. Present especially valuable and rare plant communities that have primarily a protective and scientific role 7. Compare and analyze the vegetation of anthropogenic ecosystems 8. Present non-forest forms of vegetation 9. Valorize the area based on knowledge about different forms of vegetation and their floral composition
<p>2.5. Course content (syllabus)</p>	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction - geographical position and synecological conditions for vegetation development in the Republic of Croatia. Horizontal and vertical dissection of vegetation of the Republic of Croatia, syntaxonomic review. 2. Description of the most important forest communities of the Mediterranean region. 3. Description of the most important forest communities in the lowland, floodplain area. 4. Description of the most important occasionally flooded and mesophilic and neutrophilic forest communities of lowland and hilly belt of pedunculate oak and sessile oak. 5. Description of the most important acidophilic forest communities of sessile oak and common beech. 6. Description of the most important forest communities of common beech, Central European and Illyrian beech forest. 7. Description and comparison of Pannonian and Dinaric beech-fir forests. Description of the most important fir forests. 8. Description of the most important forest communities of common spruce. Description of of Pinus mugo forest on the upper border of the forest vegetation arrival. 9. Description of especially valuable and rare forest communities that have primarily a protective and scientific role. 10. Description of vegetation of coastal and salt habitats. 11. Description of vegetation of coastal and continental sand dunes. Description of vegetation of temperate heaths. <p>Vegetation of rocky habitats and caves.</p> <ol style="list-style-type: none"> 12. Description of non-forest vegetation of freshwater habitats. 13. Description of vegetation of natural and semi-natural grasslands - open xerothermophilic pioneer communities on carbonate rocky soil, mountain and pre-mountain limestone grasslands, dry continental grasslands, sub-Pannonian steppe grasslands, Pannonian sand grasslands. 14. Description of vegetation of natural and semi-natural grasslands - eumediterranean grasslands, hardland grasslands, eastern sub-Mediterranean dry grasslands, purple moor grasslands, Mediterranean high moist grasslands, hydrophilic edges of high greens along rivers and forests, meadows, meadow and mountain grasslands. 15. Description of vegetation of anthropogenic ecosystems - anthropogenic forest ecosystems, anthropogenic grasslands (wetlands, lowlands, hills), agroecosystems, weed vegetation, ruderal vegetation. <p>Exercises:</p>



	<ol style="list-style-type: none"> 1. Factors of horizontal and vertical distribution of vegetation of the Republic of Croatia. Typical and distinctive species for individual vegetation zones, their morphological characteristics. 2. Altitudinal belts and zones of the Mediterranean region, typical and distinctive species for certain parts of the Mediterranean area and their morphological characteristics, degradation forms and floral composition of holm oak and limestone forests, ubiquitous, rocky vegetation. Xerophilous species. 3. Floral composition of lowland, flooded forest communities. Hydrophilic and hygrophilous species. Typical and distinctive species for individual vegetation units of lowland forests and their morphological characteristics. Wetland sedges. 4. Floral composition of occasional flood and mesophilic, neutrophilic forest communities of lowland and hilly belt. Morphological and ecological characteristics of diagnostic species of pedunculate oak and sessile oak forests. Relationships of flood and non-flood forest ecosystems. 5. Floral composition of acidophilic communities of sessile oak and common beech. Morphological characteristics of representative species. 6. Floral composition of Central European and Illyrian beech forests. Illyrian floral geoelement - morphological and ecological characterization. 7. Floral composition and morphological characteristics of typical and distinctive species of Pannonian and Dinaric beech-fir forests. Floral composition of communities with <i>Abies alba</i>. 8. Floral composition of spruce communities. Typical and distinctive species of montan and altimontan communities of common spruce and their morphological characteristics. Floral composition of frost vegetation and upper forest vegetation boundaries. 9. Representative species of forest communities that have primarily a protective and scientific role and their morphological characteristics. Legally protected, endangered and rare plant species. 10. Plant species of coastal and salt habitats - morphological characteristics, role, significance. 11. Morphological and ecological characterization of plant species of coastal and continental sand dunes, heaths of temperate zone, bogs, rocky habitats and caves. 12. Morphological and ecological characterization of plant species of aquatic habitats. 13. Morphological and ecological characterization of plant species of natural and semi-natural grasslands - open xerothermophilic pioneer communities on carbonate rocky soil, mountain and pre-mountain limestone grasslands, dry continental grasslands, sub-Pannonian steppe grasslands, Pannonian sand grasslands. 14. Morphological and ecological characterization of plant species of natural and semi-natural grasslands - eumediterranean grasslands, hardland grasslands, eastern sub-Mediterranean dry grasslands, purple moor grasslands, Mediterranean high moist grasslands, hydrophilic edges of high greens along rivers and forests, meadows, mowers hilly and mountain grasslands. 15. Characteristic plant species of anthropogenic ecosystems - anthropogenic forest ecosystems, anthropogenic grasslands (wetlands, lowlands, hills), agroecosystems, weed vegetation, ruderal vegetation - morphological characteristics, role, significance. Invasive species. <p>Method of performing exercises - practicum, herbarium collection, field.</p> <p>Field work (two days):</p> <ol style="list-style-type: none"> 1. Introduction to the functioning (synecology, syndynamics, characteristic plant species) and valorization of natural vegetation in urban areas. 2. Introduction to the functioning (synecology, syndynamics, characteristic plant species) and valorization of natural vegetation in protected areas. 		
2.6. Format of instruction	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor </td> </tr> </table>	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work	<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor
<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work	<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor		
	2.7. Comments:		



				<input type="checkbox"/> (other)				
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES
	Experimental work		NO	Report		NO	(other)	
	Essay		NO	Seminar paper		NO	(other)	
	Preliminary exam	YES		Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and fieldwork. Taking colloquia and exams.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Topić, J., Vukelić, J., 2009: Priručnik za određivanje kopnenih staništa u Hrvatskoj prema Direktivi o staništima EU. Državni zavod za zaštitu prirode, 376 str.			YES		YES, Web		
	Vukelić, J., Mikac, S., Baričević, D., Bakšić, D., R. Rosavec, 2008: Šumska staništa i šumske zajednice u Hrvatskoj Nacionalna ekološka mreža. Državni zavod za zaštitu prirode, 263 str.			YES		YES, Web		
2.12. Optional literature	1. Trinajstić, I., 2008: Biljne zajednice Republike Hrvatske, Akademija šumarskih znanosti, Zagreb, 179 str. 2. Vukelić, J., 2012: Šumska vegetacija Hrvatske. Sveučilište u Zagrebu Šumarski fakultet i DZZP, 403 str. 3. Šegulja, N., 2005: Vegetacija travnjaka, cretišta i močvarnih staništa Nacionalnog parka Plitvička jezera. Natura Croatica, 14 (suppl. 2), 1-194.							

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Damir Drvodelić, PhD Assist. Prof. Vinko Paulić, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Nursery production of ornamental plants	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16



1.3. Course code	225975	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of the course is to acquaint students with the reproduction, transplantation, growth and development, as well as trade and marketing of ornamental plants. By mastering this course, students are able to independently propagate ornamental plants and engage in its trade and marketing.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B6. organise and manage professional works on the production of decorative plants B14. develop current technologies as well as implement new technologies C2. perform and manage works in horticultural and communal services		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Present ways of propagating plants in nurseries (generative and vegetative propagation of ornamental plants) Analyse Container Planting (Comparison of root crop rootstocks and containerized seedlings, types of containers with the advantages and disadvantages of each type, conditions required for successful production, work dynamics) Recommend procedures for plant care in nurseries (care work, green fertilization, protection and adaptation of plants in nurseries, ways of planting seedlings) Present and explain the production of large-scale trees (ways of transplanting, factors influencing the success of the transplant, works on increasing value and receiving large trees) Identify the reproduction of individual species, species and cultivars of ornamental trees and shrubs		
2.5. Course content (syllabus)	Lectures: 1. History of nursery plant production in the world and in the Republic of Croatia 2. Introduction to vegetative propagation of ornamental plants 3. Generative propagation of ornamental plants 4. Propagation of ornamental plants by stem cuttings 5. Container production of seedlings Part I 6. Container production of seedlings Part II 7. Care of ornamental plants in the nursery 8. Reproduction of individual genera, species and cultivars of ornamental trees and shrubs Part I 9. Reproduction of individual genera, species and cultivars of ornamental trees and shrubs Part II 10. Nursery production of avenue trees and large trees 11. Growing and care of bonsai and topiary 12. Quality of planting material 13. Application of management in nursery 14. Packing and shipping of plants from nurseries 15. Legislation related to nursery Exercises:		



	<ol style="list-style-type: none"> 1. Generative propagation of ornamental plants Part I 2. Generative propagation of ornamental plants Part II 3. Tools and accessories for vegetative propagation of plants 4. Propagation of African violet by leaf cuttings 5. Propagation of ornamental plants by division 6. Propagation of ornamental plants by stool layer 7. Propagation of magnolias with special reference to simple layer 8. Autovegetative propagation of ornamental plants by stem cuttings 9. Autovegetative propagation of ornamental plants by root cuttings 10. Propagation of ornamental plants by air layer 11. Propagation of ornamental plants by grafting 12. Transplanting and cultivation of rooted cuttings 13. Growing bonsai 14. Evaluating the quality of planting material 15. Calculating the cost price of ornamental plants, market research and marketing 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments: All exercises are performed in the nursery "Šumski vrt i arboretum" of the Faculty of Forestry and Wood Technology, University of Zagreb as a demonstration and practical (working). Two days of fieldwork.		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and field classes. Absence with a maximum of 20 % of lectures and 10 % of exercises is allowed. Making and submitting exercises within the given deadline. Preparation of papers from fieldwork. Taking colloquia, exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Drvodelić, D., 2020: Prezentacije predavanja i vježbi			YES		YES, Merlin			
	Drvodelić, D., 2020: Priručnik za razmnožavanje drvenastih vrsta, 91 str.			YES		YES, Merlin			
2.12. Optional literature	<ol style="list-style-type: none"> 1. Dirr, M. A., C. W. Jr Heuser, 1987: Reference Manual of Woody Plant Propagation (From Seed to Tissue Culture), Athens, 239 str. 2. Ďurkovič, J., J. Krajňáková, 2010: Mikropropagácia drevín v podmienkach in vitro. Technická univerzita vo Zvolene. Lesnícka fakulta, 87 str. 3. Duryea, M. L., T. D. Landis, 1984: Forest Nursery Manual: Production of Bareroot Seedlings (Forestry Sciences). Springer, 396 str. 								



	<p>4. Kock, H., P. Aird, J. Ambrose, G. Waldron, 2008: Growing Trees from Seed: A Practical Guide to Growing Native Trees, Vines and Shrubs. Ken Smith "The London Free Press", 280 str.</p> <p>5. MacDonald, B., 1986: Practical Woody Plant Propagation for Nursery Growers. Timber Press, Inc. Oregon, USA, 660 str.</p> <p>6. Međedović, S., D. Ferhatović, 2003: Klonska proizvodnja sadnica drveća i grmlja. Bemust, Sarajevo, 216 str.</p> <p>7. Mason, J., 2004: Nursery management. Landlinks Press, Australia, 320 str.</p> <p>8. Suszka, B., C. Muller, M. Bonnet-Masimbert, A. Gordon, 1996: Seeds of Forest Broadleaves: from Harvest to Sowing. INRA, 334 str.</p> <p>9. USDA FS [USDA Forest Service] 1948: Woody-plant seed manual. Misc. Pub. 654. Washington, DC: USDA Forest Service. 416 str.</p> <p>10. Young, J. A., C. G. Young, 1992: Seeds of Woody Plants in North America, Portland, 407 str.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Danko Diminić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Forest Mycorrhizae	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	33960	1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students gain basic knowledge on mycorrhizae and their role in forest ecosystems and importance for their hosts. What is the specific symbiotic relationship, how it works. How to identify genera or species.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B9. Organize and manage integrated protection of plants and trees in urban areas and protected natural areas.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning	1. To present a historical overview of mycorrhiza research and its importance. 2. Explain the role of ectomycorrhiza in mineralization and nutrient uptake. List and describe the basic mechanisms of mineralization, and state the effects of ectomycorrhiza on		



outcomes)	<p>mineralization, uptake and plant growth. List and explain the role of ectomycorrhizal fungi in phosphorus uptake.</p> <p>3. Describe and explain the mechanisms of plant protection and interpret the role of ectomycorrhizal fungi in plant protection against disease. List and explain the factors influencing the control of the disease by ectomycorrhizal fungi.</p> <p>4. Demonstrate and interpret the importance and possibilities of using mycorrhizal fungi as one of the indicators of the health condition of forest trees. To connect the health condition of the forest ecosystem with the mycocenosis (taking into account the limitations of the above). Predict the trend and link the health status of the forest stand based on knowledge of the mycocenosis - there are no indications of changes, deterioration or improvement of the health status, as an additional "tool" in determining the health status.</p>								
2.5. Course content (syllabus)	<p>1. Definition of mycorrhiza. Historical review of mycorrhiza research. Types of mycorrhiza and basic characteristics: endomycorrhiza; ectomycorrhiza. Mutualist symbiosis - mycorrhizal community of plants and fungi. Genus and species of fungi that form mycorrhizae.</p> <p>2. The role of ectomycorrhiza in mineralization and nutrient uptake. Mineralization; impacts on mineralization, uptake and growth; phosphorus uptake; biological wear processes; water relations; significance of hyphae of mycorrhizal fungi.</p> <p>3. Mechanisms of disease control by ectomycorrhizal fungi; host-ectomycorrhizal fungus relationship; the role of ectomycorrhizal fungi in protecting plants from disease; factors influencing disease control by ectomycorrhizal fungi; the role of ectomycorrhizal fungi in biocontrol.</p> <p>4. Mycorrhizal fungi as an indicator of the health status of forest trees. Habitat - the role of soil and parent substrate; the impact of abiotic and biotic factors on the health status of forest ecosystems; truncation of tree canopy and association with root mycorrhiza; the role and influence of mycocenosis; change in health status associated with changes in mycocenosis.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Preparation of seminars and exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Smith, S.E. & D.J. Read, 1997: Mycorrhizal Symbiosis. Academic Press, San Diego, 605 str.					2nd level of application of e-learning			



	Diminić, D., 2015-2020: Šumske mikorize (prezentacije predavanja u PDF formatu).		2nd level of application of e-learning
2.12. Optional literature	1. Carlile, M.J. i Watkinson, S.C., 1994: The Fungi. Academic Press Limited, London, 482 str. 2. Pflieger, F.L. i Linderman, R.G. (eds.), 1994: Mycorrhizae and Planth Health. APS Press, St. Paul, 344 str. 3. Butin, H., 1995: Tree Diseases and Disorders. Oxford University Press, Oxford, 252 str.		

COURSE DECIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Damir Barčić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Waste management	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	73831	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Develop basic knowledge of the integrated waste management system (CSGO). Integrating and analyzing recycling and recovery measures into the green economy. Analysis of models of waste disposal, treatment (biological and thermal) and valorization with the aim of sustainability. Development of waste management plans, waste classification.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. After learning the student will be able to make the valorisation of the waste according to its place of origin and its properties. Students will be able to rank recuperation and recycling methods from the point of view of environmental protection and conservation. Students will be able to propose measures and models for reducing waste. 2. After learning, the student will be able to judge and analyse the technologies in waste utilization. The student will be able to present organizational measures for the implementation of the waste management system. Students will be able to critically evaluate waste treatment models and assess their impact on the environment. 3. After learning, the student will be able to classify and evaluate arranged and unmanaged waste landfills. Students will be able to present methods of remediation and reclamation of		



	waste disposal sites. Students will be able to manage and organize waste disposal. The student will be able to valorise the costs of waste disposal.								
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Definition and division of waste. Composition and quantities of waste. 2. Sources of generation and methods of waste prevention. Waste in urban forestry, forestry and wood industry. Waste composting. 3. Differences in waste management according to properties and place of origin. 4. Evaluation of waste substances as secondary raw materials. Sorting and recovery of waste materials in Croatia and abroad. 5. Definition of waste management system. Ways, possibilities and guidelines for waste management in Croatia and in the world. 6. Waste issues through sustainable development. Waste management on the principles of waste avoidance, evaluation and separation. 7. Reducing the amount of municipal and technological waste by applying new technologies in waste recovery. 8. Waste treatment, thermal and biological treatment. Advantages and disadvantages of applying different approaches. 9. Waste as the most important problem in environmental protection. Measures to combat the harmful effects on water, air, soil and wildlife. 10. Legislative framework in environmental protection with special emphasis on regulating the situation with waste and landfills. 11. Problems of landfill remediation. 12. Impact of unregulated and illegal landfills on environmental protection and condition. 13. Waste disposal in the world and in Croatia. Differences, adaptation of existing systems and possibilities in our conditions. 14. Waste and landfill management in urban and rural areas of local self-government units. 15. Waste management strategy in Croatia. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work		<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:				
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises, preparation and presentation of seminar work. Taking colloquia, exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Barčić, D., 2020: Gospodarenje otpadom (interna skripta). Šumarski fakultet, Zagreb.			NO		YES, Merlin			



2.12. Optional literature	<p>Barčić, D., Ivančić, V. (2010): Utjecaj odlagališta otpada Prudinec/Jakuševac na onečišćenje okoliša. Šumarski list 7-8, 347-359.</p> <p>Barčić, D., Dubravac, T., Španjol, Ž. (2010): «Upravljanje komunalnim otpadom na jadranskim otocima». Zbornik radova, međunarodna konferencija «Upravljanje opasnim i neopasnim otpadom u regiji», 325-329.</p> <p>Španjol, Ž., Deželjin, D., & Barčić, D. (2000): «Utjecaj odlagališta otpada Sorinj na stanje okoliša otoka Raba». Zbornik radova VI međunarodnog simpozija «Gospodarenje otpadom Zagreb 2000.»: 475-486.</p> <p>Strategija gospodarenja otpadom Republike Hrvatske (NN 130/105)</p> <p>Plan gospodarenja otpadom Republike Hrvatske 2017-2022</p> <p>Pravilnik o katalogu otpada (NN 90/175)</p> <p>Pravilnik o gospodarenju otpadom (NN 117/17)</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Marko Vucelja, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Zoonoses in natural habitats and urban areas	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225994	1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The course objective is teaching students about the characteristics of diseases transmitted from animals to humans (zoonoses) in forest habitats and urban areas, about their historical significance and the role they will potentially play in the future. Furthermore, course objectives will include teaching about zoonoses (etiology, epizootiology, pathogenesis, treatment, prevention and occurrence) that occur frequently in our country, in EU and worldwide. Gained knowledge will contribute to students' responsible approach to management of natural resources. from the perspective of health care and protection.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide B8. organise and manage wildlife management in protected natural areas C2. perform and manage works in horticultural and communal services		



2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Specify the definition and meaning of zoonoses, reservoirs and disease vectors, name pathogens and link them to zoonoses that they cause</p> <p>2. Describe and interpret the role of small rodents (mice, voles, rats), ticks and wild animals in the spread of certain zoonoses (HVBS, leptospirosis, plague, Lyme borreliosis, tick-borne meningoencephalitis...).</p> <p>3. List the causes and reservoirs of the most common zoonoses in Croatia and Europe, and also the basics of their etiology, epizootiology, pathogenesis, treatment, prevention and occurrence in Croatia and in the region</p> <p>4. Consider the importance of the "One Health" approach in the management and protection of natural resources, future prevention of the occurrence and spread of new emerging infectious diseases</p>								
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> Zoonoses: introduction (definition of zoonoses, vectors, reservoirs, routes of infection, significance of zoonoses, risk groups) The relationship between man and animals (Paleolithic, Mesolithic and Neolithic diseases) Diseases of modern civilization (bacteria, viruses, measles, respiratory syncytial virus, rhinoviruses, salmonellosis, shigellosis, cholera, syphilis, leprosy, tuberculosis, diphtheria) Pandemic diseases: plague, influenza, COVID 19 Hemorrhagic fever with renal syndrome in Croatian forest ecosystems Tick-borne meningoencephalitis in Croatian forest ecosystems Leptospirosis in Croatian forest ecosystems Lyme borreliosis in Croatian forest ecosystems Tularemia in Croatian forest ecosystems Hantavirus pulmonary syndrome, epidemic nephropathy, lymphocytic choriomeningitis virus Mediterranean spotted fever, West Nile fever Zoonoses transmissible to small rodents and ticks in Croatian forest ecosystems Zoonoses in game (trichinosis, rabies) The concept of "One Health" Significance of emergent and reemergent diseases 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, preparation and presentation of seminar work. Taking a colloquium, writing a seminar paper, taking an exam.								
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media						



	Zoonoses – Infections Affecting Humans and Animals by Andreas Sing, Focus on Public Health Aspects, Springer, Bayern, 2015., 1139. str.	NO	Yes, e-learning platform "Merlin"
	Shakespeare, M., 2002: Zoonoses. Pharmaceutical Press, 285 str.	NO	Yes, e-learning platform "Merlin"
	Zoonoses and the origins and ecology of human disease, Fiennes, R. Academic Press, London, 1979, 196.str.	NO	Yes, e-learning platform "Merlin"
	Casil, M., 2005: Hantavirus. The Rosen Publishing Group, 64 str.	NO	Yes, e-learning platform "Merlin"
2.12. Optional literature	<p>Vucelja, M.; Bjedov, L.; Boljfetić, M.; Klobučar, A.; Krčmar, S.; Borak, S.; Modrić, M.; Jurčić, K.; Peleš, V.; Margaletić, J.; Vilibić Čavlek, T. Monitoring of hard ticks at urban recreational sites in the City of Zagreb from 2016 to 2018. <i>Infektološki glasnik</i>, 39 (2019), 2; 33-39.</p> <p>Čordaš, R.; Mojčec Perko, V.; Štritof, Z.; Hađina, S.; Turk, N.; Zečević, I.; Perharić, M.; Milas, Z.; Margaletić, J.; Vucelja, M. et al. Mišoliki glodavci kao rezervoari leptospiroze. <i>Hrvatski veterinarski vjesnik</i> 28 (2020), 1; 38-44</p> <p>Vilibić-Cavlek, T.; Savic, V.; Sabadi, D.; Peric, Lj.; Barbic, Lj.; Klobucar, A.; Miklausic, B.; Tabain, I.; Santini, M.; Vucelja, M. et al. Prevalence and molecular epidemiology of West Nile and Usutu virus infections in Croatia in the "One health" context, 2018. <i>Transboundary and Emerging Diseases</i>, 66 (2019), 5; 1946-1957</p> <p>Mihelčić, M.; Habuš, J.; Vucelja, M.; Svodoba, P.; Kurolt I.-Ch.; Markotić, A.; Turk, N.; Margaletić, J.; Šantić, M. Prevalence of Francisella tularensis in the population of small mammals species in continental forests of Croatia. <i>Šumarski list</i> 9 (2018), 10; 481-486</p> <p>Margaletić, J., Glavaš, M., Turk, N., Milas, Z., Starešina, V., 2002: Small rodents reservoirs of leptospires in the forests of Posavina in Croatia. <i>Glas. šum. pokuse</i> 39: 43–65.</p> <p>Milas, Z., Turk, N., Starešina, V., Margaletić, J., Slavica, A., Živković, D., Modrić, Z., 2002: The role of myomorphous mammals as reservoirs of leptospira in the pedunculate oak forests of Croatia. <i>Veterinarski arhiv</i>, 72(3):119–129.</p> <p>Margaletić, J., 2003: Sitni glodavci šumskih ekosustava kao rezervoari zaraznih bolesti. <i>Acta Medica Croatica</i>, 57: 421–426.</p> <p>Cvetko L., Markotić A., Plyushina A., Margaletić J., Miletić-Medved M., Turk N., Milas Z., Avšič-Županc T., Plyushin A., 2005: Puumala virus in Croatia in the 2002 HFRS Outbreak. <i>Journal of Medical Virology</i>, 77: 290–294.</p> <p>Cvetko L., Turk N., Markotić A., Milas Z., Margaletić J., Miletić-Medved M., Plyushin A., Baranton, G., Postic, D., Avšič-Županc T., 2006: Dual infection with Puumala virus and Leptospira interrogans in bank vole (Clethrionomys glareolus). <i>American Journal of Tropical Medicine and Hygiene</i>, 74(4): 612–614.</p> <p>Markotić, A., Cvetko-Krajinović, L., Margaletić, J., Turk, N., Miletić-Medved, M., Žmak, Lj., Janković, M., Kurolt, I.C., Šoprek, S., Đaković-Rode, O., Milas, Z., Puljiz, I., Ledina, D., Hukić, M., Kuzman, I., 2008: Zoonoses and vector-borne diseases in Croatia - a multidisciplinary approach. <i>Veterinaria Italiana</i>, 45(1): 55-66.</p> <p>Turk, N., Milas, Z., Margaletić, J., Turk, R., Barbić, Lj., Konjević, D., Perić, S., Štritof, Z., Starešina, V., 2008: The role of fat dormouse (Glis glis L.) as reservoir host for spirochete Borrelia burgdorferi sensu lato in the region of Gorski Kotar, Croatia. <i>Eur. J. Wildl. Res.</i>, 54(1): 117–121.</p> <p>Habuš, J., Cvetnić, Ž., Milas, Z., Štritof, Z., Balen-Topić, M., Margaletić, J., Turk, N., 2009: Seroepidemiološko i seroepizootiološko istraživanje leptospiroze u Hrvatskoj tijekom 2007. <i>Infektološki glasnik</i>, 28(4): 183-188.</p> <p>Tadin, A., Turk, N., Korva, M., Margaletić, J., Beck, R., Vucelja, M., Habuš, J., Svoboda, P., Avšič Županc, T., Henttonen, H., Markotić, A., 2012: Multiple Co-infections of Rodents with Hantaviruses, Leptospira and Babesia in Croatia. <i>Vector-Borne and Zoonotic Diseases</i>, 12(5): 388–392.</p> <p>Štritof Majetić, Z., Galloway, R., Ružić Sabljčić, E., Milas, Z., Mojčec Perko, V., Habuš, J., Margaletić, J., Pernar, R., Turk, N., 2014: Epizootiological survey of mouse-like rodents as Leptospira spp. reservoirs in Eastern Croatia. <i>Acta Tropica</i>, 131: 111-116.</p>		



	Prpić, J., Keros, T., Vucelja, M., Đaković Rode, O., Margaletić, J., Habrun, B., Jemeršić, L. 2019: First evidence of hepatitis E virus infection in a small mammal (yellow-necked mouse) from Croatia. PLoS ONE 14(11):e0225583
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Irena Šapić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Typological classifications of vegetation	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	225997	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The objective of the course is to acquaint students with the basic concepts of vegetation typology, ie. to be able to independently define habitats into clearly demarcated units according to existing national and european classifications. Using classification systems, it will give each habitat type the basis for modern management and governance, ie. protection and conservation.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1.independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways A3.apply simpler methods of operation research B3.implement forest management programs B9.prepare ecological studies and forestry parts of spatial plans B14.manage forest, human resource, and technical potential during performance of forest works D1.conduct businesses of scientific and professional associate in scientific-research institutions in the field of forestry D2.conduct courses in professional secondary and other similar schools D4.professionally and scientifically upgrade through different educational ways and postgraduate study D5.gather, process and interpret reference sources and prepare simpler written professional or scientific paper.		
2.4. Expected learning	Present national and international typological classifications of vegetation and habitats. Interpret the basic criteria for the emergence of individual classification systems.		



outcomes at the level of the course (3 to 10 learning outcomes)	<p>Analyze the role of phytocenology in typological classifications and the possibility of categorizing habitats using floral composition.</p> <p>Valorize typological classifications (Natura 2000, Eunis, National Habitat Classification, CORINE, Emerald, forest typology, phytocenological classification).</p> <p>Present the role and importance of knowledge about typological classifications of vegetation in the preparation of ecological studies, spatial plans and management plans.</p>								
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Typological classification of vegetation - definition and objective. 2. Phytocenology in the typological classification of vegetation. 3. International typological classifications of vegetation. 4. Natura 2000. 5. Eunis, CORINE, Emerald. 6. National habitat classification and forest typology. 7. Identification of habitat types. 8. Criteria for delimitation of related and similar vegetation types (set of diagnostic species). 9 The key to identifying and recoding vegetation types. 10. Priority habitat types. 11. Target habitat types. 12. The role and importance of classifications in sustainable management. 13. The role and importance of classifications in the conservation of habitats and the protection of wild plants and animal species. 14. Monitoring the condition and changes of vegetation types. 15. Reporting on the condition and changes of vegetation types. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work	<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)	2.7. Comments:						
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Making seminar work. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Državni zavod za zaštitu prirode, 2014: Nacionalna klasifikacija staništa RH (IV.verzija), 157 str., Zagreb								
	Vukelić, J., S. Mikac, D, Baričević, D. Bakšić, R. Rosavec, 2008: Šumske zajednice i šumska staništa Hrvatske. Državni zavod za zaštitu prirode Republike Hrvatske, Zagreb, 263 str.								



	Topić, J., J., Vukelić, 2009: Priručnik za određivanje kopnenih staništa u Hrvatskoj prema Direktivi o staništima EU. Državni zavod za zaštitu prirode, Zagreb, 376 str.		
	European Commission, DG Environment, 2013: Interpretation Manual of European Union Habitats. EUR 28.		
2.12. Optional literature	<p>1. European Environment Agency, 2002: EUNIS habitat classification. Version 2.3 Copenhagen, EEA (Internet publication: http://mrw.wallonie.be/dgrne/sibw/EUNIS/home.html)</p> <p>2. Bertović, S., 1961: Istraživanje tipova šuma i šumskih staništa. Šum. list 9-10, Zagreb.</p> <p>3. Bertović, S., V. Glavač, 1963: Tipologija šuma. Šumarska enciklopedija II, Zagreb</p> <p>4. NN 88/2014 (23.7.2014.), Pravilnik o popisu stanišnih tipova, karti staništa te ugroženim i rijetkim stanišnim tipovima</p> <p>5. European Environment Agency, 2007: European forest types Categories and types for sustainable forest management reporting and policy. Copenhagen, 111 p.p.</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Škvorc, PhD Prof. Božena Mitić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Invasive plants	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	225998	1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduce students to the problem of invasive plants and the ecological and socio-economic consequences of the spread of invasive plants. Introduce students to ways to address the spread of invasive plants nationally, regionally and globally.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide</p> <p>B1. organize and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas</p> <p>B4. organize and conduct professional field work on the remediation of degraded habitats</p>		



	<p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas C2. perform and manage works in horticultural and communal services C3. perform jobs of professional manager and supervisor in environment and nature protection areas</p>								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>Explain the ways and means of spreading invasive species, and the characteristics of ecosystems and plants themselves that favor the spread of invasive species. Interpret the ecological and socio-economic effects of the spread of invasive plants. Present legislation related to invasive species. Analyze ways to control and prevent the spread of invasive plants. Present the most important invasive plants in Croatia and the EU.</p>								
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Introduction - definitions (indigenous species, non-indigenous species, invasive species, cryptogenic species, etc.); Historical review of invasive plant research. 2. Databases on invasive species. Current research on invasive species. 3. Problems of standardization of terminology and criteria. 4. Ways and means of spreading invasive plants. 5. Ecosystem invasiveness and habitat compatibility. 6. Functional features of invasive plants. 7. Effects of invasive plants (ecological effects, impact on biodiversity, socio-economic effects, case studies). 2 h 8. Legislation (Global, EU, Croatia). 2 h 9. Possibilities of invasive species management, control and prevention methods. 2 h 10. Overview of selected herbaceous invasive plants (global, regional and national). 3h <p>Exercises</p> <ol style="list-style-type: none"> 1. Determination of our most common herbaceous invasive plant species in practicum 4h 2. Determination of plants on the field site 4 h 3. Assessment of ecological effects of invasive species based on field sampling 4h 4. Development of recommendations for control and prevention of the spread of invasive species 3 h 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular class attendance. Taking colloquia and exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		



	Nikolić T., Mitić B., Boršić I. 2014: Flora Hrvatske – Invazivne biljke. Alfa d.d., Zagreb	YES	
	Mitić, B., Škvorc, Ž. Invazivne biljke (Predavanja)		YES, Merlin
2.12. Optional literature	<p>Nikolić T. ur. (2021): Flora Croatica Database. Alohtone biljke (URL https://hirc.botanic.hr/fcd/InvazivneVrste/). Prirodoslovno-matematički fakultet, Sveučilište u Zagrebu.</p> <p>Rejmanek, M, Richardson, D. M, Pyšek, P. 2013: Plant invasions and invasibility of plant communities. U: van der Maarel, Franklin, J. (ur): Vegetation ecology. 2nd ed. Wiley-Blackwell, pp. 387-456.</p> <p>Rotherham I.D., Lambert R.A., ur. (2013): Invasive and introduced plants and animals. Human perceptions, attitudes and approaches to management. Routledge, New York. http://www.issg.org/database/welcome/</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Jura Čavlović, PhD Assist. Prof. Krunoslav Teslak, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Analysis of management plans of park objects	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	226000	1.9. Expected enrolment in the course	8
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	1
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Within the course students will be in detail introduced with contents and structure of management and governance plans of different park recreational objects. Based on introduce lectures about types of park recreational objects, on the base of assigned concrete tasks students will analyse and present management plans for next eight types of park recreational objects: regional park, park forest, nature areas and open spaces, trails and green ways, central park, public city park, neighbour park and sport park. The aim is acquisition of knowledge and skills for contribution in elaboration of management plan for different park recreational objects.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme	B5. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans C1. plan and organize integrated management of the environment		



to which the course contributes										
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1.To analyse elements of description of actual demands and content/compositional wholes of concrete park recreational object</p> <p>2.To define of objectives and aimed state of park recreational object and discrepancies of actual state from the desired</p> <p>3.To compose, plan and evaluate activities and ways of achieving aimed state for the future period and several category of park recreational object</p>									
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Category of park recreational object: regional park 2. Category of park recreational object: park forest 3. Category of park recreational object: nature areas and open spaces 4. Category of park recreational object: trails and green ways 5. Category of park recreational object: central i park 6. Category of park recreational object: public city park 7. Category of park recreational object: neighbourhood park 8. Category of park recreational object: sport park 9. Selection and assignment of seminar themes 10. Selection and assignment of seminar themes 11. Workshops and consultations for elaboration of seminar works 12. Workshops and consultations for elaboration of seminar works 13. Workshops and consultations for elaboration of seminar works 14. Workshops and consultations for elaboration of seminar works 15. Workshops and consultations for elaboration of seminar works <p>Exercises</p> <ol style="list-style-type: none"> 1. Elaboration of seminar works 2. Elaboration of seminar works 3. Elaboration of seminar works 4. Elaboration of seminar works 5. Elaboration of seminar works 6. Elaboration of seminar works 7. Elaboration of seminar works 8. Presentation of seminar works and discussion 9. Presentation of seminar works and discussion 10. Presentation of seminar works and discussion 11. Presentation of seminar works and discussion 12. Presentation of seminar works and discussion 13. Presentation of seminar works and discussion 14. Presentation of seminar works and discussion 15. Presentation of seminar works and discussion 									
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:			
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES		
	Experimental work		NO	Report	YES		(other)			
	Essay		NO	Seminar paper	YES		(other)			
	Preliminary exam		NO	Practical work		NO	(other)			



	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities									
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Management plan of regional park					internet			
	Management plan of park forest					internet			
	Management plan of central park					internet			
	Management plan of public city park					internet			
	Management plan of neighbourhood park					internet			
2.12. Optional literature	Management plans of other types of park recreational objects					internet			

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Hrvoje Nevečerec, PhD Assist. Prof. Krung Lepoglavec, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Multipurpose trails in urban and protected areas	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	226001	1.9. Expected enrolment in the course	12
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Developing competent knowledge in urban and protected areas and implementing complex operational and environmentally acceptable professional solutions, independent decision-making and involvement in economic projects on the issue of urban and protected areas.		
2.2. Enrolment requirements and/or entry competences required for the course	-		



<p>2.3. Learning outcomes at the level of the programme to which the course contributes</p>	<p>A1. independently collect data, statistically process, present and analyse the collected data, discuss and draw conclusions based on the analysed data and distinguish the possibility of different interpretations of the same problem analysed in different ways B2. manage and make independent professional (business) decisions in the field of urban forestry, nature protection and environment B11. apply knowledge of environmentally friendly techniques and technologies for performing forestry work in urban areas and in protected nature objects</p>
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<ol style="list-style-type: none"> 1. Categorize the types of trails and present their purpose and assess the need to establish clear norms and regulations regarding all types of trails. 2. Compare different types of trails and recommend methods of conversion into multi-purpose trails and connect the needs of individual regions with the planning of multi-purpose trails. 3. Plan the development of conceptual designs of multi-purpose trails and explain the need to collect field data on relief features in the area of the planned fitting of multi-purpose trails. 4. Demonstrate the application of new methods and measuring devices and discuss their applicability in the collection of field data. Describe the methods of collecting field data for the preparation of the necessary project documentation. 5. Connect the possibilities of computer programs with the needs of visualizing the project task space, suggest the use of different types of local construction materials for the construction of trails and identify the need for different categories of trails, depending on the perceived needs of users and in accordance with field conditions. 6. Recognize the needs of users for a particular category of trails, present the existing methods of preserving certain categories of trails and analyse the current state of the trail network and critically judge the qualitative-quantitative parameters. 7. Identify the need to build a particular type of trail, describe the need to rationalize costs through conversion into multi-purpose trails and provide places for planning new trails. 8. Discuss potential ways of informing users, show the importance of different types of trails from the recreational-sociological aspect, identify problems related to the lack of specific trails and finally talk about the importance of converting certain categories of trails into multi-purpose trails. 9. Distinguish the needs of users for different categories of trails, assess the use of new techniques and construction materials for multi-purpose trails and identify areas where it is necessary to repurpose existing trails. 10. Explain the course of events leading to dysfunctional trails. Present the possibilities of making trail maps by categories and by complexity, list potential technical solutions in the conversion of existing trails and finally discuss the justification of investment and finding new sources of funding needed for the conversion of trails.
<p>2.5. Course content (syllabus)</p>	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Legislation placed in context with possible spatial advantages and limitations. (2 hours) 2. Defining and comparing certain types of trails (walking, cycling, intervention, hiking, educational, etc.). Technical characteristics of individual types of trails and their purpose. (2 hours) 3. Select a category within the selected track type in relation to the relief area / features. (2 hours) 4. Requirements of individual urban and protected forest areas. (1 hour) 5. Examples of good practice. Analysis of concrete conceptual solutions with reference to raising the added value of the selected area (according to the relief areas). (2 hours) 6. Methods of collecting spatial data and their computer processing in specialized computer programs. (1 hour) 7. Defining the procedures for the preparation of project documentation with regard to the level of the project and the type of trail that needs to be created using a personal computer and specialized or customized computer programs. (1 hour) 8. Possibilities of using locally available construction materials, recognizability of the area identity and fitting into the requirements of the space. (1 hour)



	<p>9. Justification of construction costs of the entire network of trails - analysis of space utilization and functionality and sustainability of the system. Potential sources of funding. (1 hour)</p> <p>10. The final conclusion that emerges from the whole subject. Discussion. Argumentation. Opportunities. Sustainability of the idea. Addressing the issue - why multipurpose trails in urban and protected areas? (2 hours)</p> <p>Exercises:</p> <p>1. The choice of data collection method arises from the conclusions of the lecture (6th lecture). Selection of processing method and introduction to a specialized computer program (CAD platform). (1 hour)</p> <p>2. Basic settings and functionality of a specialized computer program (CAD platform). (2 hours)</p> <p>3. Input and processing of field data on the prepared example (lack due to the impossibility of field teaching) - CAD platform. (1 hour)</p> <p>4. Horizontal path development. Linkage of processed data. Spatial accommodation - definition. Other horizontal components (CAD platform + GIS). (2 hours)</p> <p>5. Vertical path development. Technical characteristics - application. Adapting user needs to the relief area (CAD platform). (2 hours)</p> <p>6. Calculation of spatial parameters. Surfaces. Girth. Other cross-sectional elements (CAD platform). (2 hours)</p> <p>7. Selection of construction technology. Defining construction materials with special emphasis on recyclability. Making cost estimates. (2 hours)</p> <p>8. Development of the final project with all the necessary components. (3 hours)</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	NO
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work	YES		(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises. Taking all (2) colloquia with a minimum of 50% correct answers, taking the exam with a minimum of 50% correct answers on the written part of the exam. Making seminars and independent assignments - an additional option								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Nevečerel, H. & Lepoglavec, K., 2021: Višenamjenske staze urbanih područja – predavanja i vježbe - pptx						Merlin		



	Nevečerel, H. & Lepoglavec, K., 2021: Višenamjenske staze zaštićenih područja – predavanja i vježbe - pptx		Merlin
	USDA Forest Service, 2007: Trail Construction and Maintenance Notebook, International Mountain Bicycling Association (IMBA), the Student Conservation Association (SCA), and the Appalachian Mountain Club, s. 1 – 178 (odabrana poglavlja)		Merlin
2.12. Optional literature	https://www.intelika.hr/proizvodi/autodesk/architecture-engineering-a-construction-collection United States Department Of Agriculture Forest Service, Forest Trail Handbook, http://npshistory.com/publications/usfs/forest-trail-handbook/contents.htm Forest History Society, Trail Building in the National Forests - https://foresthistor.org/research-explore/us-forest-service-history/policy-and-law/recreation-u-s-forest-service/hiking-in-america/trail-building-national-forests/		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Vibor Roje, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Environmental Chemistry	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	226002	1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	1
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	After attending the classes and mastering the material from the subject of Environmental Chemistry, the student will have basic knowledge about the chemistry of environmental phenomena (in the atmosphere, geosphere and hydrosphere), both natural and anthropogenic.		
2.2. Enrolment requirements and/or entry competences required for the course	Attending and passing the exam of a course in the field of chemistry at the undergraduate level.		
2.3. Learning outcomes at the level of the programme to which the course contributes	A2. explaining of the position and trends in urban forestry, nature conservation and environmental protection in the country and in the world B2. managing and making independent professional (business) decisions in the field of urban forestry, nature conservation and environmental protection		



	<p>B13. organizing and implementing ecological monitoring, analysis and valorization of the space and design of park spaces</p> <p>D1. performing of the duties of a scientific and professional co-worker in scientific research institutions in the field of urban forestry, nature conservation and the environmental protection.</p>
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<ol style="list-style-type: none"> 1. to define the environment and the Environmental science as a branch of Science 2. to define the atmosphere, geosphere and hydrosphere 3. to relate chemical phenomena in the atmosphere, geosphere and hydrosphere with knowledge and interpretations of chemical science 4. to distinguish naturally balanced chemical phenomena in the environment from those which are anthropogenically influenced or caused 5. to list and define the types and most prominent examples of hazardous waste 6. to described the toxicological properties of the selected inorganic and organic substances.
<p>2.5. Course content (syllabus)</p>	<p>Lectures, by weeks:</p> <ol style="list-style-type: none"> 1. Introduction to Environmental chemistry What is environmental science? Environmental chemistry and environmental biochemistry. Earth, water, air and technology. Biosphere ecology. Energy and its circulation. Substances and the circulation of substances (cycles of: carbon, nitrogen, oxygen, phosphorus, sulphur). Anthroposphere. Human impact on the environment and pollution. 2. Atmosphere and atmospheric chemistry I History of the atmosphere. Stratification of the atmosphere. Gaseous components of the atmosphere. Physical properties of the atmosphere. Circulation in the atmosphere. 3. Atmosphere and atmospheric chemistry II Atmospheric photochemistry: reactions in the higher atmosphere, photoprocesses in the troposphere. Air pollution: inorganic gases (CO₂, SO₂, NO_x, NH₃, halogen elements and their compounds), organic substances. Smog. Greenhouse effect and global pollution. 4. Atmosphere and atmospheric chemistry III Acid-base reactions in the atmosphere (CO₂, SO₂, O₂, N₂, H₂O). Directives on maximum permissible concentrations of harmful substances in the air. 5. Lithosphere and chemistry of the lithosphere I Definition of the terms 'lithosphere' and 'geosphere' and basic terms in soil chemistry. Properties of matter in the lithosphere - rocks, minerals, ores. Soils and sediments. Extraction of ore resources. Soil mineral composition (oxides and hydroxides of Al, Si, Fe, Mn, non-silicate minerals, secondary clay minerals, ionic dispersions). Soil organic component (humus). Colloidal soil chemistry. Liquid soil phase, aqueous soil solution. 6. Lithosphere and chemistry of the lithosphere II Acidity, alkalinity, salinity of the soil. Soil redox potential. Macronutrients (N, P, K) and micronutrients in soil. Non-metallic materials on Earth. Wood – the main renewable source. Anthropogenic impacts on soil. Directives on maximum permissible concentrations of pollutants in soil. 1st partial exam. 7. Hydrosphere I Quality and quantity of water, water cycle, properties of water. Life in the water. Gases in water (O₂, CO₂). Calcium and other metals in water. Complexing agents and complex species in water. Redox processes. Phosphates and polyphosphates in water. Naturally present chlorinated and brominated compounds in water. Humic substances in water. 8. Hydrosphere II Water systems, ocean systems. Acid rain. Water treatment (for domestic or industrial use, wastewater); removing of: solid particles, calcium and other metals (Fe, Mn), inorganic compounds, organic compounds; water disinfection. Natural water purification processes. 9. Hydrosphere III Water pollution. Types of water pollution. Chemical elements as pollutants. Heavy metals, metalloids, organometallic species, inorganic anionic species. Acidity, alkalinity, salinity. Organic pollutants (soaps, detergents, pesticides, biorefractive pollutants, sewage sludge). Radionuclides. Directives on maximum permissible concentrations of harmful substances in water. 10. Phase interactions



	<p>Interactions between different phases in the environment: water–soil/sediments, water–air, soil–air. Ionic exchanges between water and sediments. Exchange of phosphorus between water and sediments. Organic compounds on sediments and suspended particles. Pore waters. Groundwater and wells. Gas sorption. 2nd partial exam.</p> <p>11. Industrial ecology Minerals, metals, non-metallic materials, wood.</p> <p>12. Hazardous waste in the environment Brief historical overview, classification of hazardous substances and solvents. Sources of hazardous solvents. Flammable substances. Reactive substances. Corrosive substances. Toxic substances.</p> <p>13. Toxicological chemistry Definition and basic concepts of toxicology. Inorganic toxins. Heavy metals. Non-metals. Organic toxins. Organometallic substances.</p> <p>14. Environmental chemistry of selected chemical elements Chemical properties and environmental performance of selected heavy metals (mercury, cadmium, chromium, nickel, lead) and semi-metals (arsenic, antimony).</p> <p>15. Selected chapters in Environmental chemistry In the last teaching term in the semester, selected topics in the field of environmental chemistry will be discussed on the basis of research and results published in world scientific journals. Topics will be chosen according to the interest and affinities of the students who will attend classes of this course. 3rd partial exam.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments: The methods of teaching can be subject to revision in the (near) future, according to the experience in teaching of the subject (number of students enrolled, response / opinion of students after completing the obligations of the subject, etc.).		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular class attendance.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	R.A. Bailey, H.M. Clark, J.P. Ferris, S. Krause, R.L. Strong, Chemistry of the Environment, 2nd Edition, Academic Press, San Diego, 2002.								



	S.E. Manahan, Environmental Chemistry, 7th Edition, Lewis Publishers, Boca Raton, 2000.	On the internet
2.12. Optional literature	N . Pernar, Tlo – nastanak, značajke, gospodarenje, šumarski fakultet, Zagreb, 2017. K.H. Tan, Principles of Soil Chemistry, 4th Edition, CRC Press – Taylor & Francis Group, Boca Raton, 2011.	

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marilena Idžojić, PhD Assist. Prof. Igor Poljak, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Selection and use of ornamental trees and shrubs in the landscape design	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	226003	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire knowledge about the selection and use of woody ornamental plants for landscaping outdoor and indoor green areas and spaces based on various criteria. The goal is to achieve an aesthetically pleasing and functional space by properly selecting and arranging woody ornamental plants, which form the basis of most gardens and parks, and are an important decorative element in interiors as well. Students will learn which criteria should be taken into account when choosing woody plants, according to the specifics and characteristics of green areas and spaces, but also according to the requirements of users or projects. They also acquire the skill of choosing individual woody ornamental plants based on these criteria.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B5. apply knowledge related to horticultural dendrology and recommend and choose tree species in urban areas B13. organize and implement ecological monitoring, space analysis and valorization, and landscape design		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Categorize ornamental woody plants according to morphological and biological features important for landscape design. 2. Categorize ornamental woody plants according to their possible application in landscape design. 3. Categorize ornamental woody plants according to the negative effects they have in landscape design.		



	<p>4. Use aesthetic, biological and ecological criteria for plant selection. 5. Narrow the selection of plants based on relevant criteria. 6. Narrow down the selection to aesthetically acceptable and environmentally sustainable plants that are realistically available. 7. Assess the applicability of ornamental woody plants according to the characteristics and conditions of the space. 8. Assess the applicability of ornamental woody plants according to project requirements.</p>								
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Selection of ornamental woody plants according to habit and growth rate. 2. Selection of ornamental woody plants according to durability, texture, size, shape, consistency and color of leaves. 3. Selection of ornamental woody plants according to the shape, size, color, scent and sexuality of the flowers. 4. Selection of ornamental woody plants according to the shape, size, color, smell and structure of cones and fruits. 5. Selection of ornamental woody plants according to the color and texture of the bark, and the color, thickness and shape of the shoots in winter. 6. Specificity of ornamental woody plants in a particular season. Selection of ornamental woody plants according to the time of leafing, flowering, fruiting, leaf fall and fruit fall. 7. Selection of ornamental woody plants for different habitat conditions. 8. Selection of ornamental woody plants for focal points, tree lines and hedges. 9. Selection of ornamental woody plants for ground cover, climbers and creepers. 10. Selection of ornamental woody plants for rock gardens, roof and vertical gardens. 11. Selection of ornamental woody plants for Christmas trees, windbreaks, topiaries and bonsai. 12. Selection of ornamental woody plants for garden pots, for houseplants and for arranging. 13. Selection of ornamental woody plants to increase biodiversity and benefits for animals. Autochthonous and allochthonous woody plants: advantages and disadvantages of choice. 14. Negative effects: toxicity of certain plant parts, prickles or thorns, unpleasant odor or structure of plant organs, allergies, aggressiveness of the root system, the possibility of uncontrolled spread. 15. Particularly significant and popular genera or groups of plants. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance at lectures. Writing seminar paper. Passing final exam.								



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Idžojić, M., 2005: Listopadno drveće i grmlje u zimskom razdoblju. Šumarski fakultet Sveučilišta u Zagrebu. 256 pp.	YES	
	Idžojić, M., 2009: Dendrologija – List. Šumarski fakultet Sveučilišta u Zagrebu. 904 pp.	YES	
	Idžojić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp.	YES	
2.12. Optional literature	<ol style="list-style-type: none"> 1. Bärtles, A., P. A. Schmidt, 2014: Enzyklopädie der Gartengehölze. Verlag Eugen Ulmer, Stuttgart, 888 pp. 2. Blanus, T., M. Garratt, M., Cathcart-James, L. Hunt, R.W.F. Cameron, 2019: Urban hedges: A review of plant species and cultivars for ecosystem service delivery in north-west Europe. <i>Urban Forestry & Urban Greening</i> 40: 126391. 3. Brickell, C. (Ed.), 2003: RHS A-Z encyclopedia of garden plants, Vol. I-II. Dorling Kindersley, London. 4. Capiella, K., T. Schueler, J. Tomlinson, T. Wright, 2006: Urban watershed forestry manual. Part 3. Urban tree planting guide. USDA Forest Service. 72 pp. 5. Church, G., 2002: Trees and shrubs for foliage. Firefly Books, Willowdale. 159 pp. 6. Dirr, M. A., 2011: Dirr's encyclopedia of trees and shrubs. Timber Press. 952 pp. 7. Edwards, J., 2006: Shrubs and climbers. Lorenz Books, London. 256 pp. 8. Farjon, A., 2010: A handbook of the world's conifers. Vol. I-II. Brill, Leiden. 9. Gelderen, D. M. van, P. C. de Jong & H. J. Oterdoom, 1994: Maples of the world. Timber Press, Portland, Oregon. 458 pp. 10. Gelderen, D. M. van & J. R. P. van Hoey Smith, 1996: Conifers: The illustrated encyclopedia. Timber Press. 11. Gilman, E. F., 1997: Trees for urban and suburban landscapes. Delmar Publishers. 688 pp. 12. Hillier, J., A. Coombes (eds.), 2007: The Hillier manual of trees and shrubs. A David and Charles Books, Cincinnati. 512 pp. 13. Houtman, R., 2004: Variegated trees and shrubs. Timber Press, Portland. 338 pp. 14. Idžojić, 2019: Dendrology: Cones, Flowers, Fruits and Seeds. Elsevier – Academic Press, London, San Diego, Cambridge, Oxford. 800 pp. 15. Stoeklein, M. C., 2011: The complete plant selection guide for landscape design. Purdue University Press. 750 pp. 16. Taylor, S. L., W. A. Niering, 1979: Garden guide to woody plants: A plant handbook. Connecticut College Arboretum, Bulletin No. 24. 102 pp. 17. Van Dijk, H., 1998: Encyclopaedia of border plants. Rebo Productions. 320 pp. 18. Vermeulen, N., R. Rosenfeld (ed.), 1998: Encyclopaedia of house plants. Rebo Productions, Lisse. 19. Vertrees, J. D., 2001: Japanese maples. Timber Press, Portland. 332 pp. 20. Welch, H. J., 1979: Manual of dwarf conifers. Theophrastus, Little Compton. 493 pp. 		



1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Igor Poljak, PhD Prof. Marilena Idžojić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Rare and protected autochthonous woody plants	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	226004	1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire theoretical and practical knowledge about rare and protected autochthonous woody species that are not included in the course Dendrology, and which are important for nature protection in Croatia. Theoretical knowledge includes biological properties, morphological characteristics, intraspecific variability, range, special characteristics and ecological importance of species. Practically, students acquire the ability to identify rare and protected autochthonous woody species according to various morphological characteristics: habit, leaves, flowers and fruits.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B10. carrying out ecological studies and forestry parts of spatial plans. B13. organize and implement ecological monitoring, space analysis and valorization, and landscape design		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Define and explain the biological properties and morphological characteristics of genera of rare and protected autochthonous woody species; 2. Identify and describe rare and protected autochthonous woody species by habit, leaves, flowers and fruits; 3. Use keys to determine rare and protected autochthonous woody species; 4. Group rare and protected autochthonous woody species according to biological properties, morphological characteristics, range and ecological importance. 		
2.5. Course content (syllabus)	Lectures: <ol style="list-style-type: none"> 1. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Anacardiaceae, Asteraceae, Berberidaceae and Betulaceae. 2. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Boraginaceae, Caprifoliaceae and Chenopodiaceae. 3. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Cistaceae, Convolvulaceae and Grossulariaceae. 4. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Ericaceae, Euphorbiaceae and Globulariaceae. 5. Biological properties, morphological characteristics, range and ecological importance of rare and protected indigenous woody species within the genera of the family Fabaceae (first part). 		



6. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within genera of the family Fabaceae (second part).
7. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera of the family Fabaceae (third part).
8. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within genera of the Lamiaceae family.
9. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Malvaceae, Oleaceae and Polygalaceae.
10. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Ranunculaceae and Rhamnaceae.
11. Biological properties, morphological characteristics, range and ecological importance of rare and protected indigenous woody species within genera of the family Rosaceae (first part).
12. Biological properties, morphological characteristics, range and ecological importance of rare and protected indigenous woody species within genera of the family Rosaceae (second part).
13. Biological properties, morphological characteristics, range and ecological importance of rare and protected indigenous woody species within genera of the family Rosaceae (third part).
14. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Rubiaceae, Rutaceae and Salicaceae.
15. Biological properties, morphological characteristics, range and ecological importance of rare and protected autochthonous woody species within the genera from the families Solanaceae, Tamaricaceae and Thymelaeaceae.

Exercises:

1. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Anacardiaceae, Asteraceae, Berberidaceae and Betulaceae.
2. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Boraginaceae, Caprifoliaceae and Chenopodiaceae.
3. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Cistaceae, Convolvulaceae and Grossulariaceae.
4. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Ericaceae, Euphorbiaceae and Globulariaceae.
5. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Fabaceae (first part).
6. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Fabaceae (second part).
7. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Fabaceae (third part).
8. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Lamiaceae.
9. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Malvaceae, Oleaceae and Polygalaceae.
10. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Ranunculaceae and Rhamnaceae.



	<p>11. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Rosaceae (first part).</p> <p>12. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Rosaceae (second part).</p> <p>13. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the family Rosaceae (third part).</p> <p>14. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Rubiaceae, Rutaceae and Salicaceae.</p> <p>15. Determination of shoots with leaves, flowers and fruits - exercises with the use of plant material and keys for determination - species from the families Solanaceae, Tamaricaceae and Thymelaeaceae.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input checked="" type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report	YES		(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance at lectures and exercises. Writing exercise reports. Passing final exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Idžojtić, M., 2009: Dendrologija – List. Šumarski fakultet Sveučilišta u Zagrebu. 904 pp.			YES					
	Idžojtić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp.			YES					
	Ministarstvo zaštite okoliša, 2013: Pravilnik o strogo zaštićenim vrstama. Narodne novine 144/2013.						Internet		
	Nikolić, T., J. Topić, 2005: Crvena knjiga vaskularne flore Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode, Zagreb. 693 pp.			YES					
2.12. Optional literature	<p>1. Alegro, A., S. Bogdanović, S. Brullo, 2012: Astragalus croaticus (Fabaceae), a new species from Croatia. Ann. Bot. Fennici 46: 569-573.</p> <p>2. Anić, M., 1946: Dendrologija. Šumarski priručnik I, Zagreb. 475-582 pp.</p> <p>3. Bogdanović, S., I. Boršić, I. Rešetnik, T. Šegedin, 2012: Taxonomic revision of the genus Fumana (Cistaceae) in Croatia. Plant Biosystems 146, Suppl. 1: 69-85.</p> <p>4. Forenbacher, S., 1990: Velebit i njegov biljni svijet. Školska knjiga, Zagreb.</p>								



	<p>5. Fukarek, P., 1981: Endemne i rijetke vrste drveća i grmlja dinarskog područja i njihova introdukcija na područje Biokova. Acta Biokov. Radovi o prirodi biokovskog područja 1:169-188.</p> <p>6. Herman, J., 1971: Šumarska dendrologija. Stanbiro, Zagreb. 470 pp.</p> <p>7. Kovačić, S., T. Nikolić, M. Ruščić, M. Milović, V. Stamenković, D. Mihelj, N. Jasprica, S. Bogdanović, J. Topić, 2008: Flora jadranske obale i otoka. Školska knjiga d.d., Zagreb, Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu. 558 pp.</p> <p>8. Matić, S. (ur.), 2011: Šume hrvatskoga Sredozemlja - Forests of the Croatian Mediterranean. Akademija šumarskih znanosti, Hrvatske šume d.o.o., Hrvatsko šumarsko društvo, Zagreb. 740 pp.</p> <p>9. Nikolić, T. (ur.), 2020: Flora Croatica Database. http://hirc.botanic.hr/fcd/</p> <p>10. Praprotnik, N., 2004: Blagajev volčin - naša botanična znamenitost. Prirodoslovni muzej Slovenije, Ljubljana. 65 pp.</p> <p>11. Radić, J., 1976: Bilje Biokova. Institut "Planina i more" – Malakološki muzej, Makarska. 237 pp.</p> <p>12. Šilić, Č., 1973: Atlas drveća i grmlja. Zavod za izdavanje udžbenika, Sarajevo. 218 pp.</p> <p>13. Šilić, Č., 1984: Endemične biljke. Svjetlost, Sarajevo. 227 pp.</p> <p>14. Šilić, Č., 2005: Atlas dendroflora (drveće i grmlje) Bosne i Hercegovine. Matica Hrvatska, Čitluk i Franjevačka kuća, Masna Luka. 575 pp.</p> <p>15. Šumarska enciklopedija Vol. I-III, 1980-1987. JLZ Miroslav Krleža, Zagreb.</p> <p>16. Topić, J., J. Vukelić, 2009: Priručnik za određivanje kopnenih staništa u Hrvatskoj prema Direktivi o staništima EU. Državni zavod za zaštitu prirode, Zagreb. 376 pp.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ante Seletković, PhD Prof. Renata Pernar, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Collection and processing of 3D data	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code	226006	1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	1.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduce students to the importance of using three-dimensional spatial data. Explain the methods of collection, sources and methods of 3D data processing. Develop basic knowledge and skills in processing and applying 3D data from various sources of remote sensing.		
2.2. Enrolment requirements and/or entry competences required for the course	-		



2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1 - independently collect data, statistically process, present and analyze the collected data, discuss and draw conclusions based on the analyzed data and distinguish the possibility of different interpretations of the same problem analyzed in different ways.</p> <p>B10 - make ecological studies and forestry parts of spatial plans</p> <p>B13 - organize and implement ecological monitoring, analysis and valorization of space and design of park spaces</p> <p>B14 - improve existing technologies as well as introduce new technologies</p> <p>D4. professionally and scientifically improve through various educational forms and postgraduate studies</p>								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Analyze the possibility of applying 3D data.</p> <p>2. Improve skills in 3D data manipulation.</p> <p>3. Think critically about the use of 3D data.</p> <p>4. Apply knowledge of how to collect and process 3D data.</p>								
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction, historical development 2. Problems of 3D data. 3. Sources of 3D data (Aerial photogrammetric imaging, Laser scanning, Satellite imagery, Unmanned aerial vehicles). 4. Ways of collecting 3D data. 5. Methodology of 3D data processing. 6. Two main approaches for obtaining information from 3D point clouds (ITA, ABA). 7. Products from 3D point clouds. 8. Possibility of application of 3D data obtained by digital stereophotogrammetry from aerial photographs. 9. Development of digital model of crown height (DMVK), digital model of crown surface (DMPK), digital model of relief (DMR) from various sources of remote sensing. 10. Making orthophotos from different sources of remote sensing. 11. Comparison of accuracy of field measured data and 3D data. 12. Laser imaging, laser scanning from the air (ALS), scanning from the ground (TLS), scanning from space (SLS). 13. Lidar, Advantages and disadvantages of lidar recording. 14. Use of 3D data in monitoring protected areas and urban areas. 15. Area of application of 3D data. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.								



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Lecture presentations	NO	YES, Merlin
	Martin Weinmann, 2016: Reconstruction and analysis of 3D scenes, Springer	NO	YES, internet
2.12. Optional literature	1. Balenović, I., L. Xinlian, L. Jurjević, J. Hyyppä, A. Seletković, A., Kukko, 2020: Hand-Held Personal Laser Scanning – Current Status and Perspectives for Forest Inventory Application. . CROATIAN JOURNAL OF FOREST ENGINEERING. 2. Balenovic, I., M. Gašparović, A. Šimić Milas, A. Berta, A. Seletković, 2018: Accuracy Assessment of Digital Terrain Models of Lowland Pedunculate Oak Forests Derived from Airborne Laser Scanning and Photogrammetry. CROATIAN JOURNAL OF FOREST ENGINEERING, Volume: 39, Issue: 1, Pages: 117-128. 3. Special Issue "3D Point Clouds in Forests", https://www.mdpi.com/journal/remotesensing/special_issues/3D_forest		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Nikola Pernar, PhD Academic Igor Anić Academic Goran Durn Assist. Prof. Ivan Perković, PhD Prof. Darko Bakšić, PhD Assoc. Prof. Stjepan Mikac PhD	1.7. Number of ECTS credits	5
1.2. Course title	Remediation of degraded land	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The goal is to provide a student the knowledge and skills in the of area that suffered the reduction of ecological functions or utilization opportunities caused by natural or anthropogenic factors. Furthermore, the goal is for students to acquire the competencies needed for an interdisciplinary approach in the design of a remediation project and the implementation of remediation procedures.		



	Finally, the goal is to refer the students in the optimization of remediation procedures in routine management measures where degradation changes cannot be avoided (soil compaction by transport, open pit mines).
2.2. Enrolment requirements and/or entry competences required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A2. explain position and trends of urban forestry, nature conservation and environmental protection in the country and worldwide B4. organise and manage professional works on improvement of degraded habitats B7. organise and manage professional works on the soil and water management and protection C2. perform and manage works in horticultural and communal services
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Identify the most important forms of land degradation. Valorize the influence of soil degradation and his role in lands degradation. Recognize the relative relationships of sensitivity, vulnerability, and recoverability of soils and lands. Present the most suitable remediation methods for a specific case. 2. To predict the development of erosion processes. Recommend appropriate preventative anti-erosion measures. Establish measures for remediation of eroded lands. 3. Select and apply the corresponding recovery methods for acidity or alkalinity soils. 4. Select and apply the corresponding remediation methods for contaminated soils. Evaluate the engagement of the company authorized to implement remediation measures of lands. Establish monitoring and evaluate the effects of remediation of the contaminated soil. 5. Analyze the specifics of surface mining for the apply of remediation measures. Select corresponding soil remediation method. Develop and / or participate in the development of a remediation project. Evaluate the implementation of remediation in terms of the application of technical and biological measures. 6. Determine a degradation processes as a result of petroleum mining. Preventive measures for the progression of degradation. Conclude on the proportions of degradation and design of the optimal remediation method. 7. The landfill classification. Recommend the optimal method for remediation a landfill. Appropriate control measures for air, soil and water. 8. Create principles for selecting plant species for biological remediation. Select plant species for a degraded land remediation project. Predict and evaluate the processes of biological habitat remediation. Evaluate the effects of biological remediation. 9. Assess the nature of forest habitat degradation. Biological remediation of fire site. Create a plan for the biological remediation of forest land. 10. Evaluate the causes of individual or massive drying of trees in the stand. Appropriate technical and biological measures of land remediation.
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction. Soil and land degradation. Soil and land remediation. 2. Soil remediation methods and procedures. Soil compaction. Soil coverage. 3. Soil in remediation by erosion of degraded lands Soil and soil erosion. Remediation of eroded soil. 4. Soil remediation in slope of the construction work. Surface mining and soil degradation. Soil in surface mine reclamation. Soil acidity and acidification. Remediation of acid soil. Alkalinity and alkaline soil remediation. 5. Remediation of contaminated soil. Sampling and analysis of contaminated soil. Physical remediation processes. 6. Remediation of contaminated soil. Physico-chemical remediation processes. Chemical remediation processes. 7. Remediation of contaminated soil. Biological methods of remediation. Contraindications in the remediation of contaminated soil. Soil remediation planning. 8. Environmental impacts of mining and their remediation. 9. Surface mines remediation. 10. Remediation of oil drilling waste. 11. Remediation of landfill waste.



	<p>12. Introduction to the biological aspect of soil remediation: definition, purpose, goals, possibilities, duration, physiological processes. Silvicultural principles for soil conservation.</p> <p>13. Selection of plant species for biological remediation: criteria, biological properties, ecological requirements, reproductive material. Planning, implementation and control of biological remediation.</p> <p>14. Biological remediation of eroded soil, surface mines, landslides, landfills, fires site, contaminated soil and weedy soil.</p> <p>15. Silvicultural process in conditions of individual and mass dying trees in the stand. Elimination of invasive neophytes.</p> <p>Laboratory exercises:</p> <ol style="list-style-type: none"> 1. Indicators of soil compaction and their use in remediation planning (soil texture, soil density, water permeability, ratio of macro- and micro-pores) (2 hours). 2. Determining the dose of calcium carbonate for acid soil remediation (2 hours). 3. Determining the dose of acidifying agents for alkaline soil remediation (2 hours) 4. Oxidation of soil contaminated with organic matter (2 hours). <p>Auditory exercises:</p> <ol style="list-style-type: none"> 1. The silvicultural strategy for biological remediation (1 hour) 2. Examples of biological remediation (2 hours) 3. Assessing causes and silvicultural access in conditions of individual and mass dying trees in the stand (1 hour). <p>Seminars:</p> <ol style="list-style-type: none"> 1. Seminar on surface mines remediation (2 hour) 2. Seminar on remediation of oil drilling waste. <p>Field courses:</p> <ol style="list-style-type: none"> 1. Remediation of quarries or landslides (1 day) 2. Remediation of landfills or industry-degraded land (oil extraction and transport). 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular arrival and active participation in lectures, exercises and fieldworks. Preparation of reports on laboratory exercises and (possible) preparation and presentation of seminar work. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			



	Pernar, N., D. Bakšić & I. Perković, 2020: Sanacija degradiranog tla. Sveučilište u Zagrebu, Šumarski fakultet, 156 p.	YES	
	Pernar, N., D. Bakšić & I. Perković, 2013: Terenska i laboratorijska istraživanja tla. Sveučilište u Zagrebu, Šumarski fakultet, 192 p.	YES	
2.12. Optional literature	Kisić, I., 2012: Sanacija onečišćenog tla. Sveučilište u Zagrebu, Agronomski fakultet, 271 p.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Renata Pernar, PhD Prof. Ante Seletković, PhD Assist. Prof. Jelena Kolić, PhD Assist. Prof. Mario Ančić, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Spatial analysis and valorisation	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+0
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduction to the types and models of spatial data, sources and methods of gathering data for spatial analysis and evaluation of space. Introduction to the basic methods and possibilities of application of spatial analysis and evaluation of the urban and the protected areas.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B10. prepare ecological studies and forestry parts of spatial plans B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas B14. develop current technologies as well as implement new technologies		



	D4. professionally and scientifically upgrade through different educational ways and postgraduate study
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Pronounce the definition of spatial analysis. Distinguish ordinary from spatial information. Describe and explain sources of spatial data. Recognize and apply types and forms of spatial data. Create spatial databases. 2. Describe and explain models of spatial data. Carry out the procedure georeferencing. Link thematic and geometric data. Explain and carry out interpolation of thematic variables. 3. Pronounce the definition of a digital relief model. Explain the ways of creating and editing of DEM data. Carry out a vectorization process of contour lines. Create DEM. Show and compare DEM visualization methods 4. Generate new variables based on the DEM. Show the creation of different raster layers based on the DEM. Present and explain terrain categorization using DEM. Create a digital orthophoto (DOP). Interpret and explain the data obtained from DEM and DOP 5. Compare and describe the analysis of vector and raster data. Collect data and show data analysis (overlay analysis, operations on location/distance, network analysis, thematic mapping). Creating queries into built database. Compare and describe the analysis of vector and raster data. Collect data and show data analysis (overlay analysis, operations on location/distance, network analysis, thematic mapping). Creating queries into built database 6. Explain fragmentary statistics. Calculate the area and perimeter of polygons, distance, correlation and distance of the same polygons. Analyse isolated polygons with aim of determining the homogeneity and / or heterogeneity of the studied area 7. Distinguish models for determining and quantifying spatial elements of land use, land cover and habitat. Classify results of image interpretations. Analyse the classification results and overlap them with other raster and vector content. Explain the significance of spatial analysis in the evaluation of urban and protected areas
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction to spatial analysis, spatial data 2. Spatial data types and forms, sources and formats 3. Thematic and geometric data, concepts of their storage 4. Georeferencing, orthorectifying, methods of creating thematic maps 5. Spatial data models, raster and vector models, possibilities exchange of geodata with other systems 6. Fragmentary statistics. Generating variables for the conduction of fragmentary statistics (area and perimeter of polygons, distance of line objects, number of polygons per unit of surface, number of linear elements in an area, link and distance of the same polygons, analysis of neighbourhood polygons) 7. Fragmentary statistics with the aim of determining the homogeneity and heterogeneity of the studied area, data selection, analysis of selected data 8. Spatial analysis (vector, raster), zoning, search, thematic overlapping, extracting content, autocorrelation, merging surfaces and content 9. Overlapping the vectors and rasters of the observed area with aim of evaluating and analyzing space. 10. Data sources for DRM creation, DRM creation methods 11. Creating DRM and linking thematic data with DMR Interpretation 12. visualization of digital relief model (DRM) 13. Generating new variables based on DRM (general and specific geomorphometry) 14. Creating orthophoto (DOP), application in urban forestry, nature and environmental protection 15. Valorization of spatial elements in urban and protected areas. Quantification of spatial elements of land use, land cover and habitat, significance of spatial analysis and spatial valorization in urban and protected areas <p>Exercises:</p> <ol style="list-style-type: none"> 1. Establish, use, maintain and update databases 2. Connection of thematic and geometric data, importance of thematic data 3. Ways of interpolation of thematic variables and their spatial distribution 4. Georeferencing, orthorectifying



	<p>5. Fragmentary statistics. Area and perimeter of polygons, distance of line objects, number of polygons per unit of surface, number of linear elements in an area, link and distance of the same polygons, analysis of neighbourhood polygons</p> <p>6. Creating different thematic maps</p> <p>7. Spatial Analysis in GIS. Zoning, search, thematic overlapping, extracting content, autocorrelation, merging surfaces and content</p> <p>8. Overlapping vector and raster of the observed area with aim of evaluating and analyzing the space.</p> <p>9. Quantification of spatial elements of land use, land cover and habitat</p> <p>10. Vectorization of contour lines, data editing to create the DRM</p> <p>11. Interpolation and extrapolation of data.</p> <p>12. Digital relief model (DRM) - creation, interpretation, visualization (2D, 3D)</p> <p>13. Generation of new variables based on created DRM (exposure, slope, visibility analysis ..)</p> <p>14. Making a digital orthophoto (DOP), application in urban forestry, nature and environmental protection</p> <p>15. Valorization of spatial elements in urban and protected areas, calculation of habitat characteristics, ecological sizes for studying vegetation, climate, selection of species for planting with regard to slope, sunshine, exposure and relief, ecological niches</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Within the course, with the regular attendance of lectures and exercises, students create individual assignments during the semester. Taking an exam is through the midterm exam and oral exam								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Lang, S. & T. Blaschke, (2010): Analiza krajolika pomoću GIS-a			YES					
	Skidmore A. (2003): Environmental Modelling with GIS and Remote Sensing. Taylor & Francis, London, 268 str.					YES			
	Andričević R., H. Gotovac, I. Ljubenkov, (2007): GEOSTATISTIKA: umijeće prostorne analize, Udžbenik			YES					
	Pernar R. Seletković, A. (2019): Prezentacije s predavanja					YES			



	Maguire, D. J., Batty, M. (ur.) (2005): GIS, Spatial Analysis, and Modeling. ESRI Press, USA. 480 str.		YES
	Ključanin, S., Poslončec-Petrić, V., Bačić, Ž. (2018): Osnove infrastrukture prostornih podataka, Sarajevo: Dobra knjiga. 166 str.		YES
2.12. Optional literature	Blaschke, T., Stefan Lang, S., Hay, G. J (2008): Object-Based Image Analysis, Spatial Concepts for Knowledge-Driven Remote Sensing Applications. Springer-Verlag Berlin Heidelberg. 828 str. Richards, J. A. (2013): Remote Sensing Digital Image Analysis, An introduction. Springer-Verlag Berlin Heidelberg. 494 str. Haines-Yonng, R., Green D, Cousinss (1993): Landscape ecology and GIS, Teylor & Francis, London, 288.str. Lane, S. N., Richards, K. S., Chandler, J. H. (ur.) (1998): Landform Monitoring, Modelling and Analysis. John Wiley & and sons Ltd. Baffin Lane, Chichester, West Sussex, England. 466 str.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Stjepan Posavec, PhD Assist. Prof. Karlo Beljan, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Ecotourism	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+8
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students will gain the knowledge about the: ecotourism, sustainable development of tourism, and carrying capacity as the basis for understanding of the issue of ecotourism. To perceive the role of forestry in deveopment of ecotourism activities. Methods of evaluation environment services and economic valorisation of area.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection		



	B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To present sustainable tourism development and basics of touristic policy (specific tourism forms, factors and sustainable development principles, environmental economics and environmental management, sustainable tourism, UNCED agenda 21) 2. To analyse place and role of the tourism in national economy, correlation between tourism, traffic and inhabitants (tourism as a set of complementary products and services, direct and indirect economic effect, capital redistribution, the influence of inhabitants on environment and development of ecological conscious in tourism) 3. To define characteristics of tourism resources and markets (specifics and elements of touristic market, development trends, main inbound and outbound markets, touristic resources classification) 4. Valorise environmental goods in tourism, to analyse the role of forestry in tourism (economic evaluation of the space in tourism, evaluation goals and methods, use value, contingent value ecosystem services, environmental goods and services, wood and non-wood forest products, eco-agro tourism as a driver of sustainable tourism)								
2.5. Course content (syllabus)	Lectures: 1. Introduction and history development of tourism 2. Sustainable tourism development and basis of tourism policy 3. Place and role of tourism in national economy 4. Distribution of international tourism 5. Market, supply and demand 6. Characteristics of tourism market 7. Touristic resources and attractions 8. Correlation of tourism, traffic and population 9. Influence of population on environment 10. Role of forestry in tourism 11. Ecoagrotourism 12. Evaluation of environment values in tourism 13. Carrying capacity in tourism 14. Kontingent method and Travel cost method 15. PES model for payment ecosystem services Exercises: 1. Processing topics related to supply and demand examples for products and services in ecotourism. Field work: A practical example of the role of forestry in the development of ecotourism. Visit to the protected area and get acquainted with the management model and management.								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary		NO	Practical		NO	(other)		



	exam			work					
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, preparation and presentation of seminar work. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	MÜLLER H. (2004) Turizam i ekologija, povezanost i područja djelovanja, Masmedia, Zagreb								
	Bilen, M. (2011) Turizam i okoliš, Mikrorad do.o., Zagreb								
	Posavec S., Šegotić, K., Čaklović, L., 2006: Selection of biological parameters in the evaluation of natural resources, Periodicum biologorum, VOL. 108, No 6, 671-676, Zagreb								
	Posavec, S., Beljan, K., Cvjetičanin, N. 2015: Rezultati vrednovanja općekorisnih funkcija šuma u NP Krka, Znanstveno stručni skup NP Krka, ur. Drago Marguš, Zbornik radova, Šibenik, str.630-642								
2.12. Optional literature	<p>1. WEB site Svjetske turističke organizacije (World Tourism Organization) sekcija Sustainable tourism i sekcija vezana uz Svjetsku konferenciju o ekoturizmu u Quebecu, 2002 (http://www.world-tourism.org), Madrid</p> <p>2. WEB site Obrazovne, znanstvene i kulturne organizacije Ujedinjenih naroda (United Nations Educational, Scientific and Cultural Organization) – opisi zaštićenih prirodnih područja (http://www.unesco.org), Paris</p> <p>3. WEB SITE Ministarstvo gospodarstva i održivog razvoja RH – (https://mzoe.gov.hr/), Zagreb.</p> <p>4. Europski šumarski institut Joensuu, Finska, www.efi.int</p>								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Anamarija Jazbec, PhD Assist. Prof. Mislav Vedriš, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Statistical methods and modelling in forestry	1.8. Number of hours in semester (L+E+F+e-learning)	15+30+0
1.3. Course code		1.9. Expected enrolment in the course	25



1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	The objective of the course is to introduce students to several selected statistical methods commonly used in forestry and to teach them to independently process, present and analyse compiled data. To introduce students to the possibility of various interpretations of the same problem analysed in different ways.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Design survey questionnaire and determine the sample size (composing the questionnaire, creating and organizing database, sampling methods, determination of sample size for desired precision of estimate – mean and proportion, determination of sample size for binomial distribution) 2. Explain comparison of two frequency distributions (chi-square test) 3. Present correlation analysis (define correlation in population and estimate correlation coefficient; testing statistical significance of correlation coefficient based on random sample) 4. Formulate analysis of variance: comparing more than two population means; parametric (ANOVA) and non-parametric test (Kruskal-Wallis), defining multiple comparison (post-hoc) test of difference between populations; graphical presentation using statistical software 5. Present regression analysis: define and classify types of regression, model building methods, indicators and tests for model goodness of fit, testing statistical significance of estimated parameters, graphical presentation using statistical software		
2.5. Course content (syllabus)	Comparing the equality of frequency distribution of two categorical variables-Chi2 test Correlation analysis (define the population correlation and the correlation coefficient, test the statistical significance of the estimated correlation coefficient on a random sample) Analysis of variance (comparison of more than two population means, parametric (ANOVA) and nonparametric (Kruskal - Wallis test), Post-hoc tests. Regression analysis (univariate and multivariate): define and classify regression analysis, bulinding methods of regression model, forward, backward and stepwise), testing the adequacy of the developed model (ANOVA, coefficient of determination, MSE). Testing the statistical significance of the estimated model parameters. Some nonlinear regression models. Growth models.		
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work	<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)	2.7. Comments: Exercises are performed on computers using statistical software.
2.8. Monitoring student work	Class attendance	YES	Research NO Oral exam YES



	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises, preparation and presentation of seminar work. Taking colloquia, exams.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Jazbec A . (2005) PRIRUČNIK IZ STATISTIKE. Interna skripta.			NO			YES. All materials in written and video form are on the Merlin platform		
2.12. Optional literature	1. Sokal R.R., Rohlf F.J. (1995) Biometry, Freeman and Company, New York 2. Zar J.H.(1999) Biostatistical analysis, Prentice Hall 3. Sparks T. (2000) Statistics in Ecotoxicology, Wiley & Sons, New York 4. Jongman R.H.G., Braak C.J.F., van Tongeren (2002) Data Analysis in Community and Landscape Ecology, Cambridge University Press								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Ida Katičić Bogdan, PhD Prof. Saša Bogdan, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Conservation of genetic diversity of forest trees	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+16
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire theoretical and practical knowledge of the principles and methods of conservation of genetic diversity and genetic resources of forest trees. Students are also		



	introduced to the goals of forestry policy, legislation and the economic aspect of conservation of genetic diversity, as well as its importance and significance in the forest ecosystem (assessments of quantitative and qualitative genetic diversity, in situ and ex situ methods, etc.)
2.2. Enrolment requirements and/or entry competences required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1 to independently collect data, statistically process, display and analyze collected data, discuss and draw conclusions based on the analyzed data and discern the possibility of different interpretations of the same problem analyzed in different ways</p> <p>B2 to manage and make independently professional (business) decisions in the fields of urban forestry, nature protection and the environment</p> <p>B3 to develop and implement management plans and programs in forest ecosystems of protected nature facilities and management in specific urban forest ecosystems</p> <p>B4 to organize and carry out professional field work on the restoration of degraded habitats</p> <p>B13 to organize and implement ecological monitoring, analysis and valorization of spaces and design of park spaces</p> <p>D1 to perform the duties of scientific and professional associate in scientific research institutions in the field of urban forestry, nature protection and environment protection</p>
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ol style="list-style-type: none"> 1. Interpret the genetic structure and conservation strategy (importance of conservation of genetic resources and sustainable management in forest biodiversity, evolutionary genetics and phenotypic, morphological and physiological variability of forest trees). 2. Present in situ methods of conservation of genetic diversity of forest trees (selection of target species, management and monitoring of genetic resources, number of required populations for gene banks). 3. Present ex situ methods of conservation of genetic diversity of forest trees (sample size, preservation of genetic material, method of multiple population breeding, the concept of the least sustainable population size). 4. Interpret the restoration of the genetic potential of forest trees (indicators of genetic erosion of the species, dangers to genetic diversity, genetic pollution, conservation of genetic diversity in forestry practice and conservation models in forest trees).
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Concepts of biological and genetic diversity. 2. Methods for determining genetic diversity using genetic tests. 3. Methods for determining genetic diversity using genetic markers. 4. Factors shaping genetic diversity (mutations, gene migrations). 5. Factors shaping genetic diversity (selection, genetic drift, inbreeding). 6. Geographical variability of forest trees (provenances, races, ecotypes, ecocline). 7. Spatial genetic variability at the population (stand) level 8. Temporal changes in the genetic diversity of forest trees. 9. Effective population size, population sustainability analysis, minimum viable population. 10. Biodiversity legislation. 11. Methods of in situ conservation of genetic diversity. 12. Methods of ex situ conservation of genetic diversity. 13. Management and monitoring of genetic resources, management of forest genetic resources in forestry practice 14. Management of genetic conservation units (seed stands, clone archives, genetic banks). 15. Legislation on forest reproductive material <p>Exercises</p> <ol style="list-style-type: none"> 1. Setting a hypothesis about the genetic diversity of a species with regard to its range, habitat, type of pollination and seed distribution and historical factors (practicum) 2. Population sampling planning and selection of genetic markers according to research objectives (practicum) 3. Introduction to laboratory methods for DNA analysis with a tour of the laboratory (laboratory)



	<p>4. DNA isolation with a kit for DNA isolation from plant material (laboratory). 5. Introduction to the principles of capillary electrophoresis, readings of allele lengths and the formation of genotype tables on the example of microsatellite markers (practicum) 6. Calculation of allele frequency and genotypes, HW equilibrium on an example with more than two alleles (practicum) 7. Calculation of inbreeding coefficient and effective population size (practicum) 8. Calculation of genetic parameters (percentage of polymorphic loci, average number of alleles per locus, expected heterozygosity of microsatellite markers (practicum) 9. Calculation of genetic distances between populations on the example of microsatellite markers (practicum) 10. Calculation of the influence of gene migrations and selection on genetic diversity (practicum) 11. Synthesis of the results of previous exercises, discussions and conclusions about the genetic diversity of the suitable species for the used markers based on the obtained results (practicum) 12. Genetic tests - basics of calculating the parameters of genetic variability of quantitative traits - Analysis of variance (practicum) 13. Independent design of models for conservation of exemplary populations, planning of research, monitoring and management of exemplary populations - group work - (practicum) - Part I (molecular markers) 14. Independent design of models for the preservation of exemplary populations, planning of research, monitoring and management of exemplary populations - group work - (practicum) - II. part (genetic tests, quantitative traits) 15. Independent design of models for the preservation of exemplary populations, planning of research, monitoring and management of exemplary populations - group work - (practicum) - III. part (in situ and ex situ conservation models of an exemplary species / population</p> <p>FIELD WORK: In the field, students are introduced to specific examples of degradation of stands and ways to restore and preserve forest genetic resources, with the legal regulations of seed stand management, transfer and use of forest reproductive material and genetic tests.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work				<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Class attendance								



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Bogdan, S., I. Katičić Bogdan, 2016. Genetika s oplemenjivanjem drveća i grmlja. Interna recenzirana skripta. 224. str. (selected chapters)	No	YES, Merlin
2.12. Optional literature	Ballian D., Kajba D. Oplemenjivanje šumskog drveća i očuvanje njegove genetske raznolikosti, Šumarski fakultet Sveučilišta u Zagrebu i Šumarski fakultet Univerziteta u Sarajevu 2011. White, T. L., W. T. Adams, D. B. Neale, 2007: Forest Genetics. Wallingford, UK, Cambridge, CAB International. p682. Forest Genetic Resources Conservation and Management: In Managed Natural Forests and Protected Areas (in situ). International Plant Genetics Research Institute (2002). Young, A., Boshier, D., Boyle, T. 2000. Forest Conservation Genetics: Principles and Practice. CABI. 368 str		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivan Martinić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Preparation and management of ecological projects	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	35
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The objective of the course is to develop students' knowledge and skills in approaching and participating in the preparation and implementation of environmental projects. Students acquire knowledge of the basic laws of implementation of environmental projects and mastering the techniques of preparation and participation in the implementation of projects. The goal is to understand the phases and elements of the project cycle and strengthen the skills of performing various activities independently. Emphasis is placed on the student's ability to apply a logical matrix in project preparation in order to master the connection of purpose, goals and activities with the choice of methods and techniques to achieve the expected project results. By presenting the actually implemented projects, students are instructed in different roles in project planning and implementation in order to see their own possibilities to 'be a good team player in the project' and apply successful ways of getting involved in projects. By reviewing the most important environmental programs and projects in the Republic of Croatia and insight into the possibilities of their (co) financing,		



	students are encouraged to identify opportunities and favorable opportunities for (co) financing and active participation in the preparation and implementation of environmental projects.
2.2. Enrolment requirements and/or entry competences required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	B5 - participate in the implementation of the program for the management of protected nature objects B9 - cooperate in the development of environmental impact studies and spatial plans, C1 - plan and organize integrated environmental management C3 - apply current legislation in the management of protected nature objects C4 - conduct environmental monitoring C5 - calculate basic business performance indicators, compile basic financial reports, identify types of costs, define and analyze costs D1 - continue training at graduate university studies at the Faculty of Forestry, Department of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<ul style="list-style-type: none"> • Explain the role and importance of projects to achieve general and specific objectives • Explain the individual phases of the project cycle • Apply project's tools: stakeholder analysis, SWOT analysis, 'problem tree' and analysis of project-related objectives • Define the scheme of project organization with work plan and project time schedule • List the key elements for assessing the cost-effectiveness of the project • Identify areas of possible project application by creating a list of project ideas • List the main EU funds through which environmental projects are financed and explain the specifics (criteria and conditions) of funding • Make a project proposal, according to the standard project application form, for the environmental education project • Compile an indicative project budget with a breakdown of total costs by basic groups of expenditures
2.5. Course content (syllabus)	<p>(P) Environmental projects: definition, role and significance. Specifics of environmental projects: types, elements / structure, conception, project objectives.</p> <p>(P) Project resources: people, resources, time.</p> <p>(P) Project development and project cycle: initialization, identification, formulation, implementation, evaluation.</p> <p>(V) Project tools: stakeholder analysis, SWOT analysis, collection methods</p> <p>(V) Situation analysis: analysis of problems and goals, development of an action plan.</p> <p>(P) Projects and teamwork: characteristics and functioning of the team, stages in team development, team potential.</p> <p>(V) Assessing the potential of associates and teams</p> <p>(P) Planning and decision making in the team, communication and motivation. Cohesion and conflicts in teamwork</p> <p>(V) Group decision-making techniques</p> <p>(P) Organization and management of environmental projects. Project organization: project organization, project tactics</p> <p>(P) Monitoring, control and reporting: control points, indicators and intermediate results. Reporting and corrective action.</p> <p>(V) Types of indicators: quantitative and qualitative indicators</p> <p>(P) Project economics: project budget, funding sources, risk management, overall project impact assessment.</p> <p>(V) Calculation of project profitability</p> <p>(P) Application and financing of environmental projects. Structure of the project proposal: profile of the project holder / contractor, introductory context of the project idea, expected results.</p> <p>(V) Guidelines and principles in project applications. Presentation of the project proposal.</p>



	<p>(P) Content, working methods and dynamics of project implementation, project budget. (V) Examples of structuring a project budget.</p> <p>(P) Dissemination of results. Promotion / bequest and communication with the public.</p> <p>(P) Project evaluation: objectives, tasks, methods and indicators of evaluation.</p> <p>(V) Evaluation methods and approaches. Models of evaluation questionnaires</p> <p>(P) Funding opportunities from domestic and foreign funding sources. Peculiarities of financing from EU funds.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Attending lectures and exercises, participating in the production of (group) seminar work								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Martinić, I.: Priprema i vođenje ekoloških projekata. Interna zbirka prezentacija, Šumarski fakultet Zagreb 2020					YES, Merlin			
	Upravljanje projektnim ciklusom i pristup logičke matrice, (priručnik) pripremila Lidija Pavić-Rogošić, izdavač: Lokalna razvojna agencija PINS d.o.o., 2012					YES, web			
	Pisanje prijedloga projekata i odnosi s javnošću/odnosi s medijima (priručnik), Infohouse, Sarajevo 2014					YES, web			
	Osnove uspješne provedbe projekata (priručnik), autor A. Fresl, Algebra, Zagreb 2010					YES, web			
2.12. Optional literature	<ul style="list-style-type: none"> • Boers, M. Kako voditi i financirati projekte? : [priručnik za udruge]. Zagreb : Europski dom Zagreb, 2002. • Martinić, I.: Upravljanje zaštićenim područjima prirode – planiranje, razvoj i održivost, Šumarski fakultet u Zagrebu, Zagreb 2010. • TenStep proces upravljanja projektima, Primakon 2010 • Bendeković, J. Priprema i ocjena investicijskih projekata. Zagreb : Foip 1974, 2007. • Bešlić, B. Upravljanje EU projektima. Zagreb : TIM4PIN, 2014. • Horine, G. Vodič za upravljanje projektima: od početka do kraja. Zagreb : Dva i dva, 2009. • Radnich, M. EU fondovi na dohvata ruke : praktični vodič kroz europske fondove, programe, natječaje i bespovratna sredstva. Zagreb : Folpa, 2012. 								



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Španjol, PhD Assoc. Prof. Daniel Krstonošić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Protected nature parts	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Introduction to the categories of protected nature parts (Law on Nature Protection), NATURA 2000 areas; endangered categories (Red Books, Rulebook on strictly protected species). Presentation of the elements necessary for the establishment of a protection institution. Understanding and application of current laws related to protected natural values. Methods of protection and review and evaluation of protected spatial parts of nature and rare, endangered and endemic species of flora and fauna. Identifying the causes of endangered flora and habitats and assessing the negative impact on biodiversity.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B1. organise and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To present the endangerment of flora and fauna, overview of endangered taxa in the Republic of Croatia (endangerment categories, methods and assessment criteria, legal protection, causes of endangerment, implementation of protection measures, endangered taxa, distribution, habitat) 2. To identify the causes of endangerment of flora and habitats and identify disadvantages and negative impacts on plant diversity. 3. To analyze protected areas within the European ecological network Natura 2000, legislative framework in nature protection, development of expert bases in nature protection and analysis of natural values		



	4. To identify spatial categories of protection, national parks, nature parks (historical development, spatial plans, zoning, management plans, financing).								
2.5. Course content (syllabus)	<p>Lectures</p> <ol style="list-style-type: none"> 1. Introduction to the issue of protection of biological and landscape diversity in the Republic of Croatia. Description and objectives of the module. 2. Classification and description of parts of nature protected by law and especially valuable in the Republic of Croatia (proclamation, management, protection) 3. Spatial categories of protected parts of nature (national park, nature park, strict reserve, special reserve, regional park, natural monument, significant landscape, forest park, monument of park architecture). 4. National parks (proclamation, fundamental phenomenon, zoning, management, valorization, monitoring). 5. Nature parks (proclamation, ecological-landscape values, management, valorization, monitoring). 6. Other spatial categories of protected parts of nature (proclamation, ecological-landscape values, management, valorization, monitoring) 7. Characteristics and distribution of the National Habitat Classification 8. European Ecological Network-NATURA 2000 9. Red books and red lists. Criteria and categorization of endangered flora and fauna according to IUCN. 10. Review and analysis of the state of endangerment of the vascular flora in the world and in Croatia. 11. Main causes of endangerment of flora, fauna and impact on habitat types and reduction of biodiversity. Influence of foreign invasive plants on indigenous flora and fauna. Habitat fragmentation 12. Introduction to the most important representatives of rare and endangered plant species in the flora of Croatia. Systematic affiliation. Morphological characteristics and ecological requirements of species. Prevalence in Croatia and Europe. Causes of endangerment and protection measures. 13. Endemics in Croatian flora. Introduction to the most important representatives of endemic plant species in the flora of Croatia. Systematic affiliation. Morphological characteristics and ecological requirements of species. Prevalence in Croatia and Europe. Causes of endangerment and protection measures. 14. Introduction to the most important representatives of protected plant species in the flora of Croatia. Systematic affiliation. Morphological characteristics and ecological requirements of species. Prevalence in Croatia and Europe. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								



2.10. Student responsibilities	Regular attendance and active participation in lectures preparation and presentation of seminars. Passing preliminary exams, exams.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Španjol, Ž., 1993: Uloga posebno zaštićenih objekata prirode u turizmu, Glas. šum. pokuse, posebno izdanje 4: 231-242, Zagreb.	NO	YES, Merlin
	ŠPANJOL, Ž., 1994: Problematika nacionalnih parkova u svijetu i u Republici Hrvatskoj. Glas.šum.pokuse 30: 61-94, Zagreb.	NO	YES, Merlin
	Radović, J., 1999: Pregled stanja biološke i krajobrazne raznolikosti Hrvatske sa strategijom i akcijskim planovima zaštite. Zagreb: Državna uprava za zaštitu prirode i okoliša.	NO	YES, Merlin
2.12. Optional literature	<ol style="list-style-type: none"> 1. Rauš, Đ., 1991: Zaštita prirode i čovjekova okoliša. Šumarski fakultet, Sveučilište u Zagrebu, Zagreb. 2. Attenborough, D. i Hughes, J., 2000: Život na našem planetu - moje svjedočanstvo i vizija budućnosti, Školska knjiga d.d., Zagreb. 3. SABOR Republike Hrvatske, 1997: Propisi o zaštiti okoliša, Zagreb. 4. World Resources 2000-2001: People and Ecosystems: The Fraying Web of life, 2000: Elsevier Science. Oxford. 5. Ekološki leksikon, 2001: Barbat i Ministarstvo zaštite okoliša i prostornog uređenja RH. Zagreb. 6. Topić, J., Vukelić, J., 2009: Priručnik za određivanje kopnenih staništa u Hrvatskoj prema Direktivi o staništima EU. Zagreb: Državni zavod za zaštitu prirode. 7. Nikolić, T., Topić, J., Vuković, N., ur. 2010: Botanički važna područja Hrvatske. Zagreb: Školska knjiga, Prirodoslovnomatematički fakultet. 8. Britvec, M., Bogdanović, S., Ljubičić, I., Vitasović Kosić, I. 2015: Rijetke biljke jadranskog priobalja. Zagreb: Sveučilište u Zagrebu, Agronomski fakultet. 9. Nikolić, T., Milović, M., Bogdanović, S., Jasprica, N., 2015: Endemi u hrvatskoj flori. Alfa d.d. 492 str. 10. Nikolić, T., Topić, J., 2005: Crvena knjiga vaskularne flore Republike Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode. 11. Antolović, J., Frković, A., Grubešić, M., Holcer, D., Vuković, M., Flajšman, E., Grgurev, M., Hemidović, D., Pavlinić, J., Tvrtković, N., 2006: Crvena knjiga sisavaca Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode. 12. Ozimec, R., Bedek, J., Gottstein, S., Jalžić, B., Slapnik, R., Štamol, V., Bilandžija, H., Dražina, T., Kletečki, E., Komerički, A., Lukić, M., Pavlek, M., 2009: Crvena knjiga špiljske faune Hrvatske. Ministarstvo kulture; Državni zavod za zaštitu prirode RH. 13. Tutiš, V., Kralj, J., Radović, D., Ćiković, D., Barišić, S., 2013: Crvena knjiga ptica Hrvatske. Ministarstvo zaštite okoliša i prirode; Državni zavod za zaštitu prirode RH. 14. Šašić, M., Mihoci, I., Kučinić, M., 2015: Crvena knjiga danjih leptira Hrvatske. Ministarstvo kulture; Državni zavod za zaštitu prirode RH. 15. Tkalčec, Z., Mešić, A., Matočec, N., Kušan, I., 2008: Crvena knjiga gljiva Hrvatske. Ministarstvo kulture; Državni zavod za zaštitu prirode RH. 16. Mrakovčić, M., Brigić, A., Buj, I., Čaleta, Č., Mustafić, P., Zanella, D., 2006: Crvena knjiga slatkovodnih riba Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode RH. 17. Belančić, A., Bogdanović, T., Franković, M., Ljuština, M., Mihoković, N. Vitas, 2008: Crvena knjiga vretenaca Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode. 18. Jelić, D., Kuljerić, M., Koren, T., Treer, D., Šalamon, D., Lončar, M., Podnar Lešić, M., Janev Hutinec, B., Bogdanović, T., Mekinić, S., Jelić, K. 2015: Crvena knjiga vodozemaca i gmazova hrvatske. Ministarstvo zaštite okoliša i prirode; Državni zavod za zaštitu prirode; Hrvatsko herpetološko društvo HYL A. 		



	<p>19. Jardas, I., Pallaoro, A., Vrgoč, N., Jukuć-Peladić, S., Dadić, V., 2008: Crveni knjiga morskih riba Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode.</p> <p>20. Aničić, B., Koščak, V., Bužan, M., Sošić, L., Jurković, S., Gašparović, S., Kušan, V., Bralić, I., Dumbović-Nilušić, B., Furlan-Zimmermann, N., Cimerman, R., Veseli, Ž., 1999: Krajolik-Sadržajna i metoda podloga krajobrazne osnove Hrvatske. Studija. Ministarstvo prostornog uređenja, graditeljstva i stanovanja - Zavod za prostorno planiranje i Agronomski fakultet Sveučilišta u Zagrebu - Zavod za ukrasno bilje i krajobraznu arhitekturu, Zagreb.</p> <p>21. NATURA 2000 i ekoturizam u Hrvatskoj. Državni zavod za zaštitu prirode. 16 str., Zagreb.</p> <p>22. NATURA 2000 i prostorno planiranje u Hrvatskoj. Državni zavod za zaštitu prirode. 20 str., Zagreb.</p> <p>23. NATURA 2000 i šumarstvo u Hrvatskoj. Državni zavod za zaštitu prirode. 16 str., Zagreb.</p> <p>24. NATURA 2000 u Hrvatskoj. Državni zavod za zaštitu prirode. 16 str., Zagreb.</p> <p>25. NATURA 2000 i monitoring u Hrvatskoj. Državni zavod za zaštitu prirode. 16 str., Zagreb.</p> <p>26. Martinić, I., 2010: Upravljanje zaštićenim područjima prirode - planiranje, razvoj i održivost. Sveučilište u Zagrebu, Šumarski fakultet, 368 str., Zagreb.</p> <p>27. Nikolić, T., 2020: FLORA CROATICA Vaskularna flora Hrvatske 1. Alfa d.d. 262 str.</p> <p>INTERNET PORTALI: http://www.haop.hr/hr/; http://www.conservation.org/; https://en.unesco.org/; http://www.greenpeace.org/; http://www.fao.org/; http://www.dnr.de/; https://www.iucnredlist.org/ Časopisi: "World Conservation - IUCN Bulletin"; "Šumarski list"; "Priroda"; "Okoliš", „Socijalna ekologija“ i dr.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Academic Igor Anić Assoc. Prof. Stjepan Mikac, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Virgin forests and forest reserves	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	1
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The task of this course is to acquaint students with virgin forests and forest reserves, and especially with European virgin forests and virgin forests in Croatia. Knowledge of virgin forests is useful in natural forest management. In addition to the development of science,		



	<p>especially forestry, the virgin forests also serves the conservation of plant and animal species, gene pool, has educational, aesthetic and cultural value. We understand the virgin forests as a school of nature that provides opportunities to learn about the natural life path of the forest from its emergence to dying, ie decay and simultaneous re-emergence. In the practice of forest management, this corresponds to the period from the emergence of the forest to the removal of the old stand and simultaneous restoration. Given that Croatia is dominated by natural forests, which are managed according to the principles of natural approach, it is extremely important to know the processes that take place in the virgin forests. The course is conceived in such a way that students from other faculties, especially from the group of natural and biotechnical students, can listen to it without prior forestry knowledge.</p>	
<p>2.2. Enrolment requirements and/or entry competences required for the course</p>	<p>-</p>	
<p>2.3. Learning outcomes at the level of the programme to which the course contributes</p>	<p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems B12. manage forest, human resource, and technical potential during performance of forest works in urban areas and protected natural areas</p>	
<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<p>1. Present the meaning and role of virgin forests and forest reserves, ontogenetic development of virgin forests (meaning and role of virgin forests and forest reserves, anthropogenic impact, phylogenetic development of forests, approaches and methods of research of virgin forests and forest reserves, ontogenetic forest development - pioneer, transitional and final forests, distribution in the World and the Republic of Croatia) 2. Determine the structure and texture of the virgin forests (initial, optimal, terminal, selective and other phases and stages of the virgin forests, dynamics and stability of the virgin forests) 3. Analyze the comparison of virgin forests and managed forests (physical maturity, dying, dead and decaying trees, deadwood decomposition, regeneration in virgin forests, virgin forests zoocenosis, use of knowledge from rainforest in forest management, concept of natural forest management, comparison of virgin and managed forests)</p>	
<p>2.5. Course content (syllabus)</p>	<p>1. Definitions of virgin forests and forest reserve; the meaning and role of the virgin forests; anthropogenic impact. 2. Prevalence of virgin forests in the world, Europe, Croatia. 3. Phylogenetic development of forests; silvigenetic forest development (pioneer, transitional and final forest with examples). 4. Approaches and methods of research of virgin forests and forest reserves. 5. Virgin forests structure (initial phase, optimal phase, terminal phase, selection phase, other phases), virgin forests texture 6. Virgin forests dynamics with examples of development cycles; virgin forests stability. 7. Production of virgin forests ecosystem. Growth and increment forest trees in the virgin forests; physical maturity; dying. 8. Dead and decaying trees; decomposition of dead wood. 9. Regeneration in the virgin forests. 10. Zoocenosis of the virgin forests. 11. Analysis of virgin forests in Croatia: beech-fir virgin forests, beech and oak virgin forests 12. Forest reserves in Croatia. 13. Virgin forests in Europe. 14. Virgin forests structure of the tropical area; virgin forests of the boreal area, taiga. 15. Use of knowledge from the virgin forests in forest management; the concept of natural forest management; comparison of virgin and managed forest.</p>	
<p>2.6. Format of instruction</p>	<p><input type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning</p>	<p><input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory</p>
		<p>2.7. Comments:</p>



	<input checked="" type="checkbox"/> field work		<input type="checkbox"/> work with mentor <input type="checkbox"/> (other)					
2.8. Monitoring student work	Class attendance	YES		Research	YES		Oral exam	YES
	Experimental work		NO	Report		NO	(other)	
	Essay		NO	Seminar paper		NO	(other)	
	Preliminary exam		NO	Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures. Preparation of a seminar paper. Taking exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Anić, I., 2004: Prašume i njihovo značenje za gospodarenje šumama u Hrvatskoj. Glasnik zaštite bilja, 6(27): 85–96, Zagreb.			YES				
	I. Anić, M Oršanić, 2003: Bukove prašume. U: Obična bukva u Hrvatskoj, Akademija šumarskih znanosti, 414 – 434, Zagreb.			YES				
	Matić, S., B. Prpić, Đ. Rauš, A. Vranković, Z. Seletković, 1979: Ekološko-uzgojne osobine specijalnih rezervata šumske vegetacije Prašnik i Muški bunar u Slavoniji. U: Đ. Rauš (ur.), Drugi kongres ekologa Jugoslavije, Savez društava ekologa Jugoslavije, str. 767 – 823, 1979, Zagreb.			YES				
	J. Vukelić, Z. Seletković, 2001: Bukovo-jelove prašume hrvatskih dinarida. U: Obična jela u Hrvatskoj, Akademija šumarskih znanosti, 479 – 492, Zagreb.			YES				
	Prpić, B., Z. Seletković, 1996: Istraživanja u hrvatskim prašumama i korištenje rezultata u postupku s prirodnom šumom. U: B. Mayer (ur.), Unapređenje proizvodnje biomase šumskih ekosustava, 97 – 104, Šumarski fakultet Sveučilišta u Zagrebu i Šumarski institut, Jastrebarsko, Zagreb.			YES				
2.12. Optional literature	<ol style="list-style-type: none"> 1. Wirth, Christian. (2009). Old-GrowthForests: Function, Fate and Value—a Synthesis. Old-Growth Forests, 465-491 (2009). 207. 10.1007/978-3-540-92706-8_21 2. Korpel, Š., 1996: Razvoj i struktura bukovo-jelovih prašuma i njihova primjena kod gospodarenja prebornom šumom. Šumarski list CXX (3 – 4): 203 – 209, Zagreb. 3. Korpel, Š., 1995: DieUrwaelderderWestkarpaten. Gustav Fisher Verlag, Stuttgart-Jena-New York, 310 str. 4. Korpel, Š., M. Saniga, 1995: Prirode blizkepestovanie lesa. TU Zvolen, 158 str., Zvolen. 5. Korpel, Š., 1989: Pralesy Slovenska. VEDA, 322 str., Bratislava. 6. Leibundgut, H., 1982: Europaeische Urwaelderder Bergstufe. Bern – Stuttgart. 7. Leibundgut, H., 1978: Überdie Dynamik europaeisher Urwaelder. Allg. Forstzeitschr. 24: 686 – 690. 							



	8. Leibundgut, H., 1959: Über Zweck und Methodik der Struktur- und Zuwachsanalyse von Urwäldern. Schwiz. Zeitschr. f. Forstwes., 110 (3): 111 – 124.
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Mario Šporčić, PhD Assist. Prof. Matija Landekić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Organizational culture	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+0
1.3. Course code		1.9. Expected enrolment in the course	15
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Get to know the organizational culture as an element of the effectiveness of modern companies. Develop basic knowledge and skills of research, measurement and design of organizational culture and the ability to manage the organizational culture of the company.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B2. manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection B12. manage forest, human resource, and technical potential during performance of forest works in urban areas and protected natural areas C1. manage most complex tasks in all forms of organizing the protection of nature areas; national, county, and municipal administration, including advisory services and inspection supervision C3. perform jobs of professional manager and supervisor in environment and nature protection areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Present the basics of organizational culture (elements of organizational culture, organizational climate, classification and typology, design and maintenance of organizational culture, role and functions, importance of organizational culture in forestry). 2. Evaluate organizational culture in the forestry situation and environment context (ethical components, influence of information and communication technologies, contemporary trends, research and features of organizational culture in forestry) 3. Ensure measurement and management of organizational culture (methods and models, influence of managers, best known theories and models of management and managerial styles, subculture in business organization, changes in organizational culture)		



	4. Compare the organizational culture and effectiveness of the organization (the impact of culture on organizational success and efficiency, the relationship between culture and business strategy, case studies and examples of best practice)								
2.5. Course content (syllabus)	1. The concept and definition of organizational culture 2. Elements, role and functions of organizational culture. 3. Models, kinds and types of organizational culture. 4. Organizational climate and culture 5. The impact of the environment on the organizational culture of the company 6. The influence of managers on organizational culture 7. Ethical components of organizational culture. 8. Methods and models in organizational culture research. 9. The impact of organizational culture on the success and efficiency of the business system. 10. Organizational culture management. 11. Designing and maintaining organizational culture. 12. Changes in organizational culture 13. Contemporary trends in organizational culture 14. Subcultures in business organization. 15. Organizational culture of successful domestic and foreign companies								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking the exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Landekić, M., 2013: Unapređenje poslovanja razvojem organizacijske kulture šumarske tvrtke. Disertacija, Šumarski fakultet Sveučilišta u Zagrebu			YES					
	Sušan, Z., 2005: Organizacijska klima i kultura. Naklada Slap, Jastrebarsko.			NO			YES		
	Žugaj, M., Bojanić-Glavica, B., Brčić, R., Šehanović, J., 2004: Organizacijska kultura. TIVA Tiskara Varaždin.			NO			YES		
2.12. Optional literature	Landekić, M., Šporčić, M., Martinić, I., Bakarić, M., Lepoglavec, K., 2016: Utjecaj stilova vodstva na upravljanje i organizacijsku kulturu šumarskog poduzeća. Šumarski list 140 (1-2): 17–28.								



	<p>Landekić, M., Šporčić, M., Martinić, I., Bakarić, M., 2015: Influence of organizational culture on firm efficiency: competing values framework in Croatian forestry. <i>Scandinavian Journal of Forest Research</i> 30(7): 624–636.</p> <p>Landekić, M., Šporčić, M., 2015: A Link between Business Improvement and Organizational Culture: A Case Study in Croatian State Forestry Sector. In: <i>Organizational Culture - Leadership Strategies, Outcomes and Effectiveness</i> (ed. Camerun P. Fuller), Nova Science Publishers, New York.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Dinko Vusić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Utilization of forest biomass	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of this course is to provide an insight on the sources, harvesting methods and the potential for the use of forest biomass, primarily in urban forestry.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B11. apply knowledge related to ecologically friendly techniques and technologies of forestry works used in urban areas and protected natural areas C2. perform and manage works in horticultural and communal services		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Establish a production system according to the potential of wood biomass of certain stands and biomass from urban areas by introducing new technologies 2. Organize collection-logistic centres for storing and selling certain quantities of solid biofuels according to the basic features of the product declaration 3. Valorise solid biofuel based on physical and chemical properties and use.		
2.5. Course content (syllabus)	Lectures 1. Wood biomass - potential and structure. 2. Standards of wood forest products by purpose (HRN). 3. Standards of wood forest products by quality (HRN EN). 4. Legal acts and bases in the field of production, trade and use of wood biomass. 5. Wood as an energy source. Ecological advantage of using energy wood.		



	<p>6. Solid biofuels - normative framework. 7. Quality parameters of solid biofuels. 8. Energy harvesting systems. 9. Transport of energy wood. 10. Energy wood storage. 11. REgional logistics centers. 12. By-products and revocation of waste status. 13. Use of wood biomass in horticulture and compost production. 14. Use of wood biomass in energy facilities. 15. Trade and market of wood forest products.</p> <p>Exercises</p> <p>1. Methods for determining the amount and structure of aboveground wood biomass. 2. Wood defects - recognition and measurement. 3. Characteristics of wood - recognition and measurement. 4. Measurement, records and shipping of wood assortments. 5. Sampling of solid biofuels. 6. Determination of bulk density of wood chips. 7. Gravimetric analysis - determination of moisture content of wood chips. 8. Determination of the mass fraction of ash. 9. Granulometric analysis - determination of the mass of wood chips fractions. 10. Productivity of wood chips harvesting system. 11. Optimization of wood chips harvesting system. 12. Transport of wood chips. Cost break-even analysis. 13. Determining the optimal storage time of wood chips. 14. Procedure for revoking the status of waste for solid biofuels - preparation of documentation. 15. Statistical indicators of production and trade of wood products according to UNECE / FAO methodology; national product classification and customs tariffs.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Zečić, Ž., 2018: Uporaba šumske biomase (interna skripta), Šumarski fakultet. Zagreb			NO			YES, Merlin		



	Zečić, Ž., Vusić, D., 2020: Katalog drvnih šumskih proizvoda. Sveučilište u Zagrebu Šumarski fakultet, 1–217.	YES	
	United Nations, Economic Commission for Europe, 2018: Wood Energy in the ECE Region: Data, trends and outlook in Europe, the Commonwealth of Independent States and North America. Aguilar, Francisco X. (ur.), Geneva, 1–93.		YES, Web
2.12. Optional literature	1. Hakmila, P., 1989: Utilization of Residual Forest Biomass. Springer-Verlag, Berlin, 1–568. 2. Aguilar, F. X., 2014: Wood Energy in Developed Economies: Resource Management, Economics and Policy. Routledge, London and New York, 1–338.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Kruno Lepoglavec, PhD Assoc. Prof. Hrvoje Nevečerel, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Mobile applications in forestry	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	3
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of the subject is to provide knowledge and techniques necessary for independent use of specialized forestry applications on mobile phones and other devices. Get acquainted with the way of creating mobile applications, installation and application. Menage with modern technology and application in the daily tasks of the forestry profession.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B12. manage forest, human and technical potentials when performing forestry works in urban areas and in protected nature area B14. improve existing technologies as well as introduce new technologies		
2.4. Expected learning	Lectures:		



<p>outcomes at the level of the course (3 to 10 learning outcomes)</p>	<p>1. Historical development of mobile applications. The evolution of mobile devices - from the beginning to the first smart device. An overview of development through history, the beginnings of the integration of mobile applications in forestry. (2 hours)</p> <p>2. General information about Android, IOS and Windows Mobile operating system. Platforms and programming languages for their programming. (2 hours)</p> <p>3. Mobile applications in forestry, urban forestry and protected areas and their professional application. (3 hours)</p> <p>4. Mobile applications for use in forestry machinery and equipment. (2 hours)</p> <p>5. Mobile applications for application in forest management, silviculture, forest protection and hunting. (2 hours)</p> <p>6. Mobile applications for spatial data collection in forestry. Applications for working with GIS and CAD tools. Applications for works in wood extraction and studies of work and time. (2 hours)</p> <p>7. Mobile applications for working with unmanned aerial vehicles and designing forestry and park infrastructure. (2 hours)</p> <p>Exercises:</p> <p>1. Basic properties of Google Maps system and other applications applicable in forestry that use resources from Google Maps system. (2 hours).</p> <p>2. Maps and spatial orientation in forestry. Field data collection. (2 hours).</p> <p>3. GIS and CAD applications. Ways of collecting information, transmitting information and data in two directions FIELD-OFFICE and OFFICE-FIELD. (3 hours).</p> <p>4. Sending messages and data over the network. Use of mobile application services. (2 hours).</p> <p>5. Printing and plotting reports and projects from mobile applications on printable media. (1 hour).</p> <p>6. Independent task of students - through the study of the market and the final analysis of selected applications for presentation (presentation of each student separately). (5 hours).</p>									
<p>2.5. Course content (syllabus)</p>										
<p>2.6. Format of instruction</p>	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input checked="" type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			<p>2.7. Comments:</p>			
<p>2.8. Monitoring student work</p>	Class attendance	YES		Research	YES		Oral exam	YES		
	Experimental work		NO	Report		NO	(other)			
	Essay		NO	Seminar paper	YES		(other)			
	Preliminary exam	YES		Practical work		NO	(other)			
	Project		NO	Written exam	YES		ECTS credits (total)			
<p>2.9. Assessment methods and criteria</p>	<p>Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</p>									
<p>2.10. Student responsibilities</p>	<p>Monitoring the achieved learning outcomes will be monitored in two basic ways: through exercises and through the independent task of each student.</p> <p>During the exercises through an independent task, students will present the adopted learning outcomes by finding mobile applications through online services and mastering them in a possible professional application.</p>									



	Regular attendance and active participation in lectures. Taking a colloquium with a minimum of 60 % correct answers, taking an exam with a minimum of 60 % correct answers on the written part of the exam and the oral part of the exam.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Lectures from the elective subject Mobile applications in forestry in .pptx and .pdf. format	NO	YES, Merlin
	The Definitive Guide to Mobile App Design, ebook	NO	YES, Merlin https://buildfire.com/e-books/the-definitive-guide-to-mobile-app-design/
2.12. Optional literature	<p>Anureet Kaur, Kulwant Kaur, 2018: Systematic Literature Review of Mobile Application Development and Testing Effort Estimation. Journal of King Saud University - Computer and Information Sciences, DOI: 10.1016/j.jksuci.2018.11.002.</p> <p>Gao, J., Bai, X., Tsai, W.-T., Uehara, T., 2014: Mobile Application Testing: A Tutorial. Computer (Long Beach, Calif). 2: 46–55.</p> <p>Harrison R., Flood D., Duce D.; 2013: Usability of mobile applications: literature review and rationale for a new usability model. Journal of Interaction Science, https://doi.org/10.1186/2194-0827-1-1.</p> <p>Kim, H.K., 2012: Mobile applications software testing methodology, Computer Applications for Web, Human Computer Interaction, Signal and Image Processing, and Pattern Recognition. Communications in Computer and Information Science. Springer, Berlin, Heidelberg.</p> <p>Hosbond J. H., Nielsen P.A., 2005: MOBILE SYSTEMS DEVELOPMENT: A Literature Review. International Working Conference, August 1–3, 215-232.</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Martina Temunović, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Species distribution models	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			



2.1. Course objectives	Aim is that students get familiar with theoretic background and overview of the key concepts and basic principles in species distribution modelling (SDM). Students get acquainted with required input data, with the main modelling steps, with interpretation of the obtained results and with projections of the models in space and time. They also get an overview of the broad applications of species distribution models (SDMs) in fields of conservation biology and conservation planning, in invasive species risk assessment and management, and most importantly in predicting potential future distributions of species and habitats in response to climate change scenarios. This enables students to independently define variety of research questions and problems that may be addressed and resolved using this useful and state-of-the-art tool.
2.2. Enrolment requirements and/or entry competences required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>B3. establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p> <p>B8. organise and manage wildlife management in protected natural areas</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p> <p>D1. conduct businesses of scientific and professional associate in scientific-research institutions in the field of urban forestry, nature conservation and environmental protection</p> <p>D4. professionally and scientifically upgrade through different educational ways and postgraduate study</p> <p>D5. gather, process and interpret reference sources and prepare simple written professional or scientific paper</p>
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. To find sources of the input data, to collect, process and prepare required input data for species distributions models (species occurrence data and environmental data)</p> <p>2. To independently build step by step simple species distributions models</p> <p>3. To be able to evaluate and interpret the results of the species distributions models</p> <p>4. To project species distributions models in space and time</p> <p>5. To present results of the models as species distribution maps</p> <p>6. To be able to correctly apply and use species distributions models as a tool for applied and basic research in a variety of questions and studies in the Nature and Environmental Protection Sector</p>
2.5. Course content (syllabus)	<p>Lectures (1h each):</p> <ol style="list-style-type: none"> 1. Concept and theory of ecological niches 2. From ecological niche to species distributions 3. Basic principles and methodological steps in species distributions modelling 4. Assumptions behind species distributions models (SDMs) 5. Input data - species occurrence data (sources, filtering, Presence– Absence vs. Presence-Only Data) 6. Input data - environmental data (sources, variable selection, resolution, extent) 7. Modelling Algorithms 8. Model calibration 9. Model evaluation (errors, assessing model performance and accuracy) 10. Projecting SDMs in space and time (extrapolation) 11. SDM applications - predicting distributions of unknown populations and species, predicting invasions (case studies) 12. SDM applications – conservation measures and planning (design of protected areas, translocations and reintroductions)



	<p>13. SDM applications – climate change consequences (case studies of range shifts and predicting potential future distributions of species) 14. Model uncertainty (Ensemble modelling) 15. Seminars</p> <p>Practical part of this module will enable students to develop simple species distribution models using Maxent, from collecting and preparing necessary input data, walking through the main steps in building and testing a distribution model to interpretation of the predictions.</p> <p>Exercises (2h each):</p> <ol style="list-style-type: none"> 1. Preparation of the input data for SDMs – species occurrence data sources and gathering (find and collect/download biological data from online databases such as FCD and/or GBIF, check and filter occurrence data, prepare the .shp layer) 2. Preparation of the input data for SDMs – climatic variables (WorldClim database) – obtain and prepare climatic variables with a given extent 3. Preparation of the input file for SDMs – extract values of the climatic variables for each species occurrence point, prepare .csv input file 4. Introduction to Maxent – installation, settings and fitting/building SDM with prepared input data 5. Maxent – interpretation of the SDM outputs and results, model evaluation, variable importance/contribution 6. Visualization of the Model Results – projecting model onto geographic space, prepare potential species distribution maps 7. Projecting models to future climates under different climate change scenarios to predict potential future species distributions 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and activity during the lectures and exercises. Written exam and/or independent assignments.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Guisan, A., Thuiller, W. Zimmermann, N.E. (2017) Habitat suitability and distribution models: with applications in R. Cambridge University Press.			NO			YES, Available as pdf from Lecturer		
	Zurell, D., Franklin, J., König, C., Bouchet, P.J., Dormann, C.F., Elith, J., Fandos, G., Feng, X.,						YES, online, google scholar		



	Guillera-Arroita, G., Guisan, A. and Lahoz-Monfort, J.J. (2020) A standard protocol for reporting species distribution models. <i>Ecography</i> .		
	Elith, J., Phillips, S.J., Hastie, T., Dudík, M., Chee, Y.E. and Yates, C.J. (2011) A statistical explanation of MaxEnt for ecologists. <i>Diversity and distributions</i> , 17(1), pp.43-57.		YES, online, google scholar
	Phillips, S.J., Anderson, R.P. and Schapire, R.E. (2006) Maximum entropy modeling of species geographic distributions. <i>Ecological modelling</i> , 190(3-4), pp.231-259.		YES, online, google scholar
2.12. Optional literature	<p>Hijmans, R.J. and Elith, J (2019) Spatial Distribution Models. DOI, 10, pp.b978-008045405.</p> <p>Radosavljevic, A. and Anderson, R.P. (2014) Making better Maxent models of species distributions: complexity, overfitting and evaluation. <i>Journal of biogeography</i>, 41(4), pp.629-643.</p> <p>Merow, C., Smith, M.J. and Silander Jr, J.A. (2013) A practical guide to MaxEnt for modeling species' distributions: what it does, and why inputs and settings matter. <i>Ecography</i>, 36(10), pp.1058-1069.</p> <p>Elith, J. and Leathwick, J.R. (2009) Species distribution models: ecological explanation and prediction across space and time. <i>Annual review of ecology, evolution, and systematics</i>, 40, pp.677-697.</p> <p>Phillips, S.J. and Dudík, M. (2008) Modeling of species distributions with Maxent: new extensions and a comprehensive evaluation. <i>Ecography</i>, 31(2), pp.161-175.</p> <p>Araujo, M.B. and Guisan, A. (2006) Five (or so) challenges for species distribution modelling. <i>Journal of biogeography</i>, 33(10), pp.1677-1688.</p> <p>Elith, J., H. Graham*, C., P. Anderson, R., Dudík, M., Ferrier, S., Guisan, A., J. Hijmans, R., Huettmann, F., R. Leathwick, J., Lehmann, A. and Li, J. (2006) Novel methods improve prediction of species' distributions from occurrence data. <i>Ecography</i>, 29(2), pp.129-151.</p> <p>Phillips, S.J., Dudík, M. and Schapire, R.E. (2004) A maximum entropy approach to species distribution modeling. In <i>Proceedings of the twenty-first international conference on Machine learning</i> (p. 83).</p> <p>Guisan, A. and Zimmermann, N.E. (2000) Predictive habitat distribution models in ecology. <i>Ecological modelling</i>, 135(2-3), pp.147-186.</p> <p>https://biodiversityinformatics.amnh.org/open_source/maxent/</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Matija Landekić, PhD Prof. Mario Šporčić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Safety and organization of work in urban and protected forests	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	15



1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of the course is to properly orient students to organize safer and more economically efficient work in urban forests and improve the level of safety for visitors of protected areas. Through the subject units, the student acquires (a) the skill of risk assessment and defining general and specific measures within the site development plan, in accordance with the correct work technique and rules of safe work at height or on the ground; (b) the skill of designing a risk management system for pedestrian infrastructure in protected areas; and (c) the skill of designing organizational dynamics for the execution of works on trees, green areas and parks in urban areas.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently collect data, statistically process, present and analyze the collected data, discuss and draw conclusions based on the analyzed data and distinguish the possibility of different interpretations of the same problem analyzed in different ways B11. apply knowledge of environmentally friendly techniques and technologies for performing forestry work in urban areas and in protected nature objects B12. manage forest, human and technical potentials when performing forestry works in urban areas and in protected nature objects		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Analyze and implement in practice the organization of safe work on trees in urban areas (selection of correct work techniques, rules of safe work at height, preparation of site development plan). Develop an action plan for the implementation of a risk management model on pedestrian infrastructure for a specific protected area (risk inspection protocol, safety recommendations for zones and / or identified risk points). Develop organizational dynamics of performing works on trees and parks in urban areas within the annual management plan.		
2.5. Course content (syllabus)	L1 – The role and importance of safety at work in urban forests (types of hazards and risk assessment); E1 – Implementation of „Job Rotation“ concept L2 – General rules for safe operations during felling and cutting (technical, health, legal and social aspects of protection); E2 – Evaluation of the working technique of arborist workers during felling and cutting (analysis of 12 elements of working technique) L3 – Safe work on trees in urban areas Part I. (legislation, means of work and PPE); E3 – Evaluation of the working technique of arborist workers during felling and cutting (evaluation of working technique through video simulation) L4 – Safe work on trees in urban areas Part II. (work techniques and rules of safe work at height); E4 – Risk and load assessments of arborist workers in manual cargo handling L5 – Legislative framework for the development of site development plans in urban forests; E5 – Development of a site development plan in urban forests - defining safety measures for contractors L6 – Key components of a site development plan in urban forests; E6 – Development of a site development plan in urban forests - defining safety measures for passers-by L7 – Analysis of training programs for work in arboriculture (Part I - work from the ground); E7 – Physical ability and workload of workers in arboriculture (work from the ground) L8 – Analysis of training programs for work in arboriculture (Part II - work at height); E8 – Physical ability and workload of workers in arboriculture (work at height) L9 – Risk management system when visiting protected areas; E9 – Development of risk inspection protocols on pedestrian infrastructure in protected areas		



	<p>L10 – The role of sign signalling on pedestrian infrastructure in protected areas; E10 – Development of safety recommendations for zones and / or identified risk points on pedestrian infrastructure</p> <p>L11 – The role of a generic risk management framework on pedestrian infrastructure in protected areas; E11 – Development of a programmed regime for overcoming the ascent of pedestrian infrastructure in protected areas</p> <p>L12 – Introduction to the organization of work and technological structure of working time; E12 – Analysis and development of the scheme of daily work dynamics (example of an arborist worker and an auxiliary worker on the ground)</p> <p>L13 - Models and methods of studying work (forms of work and work performance); E13 - Fundamentals of time study measurement and methods for work standardization</p> <p>L14 – Key components of the annual tree maintenance plan (analysis of fixed and variable costs); E14 – Organization of dynamics of works on trees in urban areas (foreign case study)</p> <p>L15 – Key components of the annual green space and park maintenance plan (analysis of fixed and variable costs); E15 – Organization of dynamics of works on green areas and parks (foreign case study)</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures. Taking an exam.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	European Arboricultural Council, 2008: A Guide to Safe Work Practice - Aerial Tree Work Operations. 12 pp.			NO			YES, online		
	GREENING, LANDSCAPE AND TREE MANAGEMENT SECTION - DEVELOPMENT BUREAU, 2012: Guidelines on Arboriculture Occupational Safety and Health. 12 pp.			NO			YES, online		
	Ministarstvo poljoprivrede, 2015: PRIRUČNIK ZA SIGURNO RUKOVANJE I PRIMJENU SREDSTAVA ZA ZAŠTITU BILJA. 221 str.			NO			YES, online		
	Zakon o zaštiti na radu (NN 96/18);			NO			YES, online		
	Pravilnik o zaštiti na radu u šumarstvu (NN 10/86); Pravilnik o zaštiti na radu u HŠ d.o.o.			NO			YES, online		



2.12. Optional literature	<p>Landekić, M., Martinić, I., Šporčić, M., 2019: Dosing of physical load for hiking infrastructure users in the forests of the Krka national park // Proceedings of the 52nd International Symposium on Forestry Mechanization - EXCEEDING THE VISION: FOREST MECHANISATION OF THE FUTURE / Czupy, Imre (ur.). Sopron: University of Sopron Press, 2019. str. 423-430</p> <p>Landekić, M., Martinić, I., Galić, F., 2018: Razvoj sheme programiranog odmaranja na pješačkoj stazi »Podgarić – Garić grad« u regionalnom parku Moslavačka gora. Nova mehanizacija šumarstva, 39 (1), 13-23</p> <p>Landekić, M., Martinić, I., Šporčić, M., Bakarić, M., 2016: Tehnike rada i mjere sigurnosti pri radu na stablima u urbanim sredinama. Zbornik radova VI. međunarodnog stručno-znanstvenog skupa ZAŠTITA NA RADU I ZAŠTITA ZDRAVLJA, Kirin, Snježana (ur.), Karlovac: Veleučilište u Karlovcu, 2016. str. 362-374</p> <p>Martinić, I., Landekić, M., Bakarić, M., Marguš, D., Jurković, A., 2015: Smanjenje opterećenja posjetitelja na pješačkim stazama u zaštićenim područjima primjenom sheme programiranog odmaranja. Šumarski list : znanstveno-stručno i staleško glasilo Hrvatskoga šumarskog društva. 139 (5-6); 233-244</p> <p>International Society of Arboriculture, 2009: ISA CERTIFIED TREE WORKER CLIMBER SPECIALIST HANDBOOK/APPLICATION. 24 pp.</p> <p>Health and Safety Executive and the Forestry Commission, 2008: Evaluation of current rigging and dismantling practices used in arboriculture. 370 pp.</p>
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COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Tibor Pentek, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Forest roads in protected areas	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	20
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	The main goal and task of this subject is to teach the students the process of establishing an optimal forest roads network in protected forest ecosystems through the phases of their planning, design, construction and maintenance. Acquired theoretical and practical knowledge will enable students to understand the purpose of establishing an optimal forest roads network in a protected forest ecosystem, understand the content of produced documents produced in each phase, know the methods and procedures used in the preparation of documents, as well as learn the legal (primary) framework and secondary legislation related to particular documents.		
2.2. Enrolment requirements and/or	-		



entry competences required for the course	
2.3. Learning outcomes at the level of the programme to which the course contributes	B11. apply knowledge related to ecologically friendly techniques and technologies of forestry works used in urban areas and protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>Connect the basic phases and sub-phases of establishing an optimal forest roads network in protected forest ecosystems.</p> <p>Interpret and apply primary and secondary legislation used in the phases of planning, design, construction and maintenance of forest roads in protected forest ecosystems.</p> <p>Understand and know how to use technical documentation prepared in the phases of planning and design of forest roads in protected forest ecosystems.</p> <p>Compare technical documentation of forest roads construction and maintenance in protected forest ecosystems with field construction and maintenance works.</p> <p>Decision making on compatibility of the performed construction and maintenance works with the technical documentation.</p> <p>Documentation understanding that accompanies the phases of construction and maintenance of forest roads in protected forest ecosystems.</p>
2.5. Course content (syllabus)	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction. Permanent and temporary phases of establishing an optimal forest road network in the protected forest ecosystems. 2. Planning in forestry. Planning of forest roads - strategic, tactical, operational planning level. 3. Technical documentation prepared in the planning phase of forest roads at the strategic, tactical and operational level. Primary and secondary legislation used in the planning phase of forest roads at the strategic, tactical and operational level. 4. Study of forest accessibility - basic components, methods and preparation procedures. The effectiveness study of forest road traffic infrastructure - basic components, methods and preparation procedures. 5. Forest road design. Basic types of forest road designs – conceptual, general and final design. The complete (full) and abbreviated design procedure. 6. Conceptual forest road design - basic components, methods and preparation procedures. General forest road design - basic components, methods and preparation procedures. 7. Final forest road design - basic components, methods and preparation procedures (part 1). 8. Final forest road design - basic components, methods and preparation procedures (part 2). 9. Primary and secondary legislation used in the design phase of forest roads. 10. Forest roads construction. Possible, suitable and optimal technologies for forest roads construction. Criteria for selecting the optimal technology for forest roads construction. 11. Technology of forest roads construction in the lowland area. Finding the most important problems during forest roads construction in the lowland area. Technology of construction of forest roads on sloped terrain. Finding the most important problems during forest roads construction on sloped terrain. 12. Forest road maintenance - types and definitions. Regular maintenance of forest roads. Investment maintenance of forest roads. Periodic maintenance of forest roads. Forest road maintenance effectiveness study - basic components, methods and design procedure. 13. Primary and secondary legislation that follow the procedure of construction and maintenance of forest roads. Participants in the process of construction and maintenance of forest roads, required qualifications, basic tasks and area of responsibility. 14. Organization and management of procedures during construction and maintenance of forest roads. Supervision of construction and maintenance procedures of forest roads. 15. Building diary - basic components. Building book - basic components. Temporary and completed situation - basic components. <p>Practical exercises:</p>



	<ol style="list-style-type: none"> 1. Forest roads in protected areas – introduction. 2. Determining the location of the project. 3. Describing the project intervention. 4. GIS designing of the researched area (work with ARCGIS tools). 5. Zero line, calculating zero line inclination, defining dividers' segments. 6. Zero line designing on a digital map (work with ARCGIS tools). 7. Defining the differences between zero line, operational and axial polygon of forest roads. 8. Introduction with different types of vector data (point, line, polygon) (work with AutoCAD tools). 9. Basics of drawing and spatial data manipulation (work with AutoCAD tools). 10. Defining of cadastral parcels in the project area (work with AutoCAD tools). 11. Extraction of the cadastral parcels which are overlapping with project (work with AutoCAD tools). 12. Preparation and data storage suitable for further analysis in the ArcGIS environment (work with ARCGIS tools). 13. Digital map preparation of all roads with the corresponding cadastral number included in the project area (work with ARCGIS tools). 14. Preparation of situation plan of primary accessibility of the project area with conceptual forest road routes included (work with ARCGIS tools). 15. Export and print data. 								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)		2.7. Comments:		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project	YES		Written exam	YES		ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities									
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media			
	Dietz, P., H. Löffler, & W. Knigge, 1984: Walderschließung, Eine Lehrbuch für Studium und Praxis unter besonderer Berücksichtigung des Waldwegebaus. Verlag Paul Parey, Hamburg und Berlin, p. 1-196, odabrana poglavlja.			YES					
	Pičman, D., 2007: Šumske prometnice (sveučilišni udžbenik), Šumarski fakultet Sveučilišta u Zagrebu, s. 1-460, odabrana poglavlja.			YES					



	Šikić, D. i dr., 1989: Tehnički uvjeti za gospodarske ceste, Znanstveni savjet za promet JAZU, Zagreb, s. 1-40, odabrana poglavlja	YES	
2.12. Optional literature	<p>1. Znanstveni i stručni radovi o predmetnoj problematici domaćih i stranih autora objavljeni u časopisima i zbornicima savjetovanja.</p> <p>2. Anon., 2002: Forest Road Engineering Guidebook, B.C. Ministry of Forests, p. 1-208, odabrana poglavlja.</p> <p>3. Anon., 2011: Colorado Forest Road Field Handbook, Colorado State Forest Service, p. 1-142, odabrana poglavlja.</p> <p>4. Lacombe, G., 1999: Forest Roading Manual, Liro Forestry Solutions, New Zeland, p. 1-404, odabrana poglavlja.</p> <p>5. Ryan, T. et al., 2004: Forest Road Manual, Guidelines for the design, construction and management of forest roads, COFORD, Dublin, p. 1-156, odabrana poglavlja.</p>		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Vinko Paulić, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Tree sanitation and conservation	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code		1.9. Expected enrolment in the course	10
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Elective	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	<p>Aims of this course are to introduce students to tree sanitation and conservation treatments. In regards to conditions in which trees develop or due to their age, damage on trees and negative influence of different abiotic and biotic agents are often present which affects development of trees. With tree sanitation, different treatments are prescribed which improve state of tree and are targeted to root system, trunk or crown while with tree conservation it is intended to preserve old and especially valuable trees form further decline. Through this subject student would be able to produce expert report in which on one example they would determine state of tree, give recommendation of tree sanitation procedures for damaged or endangered tree parts and prescribe measures for long term tree conservation.</p>		
2.2. Enrolment requirements and/or entry competences required for the course	-		



2.3. Learning outcomes at the level of the programme to which the course contributes	<p>B1. Organise and perform the most complex jobs all forms of organizing the protection of nature areas and the most complex forestry works in urban areas B2. Manage and make independent professional (business) decisions form the field of urban forestry, nature conservation and environmental protection B3. Establish and implement programs for the management of forest ecosystems in protected natural areas as well as management programs in specific urban forest ecosystems</p>																																																								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Present significance of tree sanitation and conservation 2. Recommend treatments for different tree parts (root, trunk, crown) sanitation 3. Describe tree crown cabling treatments 4. Prepare expert report of tree sanitation and conservation</p>																																																								
2.5. Course content (syllabus)																																																									
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments: During course students make expert report of tree sanitation and conservation by themselves which is evaluated and participates in final grade.																																																		
	<table border="1"> <tr> <td>2.8. Monitoring student work</td> <td>Class attendance</td> <td>YES</td> <td></td> <td>Research</td> <td></td> <td>NO</td> <td>Oral exam</td> <td>YES</td> <td></td> </tr> <tr> <td></td> <td>Experimental work</td> <td></td> <td>NO</td> <td>Report</td> <td></td> <td>NO</td> <td>(other)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Essay</td> <td></td> <td>NO</td> <td>Seminar paper</td> <td>YES</td> <td></td> <td>(other)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Preliminary exam</td> <td></td> <td>NO</td> <td>Practical work</td> <td>YES</td> <td></td> <td>(other)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>Project</td> <td>YES</td> <td></td> <td>Written exam</td> <td>YES</td> <td></td> <td>ECTS credits (total)</td> <td></td> <td></td> </tr> </table>								2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES			Experimental work		NO	Report		NO	(other)				Essay		NO	Seminar paper	YES		(other)				Preliminary exam		NO	Practical work	YES		(other)				Project	YES		Written exam	YES		ECTS credits (total)	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES																																																	
	Experimental work		NO	Report		NO	(other)																																																		
	Essay		NO	Seminar paper	YES		(other)																																																		
	Preliminary exam		NO	Practical work	YES		(other)																																																		
	Project	YES		Written exam	YES		ECTS credits (total)																																																		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.																																																								
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises and field classes. Absence with a maximum of 20 % of lectures and 10 % of exercises is allowed. Preparation and submission of a study of sanitation and conservation on the example of one tree. Taking exam.																																																								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media																																																			
	Paulić, V., 2021: Sanacija i konzervacija stabala, predavanja.			NO		YES, Merlin																																																			
	HUA, 2015: Rječnik arborikulturalnih pojmova, Glossary of arboricultural terms. Hrvatska udruga za arborikulturu, Zagreb			YES		NO																																																			
	HUA, 2013: Europski priručnik o orezivanju, Hrvatska udruga za arborikulturu, Zagreb			YES		NO																																																			
	Mattheck, C., 2004: Stablo i okoliš, Zrinko tumači život urbanog stabla, Zrinjevac, Zagreb			NO		YES, Merlin																																																			
2.12. Optional literature	<p>Gilman, E., F., 2002 : An illustrated guide to pruning, 2nd ed., Delmar, NY, SAD Kolarik, J., 2004: Péče o dřeviny rostoucí mimo les, II. ČSOP, Vlašim, Češka Shigo, A. 1998: A New Tree Biology and Dictionary, Shigo and Trees, Associates, Snohomish, WA, SAD</p>																																																								



COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Danko Diminić, PhD Prof. Boris Hrašovec, PhD Assist. Prof. Marko Vucelja, PhD Valentina Lovrić, mag. ing. silv. Assist. Prof. Milivoj Franjević, PhD Linda Bjedov, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Integrated Forest Protection in Protected Areas	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	Students are trained for analytical procedures in complex forest ecosystem management processes in limited management conditions (protected objects). They adopt modern methods and approaches and acquire competencies for decision-making and preparation of a part of the study of management of such facilities (management plans) in the part related to the protection of the basic forest phenomenon.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B9. Implement integrated protection of woody species in urban areas and in protected nature objects.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Analyze the integrated protection of lowland forest ecosystems (emphasis is placed on problems in water supply disruptions (rainfall / flood waters) and elevated temperatures (global warming), anthropogenic impact and the role of pathogens, harmful insect species, small rodents and wildlife, the above factors are analyzed separately and in synergy and form the basis for an integrated approach to measures to protect major tree species and floodplain forest ecosystems as a whole in order to prevent, reduce damage and repair the damage)		



	<p>2. Present integrated protection of beech forest ecosystems (current abiotic and biotic factors that by their individual or joint (synergistic) action affect or may affect the stability of beech forest ecosystems, climatic disturbances, anthropogenic impact)</p> <p>3. Analyze the integrated protection of spruce forest ecosystems, forest communities and protected natural objects of mountain and mountain ecosystems, abiotic and biotic factors that by their individual or joint (synergistic) action affect or may affect the stability of spruce forest ecosystems, emphasis is placed on problems with climatic disturbances, anthropogenic impact and pathogen roles, harmful insect species, small rodents and wildlife)</p> <p>4. Present integrated protection of forest ecosystems of the Mediterranean (forest communities and protected natural objects of the Croatian Mediterranean, analyze all current abiotic and biotic factors that individually or jointly (synergistically) affect or may affect the stability of forest ecosystems in the Croatian Mediterranean, emphasis is placed on problems with climate disturbances with special reference to the phenomenon of drought and forest fires, anthropogenic impact and the roles of pathogens and harmful species of insects).</p>
<p>2.5. Course content (syllabus)</p>	<p>Lectures:</p> <ol style="list-style-type: none"> 1. Introduction, the harmful role of individual abiotic and biotic factors and their negative synergistic effect on the health status of individual trees and forest ecosystems. 2. Forest communities and protected natural objects of lowland flood ecosystems (in general). Integrated protection is focused on the main tree species and floodplain forest ecosystems. All current abiotic and biotic factors that, through their individual or joint (synergistic) action, affect or may affect the stability of floodplain forest ecosystems are analyzed. An integrated approach to measures to protect major tree species and floodplain forest ecosystems in order to prevent, reduce damage and repair the damage. 3. Forest communities and protected natural objects of lowland ecosystems (in general). Integrated protection is focused on the main tree species and lowland forest ecosystems. All current abiotic and biotic factors that, through their individual or joint (synergistic) action, affect or may affect the stability of lowland forest ecosystems are analyzed. An integrated approach to protection measures for the main tree species and lowland forest ecosystems in order to prevent, reduce the occurrence of damage and repair the damage. 4. Forest communities and protected natural objects of mountain and mountain ecosystems (in general). Integrated protection is focused on the main tree species and beech forest ecosystems. All current abiotic and biotic factors that, through their individual or joint (synergistic) action, affect or may affect the stability of beech forest ecosystems are analyzed. Integrated approach to measures for the protection of beech forest ecosystems in order to prevent, reduce the occurrence of damage and repair the damage. 5. Forest communities and protected natural objects of mountain and mountain ecosystems (in general). Integrated protection is focused on the main tree species and the forest fir ecosystems. All current abiotic and biotic factors that, through their individual or joint (synergistic) action, influence or may affect the stability of fir fir ecosystems are analyzed. An integrated approach to measures to protect forest fir ecosystems in order to prevent, reduce the occurrence of damage and repair the damage. 6. Forest communities and protected natural objects of the Croatian Mediterranean (in general). Integrated protection focuses on the main tree species and the forest ecosystems of the Mediterranean. All current abiotic and biotic factors that, through their individual or joint (synergistic) action, influence or may affect the stability of forest ecosystems in the Croatian Mediterranean are analyzed. An integrated approach to measures to protect the forest ecosystems of the Croatian Mediterranean in order to prevent, reduce the occurrence of damage and repair the damage. 7. Emphasis in the analysis of these forest ecosystems is given to problems with climate disturbances, forest fires; anthropogenic impact and roles of pathogens and harmful insect species with special reference to invasive indigenous and non-indigenous species. <p>Exercises in the partikum:</p>



	<p>1. On the examples of current diseases, insect pest species, small rodents and wildlife, their individual impacts and indirect synergistic effects on the health status of major tree species and floodplain forest ecosystems are analyzed.</p> <p>2. On the examples of current diseases, insect pest species, small rodents and wildlife, their individual impacts and indirect synergistic effects on the health status of major tree species and lowland forest ecosystems are analyzed.</p> <p>3. On the examples of current diseases, insect pest species, small rodents and wildlife, their individual impacts and indirect synergistic effects on the health status of the main species of beech trees and beech forest ecosystems are analyzed.</p> <p>4. On the examples of current diseases, insect pest species, small rodents and wildlife, their individual impacts and indirect synergistic effects on the health status of the main species of fir trees and forest fir ecosystems are analyzed.</p> <p>5. On the examples of current diseases and insect pest species, their individual influences and indirect synergistic effects on the health status of the main tree species and forest ecosystems of the Croatian Mediterranean are analyzed.</p> <p>Field work:</p> <p>1. In forest beech ecosystems, the harmful effects of individual abiotic and biotic factors and their synergistic effect on the health status of individual trees and the stability of forest ecosystems are observed, analyzed and discussed.</p> <p>2. In forest fir ecosystems, the harmful effects of individual abiotic and biotic factors and their synergistic effect on the health status of individual trees and the stability of forest ecosystems are observed, analyzed and discussed.</p> <p>3. In the forest ecosystems of the Croatian Mediterranean, the harmful effects of individual abiotic and biotic factors and their synergistic effect on the health status of individual trees and the stability of forest ecosystems are observed, analyzed and discussed.</p>								
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments: Through 2 seminar papers and presentations, students deal with two different thematic units of biotic / abiotic factors that in certain conditions disrupt the health of protected forest ecosystems, and recommend possible integrated measures for their protection. The presentations are related to the oral exam and form the final grade.		
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Regular attendance and active participation in lectures, exercises and fieldwork. Taking colloquia and exams.								



2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Grupa autora (J. Vukelić, ed.) 2005: Poplavne šume u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 455 str.	YES	2nd level of application of e-learning
	Grupa autora (M. Oršanić, ed.) 2020: Ekologija, obnova i zaštita poplavnih šuma Posavine. Sveučilište u Zagrebu, Šumarski fakultet, Zagreb, 368 str.	YES	2nd level of application of e-learning
	Grupa autora (D. Klepac, ed.) 1996: Hrast lužnjak (<i>Quercus robur</i> L.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 559 str	YES	2nd level of application of e-learning
	Grupa autora (S. Matić, ed.) 2003: Obična bukva (<i>Fagus sylvatica</i> L.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 855 str.	YES	2nd level of application of e-learning
	Grupa autora (B. Prpić, ed.) 2001: Obična jela (<i>Abies alba</i> Mill.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 895 str.	YES	2nd level of application of e-learning
	Grupa autora (S. Matić, ed.) 2011: Šume hrvatskoga sredozemlja. Akademija šumarskih znanosti, Zagreb, 740 str.	YES	2nd level of application of e-learning
2.12. Optional literature	1. Altenkirsh, W., Majunke, C., Ohnesorge, B., 2002: Waldschutz auf ökologischer Grundlage. Eugen Ulmer Verlag, Stuttgart, Deutschland. ISBN 3-8001-3684-8, 434 str. 2. Berryman, A.A., 1988: Dynamics of Forest Insect Populations – Patterns, Causes, Implications. Plenum Press, New York and London, 603 str. 3. Professional and scientific articles relevant to the subject.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivica Tikvić, PhD Assoc. Prof. Damir Ugarković, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Ecological Monitoring	1.8. Number of hours in semester (L+E+F+e-learning)	15+30+16
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian



1.6. Year of the study	2.	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Get acquainted with the methods of monitoring the condition of forest ecosystems, monitoring the condition of forest trees and other organisms, monitoring the condition of ecological factors, natural disasters and forest habitats. Learn how to monitor the vitality, damage and extinction of urban forest trees, how to monitor the status of endangered organisms in urban forest ecosystems. Get acquainted with national, European and world programs for monitoring the state of forest ecosystems and with ecological equipment and regulations in the field of ecological monitoring. Be able to design monitoring of the state of protected NATURA 2000 forest habitats.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	<p>A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways</p> <p>B3. apply simpler methods of operation research</p> <p>B7. organise and manage professional works on the soil and water management and protection</p> <p>B10. prepare ecological studies and forestry parts of spatial plans</p> <p>B13. conduct ecological monitoring, area analysis and spatial evaluation as well as design of park areas</p>		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	<p>1. Identify changes, disturbances and excesses events in forest ecosystems (functioning of forest ecosystems, stability and sustainability, changes, disturbances and degradation of forest ecosystems, causes and consequences of changes and disturbances in forest ecosystems, excesses events in nature, causes of excesses events in forests, time of occurrence, intensities, indicators of damage, consequences in forests, economic consequences)</p> <p>2. Analyse monitoring of water, air and soil pollution in forests (reasons for monitoring water, air and soil in forests, water pollution, water forms in forest ecosystems, water quality, water quality indicators, methods of determining water status in forests and urban areas, equipment for determining, monitoring air quality and the condition of forest and urban soils)</p> <p>3. Present monitoring of dynamics of hydrological conditions and climate in forests (forest hydrology, dynamics of waters in lowland forests, monitoring of precipitation, surface, flood, watercourses, groundwater, climate, weather, climatic phenomena, monitoring of climatic elements in forests and nurseries, processing and display of climate data)</p> <p>4. Interpret the monitoring of biomass, phenophases and mycorrhiza in forest ecosystems (biomass plants, animals, microorganisms, stands, ecosystems), tree biomass, methods for determining the biomass of tree, phenology, description of phenophases, organization of monitoring of phenophases of forest trees, data processing using phenological database, phenological observations within ICP Forests, mycorrhiza, significance for plants)</p> <p>5. Present the program of monitoring the damage of forest ecosystems (monitoring / habitat and stressors, ICP Forests, visual assessment of canopy condition, causes and consequences of tree disturbances, tree condition databases, regulations on tree condition assessment, forest soil condition assessment, meteorological monitoring parameters, ground vegetation, phenophase of forest trees, tree vitality, hierarchical method of tree vitality assessment based on morphological indicators, tree vitality indicators)</p> <p>6. Analyze ecological equipment and regulations for monitoring the condition of forests (equipment and instruments for monitoring meteorological elements, regulations related to monitoring the condition of forests)</p>		
2.5. Course content (syllabus)	<p>Lectures</p> <p>1. Introduction to environmental monitoring</p> <p>2. Monitoring the condition of forests and forest ecosystems</p> <p>3. Monitoring the state of organisms and ecological factors in forest ecosystems</p>		



	<p>4. Excess phenomena in forest ecosystems 5. Water, air and soil pollution in forests 6. Monitoring of weather characteristics and climate 7. Monitoring the dynamics of hydrological conditions in forests 8. Assessment of vitality of forest tree trees based on morphological indicators 9. Assessment of the state of mycorrhiza on forest trees 10. Monitoring of phenophases of forest trees 11. Monitoring of components of living and extinct aboveground biomass in forest ecosystems 12. International Forest Monitoring Program ICP Forests 13. Other international forest monitoring programs 14. Equipment for ecological and biological monitoring of forest ecosystems 15. National and European regulations and programs related to ecological monitoring in forest ecosystems</p> <p>Exercises</p> <p>1. Equipment and instruments for ecological monitoring in forest ecosystems 2. Analysis of excessive and catastrophic phenomena in forests 3. Analysis of climate monitoring and climate elements 4. Analysis of tree canopy damage 5. Analysis of tree dying intensity 6. Ecological monitoring in the Republic of Croatia 7. International environmental monitoring programs</p> <p>Field work</p> <p>1. Monitoring the situation in urban forestry in continental Croatia 2. Monitoring the state of urban greenery in Mediterranean Croatia</p>							
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input checked="" type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input checked="" type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:	
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES
	Experimental work		NO	Report	YES		(other)	
	Essay		NO	Seminar paper		NO	(other)	
	Preliminary exam	YES		Practical work		NO	(other)	
	Project		NO	Written exam	YES		ECTS credits (total)	
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.							
2.10. Student responsibilities	Regular attendance and active participation in lectures, fieldwork and exercises, production and presentation of materials from exercises and fieldwork. Taking exam.							
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library		Availability via other media		
	Catalog of information systems for environmental protection and nature 2017					Website of the Ministry of Economy and		



			Sustainable Development
	National Possibilities for Collecting Environmental Data 2001		Website of the Ministry of Economy and Sustainable Development
	State of the Environment Report in the Republic of Croatia 2014		Website of the Croatian Forestry Institute
	Damage to forest ecosystems in the Republic of Croatia - report for 2019		Website of the Ministry of Economy and Sustainable Development
	Branimir Prpić - Forest Ecology and Forestry, 2018, Croatian Forestry Society, Faculty of Forestry, University of Zagreb, p. 430.		Website of the Croatian Forestry Society
2.12. Optional literature	The European environment – state and outlook 2020 Knowledge for transition to a sustainable Europe, European Environment Agency, 2019. Ferretti, M., R. Fischer (editors), 2013: Forest Monitoring. Elsevier, Oxford, UK, str. 507		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	-	1.7. Number of ECTS credits	20
1.2. Course title	Master thesis	1.8. Number of hours in semester (L+E+F+e-learning)	-
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	
2. COURSE DESCRIPTION			
2.1. Course objectives	Master thesis is a comprehensive and highly independent task in which the student must demonstrate knowledge of the basics of the profession and scientific research work in defining hypotheses and research goals, research planning, data collection and processing and writing a scientific paper. It includes expanding and deepening knowledge from the content of the curriculum, individual engagement on problem topics, gaining experience in writing professional papers, ability to apply scientific methods and tools in problem processing and writing, ability to independently use relevant domestic and foreign literature published in the cited sources.		



2.2. Enrolment requirements and/or entry competences required for the course	-								
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways D5. gather, process and interpret reference sources and prepare simpler written professional or scientific paper								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. apply previous knowledge to define the scientific-professional problem when choosing the topic of the paper 2. create a term work plan in accordance with the given deadlines for the preparation of the master thesis in stages 3. independently design the methodology of research work 4. apply the methodology of writing a professional and scientific work 5. present the work in written and oral form, using the skills of concise interpretation of results and conclusions, and provide guidelines for future development of the topic of the paper.								
2.5. Course content (syllabus)	Master thesis is an individual written work based on own research that is written in scientific form and involves the time load of students with research work that is equivalent to the value of 20 ECTS. As a rule, the diploma thesis is prepared during the 4th semester of the graduate study, and ends with an oral defense (presentation and answering questions).								
2.6. Format of instruction	<input type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input type="checkbox"/> partial e-learning <input checked="" type="checkbox"/> field work			<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input checked="" type="checkbox"/> laboratory <input checked="" type="checkbox"/> work with mentor <input type="checkbox"/> (other)			2.7. Comments:		
2.8. Monitoring student work	Class attendance		NO	Research	YES		Oral exam	YES	
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)		
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.								
2.10. Student responsibilities	Apply for the topic of the thesis, conduct research and prepare the paper in accordance with the Instructions for the design of the thesis. Attend consultations and present the progress in conducting research and drafting the paper. Respect and follow the instructions of the mentor. Adhere to the principles of ethical approach in writing the thesis. Prepare a presentation and defend the thesis before the appointed committee.								
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media		
	Ordinance on the preparation and defense of the master thesis at the graduate studies of the University of Zagreb, Faculty of Forestry and Wood Technology			NO			YES, web		
	Instructions for the preparation of the bachelor and master thesis			NO			YES, web		



2.12. Optional literature

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)		1.7. Number of ECTS credits	4
1.2. Course title	Professional practice	1.8. Number of hours in semester (L+E+F+e-learning)	15 days
1.3. Course code		1.9. Expected enrolment in the course	25
1.4. Study programme	University graduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	2.	1.12. Possibility of instruction in English	
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of the course is to gain experience and insight into the activities of companies that employ masters of forestry engineering in jobs that require the specified profile of experts. Within the course, students will connect the previous knowledge acquired during their studies with the performance of specific work tasks related to the part of the profession in which the company is engaged, and learn the importance of developing business responsibility, communication skills and teamwork.		
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1. independently gather data, statistically process, present and analyse data, discuss and conclude based on analysed data and distinguish possibilities of different interpretation of the same problem analysed in different ways B2. implement forest management programs B13. manage forest, human resource, and technical potential during performance of forest works C1. plan, organise and works of organization of production in forestry D5. gather, process and interpret reference sources and prepare simpler written professional or scientific paper		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. independently and responsibly perform entrusted professional tasks in forestry 2. apply in practice the knowledge and skills necessary for the implementation of the entrusted tasks 3. apply in practice legal regulations from the forestry sector 4. present professional issues in writing		
2.5. Course content (syllabus)	During the implementation of the professional practice, the student will, on the basis of a previously defined task, and according to the instructions and under the supervision of a mentor in the company, perform professional forestry work for which he is in charge. When performing professional work, the student will, in accordance with the instructions and in agreement with the mentor in the company, independently study the relevant professional		



	literature, business documentation and legislation in the forestry sector. The results of the completed professional practice will be presented by the student to the mentor at the faculty in the form of a written report.											
2.6. Format of instruction	<input checked="" type="checkbox"/> lectures <input type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> <i>online in entirety</i> <input type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input checked="" type="checkbox"/> work with mentor <input type="checkbox"/> (other)				2.7. Comments:			
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO			
	Experimental work		NO	Report		NO	Written report	YES				
	Essay		NO	Seminar paper		NO	(other)					
	Preliminary exam		NO	Practical work	YES		(other)					
	Project		NO	Written exam	Y	NO	ECTS credits (total)					
2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.											
2.10. Student responsibilities	Perform entrusted professional tasks during the implementation of professional practice. Upon completion of the professional practice, prepare a written report.											
2.11. Required literature (available in the library and/or via other media)	Title			Availability in the library			Availability via other media					
	Professional practice handbook						YES					
2.12. Optional literature												