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

Undergraduate Study Urban Forestry, Nature Conservation and Environmental Protection

Syllabus

from Acad. Year 2021/22

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
Basics of Chemistry	Assoc. Prof. Vibor Roje, PhD.	45	15			6	compulsory
Mathematics	Assist. Prof. Azra Tafro, PhD.	45	45			7	compulsory
Petrology with Geology	Assoc. Prof. Bojan Matoš, PhD. Assist. Prof. Duje Smirčić, PhD.	30	15			5	compulsory
Applied zoology	Assist. Prof. Marko Vucelja, PhD. Prof. Josip Margaletić, PhD.	30	15	8		5	compulsory
Sociology of urban and protected areas	Assist. Prof. Sara Ursić, PhD.	15	15			3	compulsory
Botany – Plant Morphology	Prof. Željko Škvorc, PhD. Assist. Prof. Martina Temunović, PhD.	15	15			3	compulsory
Physical and health education 1	Davor Pavlović prof. kinesiology		30			1	compulsory
In total		180	150	8		30	

Year of study: I							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Botany – Plant Systematics	Assoc. Prof. Daniel Krstonošić, PhD. Prof. Željko Škvorc, PhD.	30	15	24		4	compulsory
Soil science	Prof. Nikola Pernar, PhD. Prof. Darko Bakšić, PhD. Assist. Prof. Ivan Perković, PhD.	30	30	24		6	compulsory

Biometrics for Spatial Valorizations	Prof. Anamarija Jazbec, PhD.	30	30			5	compulsory
Ground surveying with basics of cartography	Prof. Renata Pernar, PhD. Assist. Prof. Mario Ančić, PhD.	30	30	24		6	compulsory
Introduction to urbanism	Prof. Ivan Mlinar, PhD.	15	15			4	compulsory
Heritage of Landscape Architecture	Assist. Prof. Marko Rukavina, PhD.	15	30			4	compulsory
Physical and health education 2	Davor Pavlović prof. kinesiology		30			1	compulsory
In total		150	180	72		30	

Year of study: II							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Phytocenology	Prof. Dario Baričević, PhD. Assist. Prof. Irena Šapić, PhD.	30	15	16		5	compulsory
Remote sensing and GIS of protected and urban areas	Prof. Renata Pernar, PhD. Prof. Ante Seletković, PhD. Assist. Prof. Jelena Kolić, PhD.	30	30			5	compulsory
General and landscape ecology	Prof. Ivica Tikvić, PhD. Assoc. Prof. Damir Ugarković, PhD.	30	15	16		5	compulsory
Genetics of Forest Trees	Prof. Saša Bogdan, PhD. Assist. Prof. Ida Katičić Bogdan, PhD.	30	30	8		4	compulsory
Environmental Microbiology	Assoc. Prof. Marija Gligora Udovič, PhD.	30	15			3	compulsory
Plant physiology	Prof. Željko	30	15			3	compulso

	Škvorc, PhD. Assist. Prof. Krunoslav Sever, PhD.						ry
Wildlife Management	Prof. Krešimir Krapinec, PhD. Prof. Marijan Grubešić, PhD. Assist. Prof. Kristijan Tomljanović, PhD.	30	15			4	compulso ry
Physical and health education 3	Davor Pavlović prof. kinesiology		30			1	compulso ry
In total		210	165	40		30	

Year of study: II							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Applied entomology	Prof. Boris Hrašovec, PhD.	30	15	16		6	compulso ry
Applied phytopathology	Prof. Danko Diminić, PhD.	30	15	16		6	compulso ry
Dendrology	Prof. Marilena Idžojtić, PhD. Assist. Prof. Igor Poljak, PhD.	45	30	24		7	compulso ry
Perennial and Annual Ornamental Plants	Assoc. Prof. Daniel Krstonošić, PhD.	30		16		3	compulso ry
Landscape design and planning	Prof. Damir Krajnik, PhD.	15	15			3	compulso ry
Introduction to physical planning	Assoc. Prof. Lea Petrović Krajnik, PhD.	15	30			4	compulso ry
Physical and health education 4	Davor Pavlović prof. kinesiology		30			1	compulso ry
In total		165	135	72		30	

Year of study: III							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective

Environmental protection	Prof. Željko Španjol, PhD. Prof. Ivica Tikvić, PhD.	30	30	8		5	compulsory
Environmental economics	Prof. Stjepan Posavec, PhD. Assist. Prof. Karlo Beljan, PhD.	30	15			4	compulsory
Silviculture of special purpose forests	Prof. Milan Oršanić, PhD. Assoc. Prof. Damir Drvodelić, PhD.	45	30	16		6	compulsory
Forest regulation of forest for special purposes	Prof. Jura Čavlović, PhD. Assoc. Prof. Krunoslav Teslak, PhD.	45	30	16		6	compulsory
Technical components of park design	Assoc. Prof. Hrvoje Nevečerel, PhD. Assist. Prof. Kruno Lepoglavec, PhD.	30	15	16		4	compulsory
Nature protection	Prof. Željko Španjol, PhD. Prof. Damir Barčić, PhD.	30	15	16		5	compulsory
In total		210	135	72		30	

Year of study: III							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / elective
Mechanisation of forestry in urban and protected areas	Prof. Marijan Šušnjar, PhD. Assist. Prof. Zdravko Pandur, PhD.	30	30	24		5	compulsory
Arboriculture	Assist. Prof. Vinko Paulić, PhD. Assoc. Prof. Damir Drvodelić, PhD.	30	30	16		5	compulsory
Protected areas management and supervision	Prof. Ivan Martinić, PhD.	30	15	24		5	compulsory

Ecology of Forest Tree Species	Prof. Ivica Tikvić, PhD. Assoc. Prof. Damir Ugarković, PhD.	15	15			2	compulsory
Professional practice						2	compulsory
Bachelor thesis						8	compulsory
Forest Mushrooms	Prof. Danko Diminić, PhD.	15				1	elective
Tree measurement	Prof. Mario Božić, PhD.	15				1	elective
Floriculture	Assoc. Prof. Daniel Krstonošić, PhD.	15				1	elective
Exotic Woody Plants	Prof. Marilena Idžojtić, PhD. Assist. Prof. Igor Poljak, PhD.	15				1	elective
Applied technical graphics	Prof. Anka Ozana Čavlović, PhD.	15				1	elective
Conservation biology	Assist. Prof. Martina Temunović, PhD.	15				1	elective
Allergenic herbaceous plants	Prof. Željko Škvorc, PhD.	15				1	elective
Wood structure properties of park tree species	Assoc. Prof. Bogoslav Šefc, PhD. Prof. Jelena Trajković, PhD. Assist. Prof. Iva Ištok, PhD.	15				1	elective
Bioclimatology of forest and urban ecosystem	Assoc. Prof. Damir Ugarković, PhD. Prof. Ivica Tikvić, PhD.	15				1	elective
Medicinal Plants	Prof. Marijana Zovko Končić, PhD.	15				1	elective
Foreign Language-English	Sanda Gitt, prof.	15				1	elective
In total		150	90	64		30	

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Vibor Roje, PhD.	1.7. Number of ECTS credits	6
1.2. Course title	Basics of Chemistry	1.8. Number of hours in semester (L+E+F+e-learning)	45+15+0
1.3. Course code	226092	1.9. Expected enrolment in the course	90
1.4. Study programme	University undergraduate 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	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	After attending of the classes and successfully passing the exam in the subject Basics of Chemistry, the student will have knowledge that will enable him to understand the content of the professional subjects that he will encounter in the further course of study, when he/she will meet some chemical phenomena in the context of 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	A1. apply aproach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyse data and conclude individually based on analysed data
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	After attending the course Basics of Chemistry, the student will be able: 1. to distinguish extensive and intense physical quantities 2. to connect physical quantities for expressing the quantity (mass, quantity, volume, number) of a substance and the composition of mixtures (fractions, concentrations, molality) with SI, some exceptionally permitted and old units of measurement 3. to apply the basic settings of the precision calculus when processing experimental results 4. to distinguish pure substances and mixtures 5. to recognize a substance represented by chemical symbols 6. to connect the basic physical and chemical properties of simple inorganic and organic substances with their chemical composition 7. to apply the relations between physical quantities for calculation based on a chemical reaction equation 8. to distinguish the limiting reactant and the reactant in excess 9. to connect names and chemical formulas with the basic chemical and physical properties of simple inorganic and organic substances 10. to identify natural organic compounds (carbohydrates, amino acids, lipids, nucleic acids, alkaloids) on the basis of a representation of a structure or structure segment and put it in the relation to the basic properties.
2.5. Course content (syllabus)	LECTURES: 1. Physical quantities, units of measurement and basics of precise calculation What is measurement, what is physical quantity? Extensive and intense physical quantities. Units of measurement according to SI, exceptionally permitted units of measurement. Decimal units of measurement, prefixes. Conversion of units of measure using prefix values. Relationships between exceptionally permitted or old units for pressure (bar, atm,

	mmHg) with the official one (Pa). Exceptionally permitted unit of measurement for volume (liter and decimal versions: mL, dL,...). Precise calculation. Rules for determining significant digits. Basic rules of precision calculus for determining the number of significant digits in the calculation result: addition and subtraction, multiplication and division. 2. Basic chemical concepts Periodic table of the elements. Symbols and names of the chemical elements. Atomic radius, electronegativity, ionization energy. Chemical bonding - covalent and ionic bond. Metallic bond. Intermolecular interactions, hydrogen bond. Lewis molecule structures. VSEPR model. 3. Basics of stoichiometry I Relative atomic mass, relative molecular mass, unified atomic mass unit. Mole, number-of-moles, molar mass. Number of entities (abundance), Avogard's constant. Empirical and molecular formula. Calculation of an empirical formula on the basis of the results of chemical analysis. Calculation of the molecular formula from the empirical one, with the using the molar mass of the compound. 4. Basics of stoichiometry II Stoichiometry of chemical reactions. The ratio of the sets of reaction participants. Reach of a reaction. Reaction yield. Limiting reactant and reactant in excess. 5. Chemical thermodynamics What is chemical thermodynamics? Laws of thermodynamics. Internal energy, work, heat. Enthalpy: reaction enthalpy, enthalpy of formation, combustion enthalpy, enthalpy of melting, enthalpy of evaporation, enthalpy of sublimation, enthalpy of chemical bond. Thermochemical equation. Hess's law. Entropy, Gibbs energy. 6. Aggregation states Solid, liquid and gaseous state of aggregation. Differences in basic physical properties of aggregation states (shape, order, compressibility). Crystalline and amorphous structure of solids. Aggregation states changes, boiling point, normal boiling point. Properties of liquids (viscosity / fluidity, capillarity, surface tension). Ideal and real gases. Ideal gas state equation (general gas equation). Phase diagram. 7. Solutions and colloidal systems I Solutions, solvents, solutes. Polar and non-polar solvents, electrolytic and non-electrolytic solutions. Processes in dissolving solid ionic substances in water; enthalpy diagrams. Solubility diagrams. Henry's law of solubility of gases. Quantitative expression of the composition of mixtures. Proportions (mass, volume, plural), concentrations (mass, plural), molarity and appropriate units of measurement. Less commonly used physical quantities to express the composition of mixtures: numerical fraction, numerical concentration, volume concentration; ratios; contents. 8. Solutions and colloidal systems II Colloidal systems. Dispersed phase, dispersion medium. Micelles. Surfactants. Electrical bilayer, coagulation, peptization. 9. Chemical kinetics and chemical equilibrium Chemical kinetics as a branch of physical chemistry. The rate of change in the concentration of reactants or products and the rate of a chemical reaction. Reaction rate law. Order of reaction. Factors affecting the rate of a chemical reaction: concentration, pressure, temperature, catalyst. Dependence of reactant concentration on time. Collision theory. Activation energy and transition state. Chemical equilibrium. Dynamic equilibrium phenomenon. Factors that can affect the system in a state of dynamic equilibrium: concentration, pressure, temperature. Le Chatélier's principle. Equilibrium constant (concentration and pressure). Units of measurement of equilibrium constants. Relationship between concentration and equilibrium pressure constant. 10. Acids, bases, and salts I Acids and bases. The definitions of acids and bases by various authors, according to different criteria. Substances forming acidic aqueous solutions: covalent hydrides and similar compounds, oxoacids, oxoacid anhydrides, carboxylic acids. Substances forming basic aqueous solutions: hydroxides, hydroxide anhydrides, covalent hydrides (ammonia

	and derivatives), organic amines. Acid and base strength. pH, pOH, Kw, Ka, Kb, Ksp, degree of ionization. 11. Acids, bases, and salts II Salts. Salt ionization. Solubility of salts in water. Reactions in which salts are formed. Reactions of metals with acids. Salt hydrolysis, acidity of aqueous salt solutions. Basics of nomenclature of acids, bases and salts. Amphoterism (of some metals, their oxides and hydroxides). Amphoteric acid residues. Buffer solutions, acidic and basic buffers. 12. Oxidation and reduction processes The concept of oxidation number, oxidation and reduction. Rules for determining the oxidation number. Rules for equalization of redox process equations by ion and electron method, in acidic and basic aqueous medium and in aqueous solution without the participation of H+ and OH− ions. Important oxidizing agents and reducing agents (KMnO4, K2Cr2O7, HNO3, H2O2), aqua regia. Complex compounds Complex compounds, central metal atom, ligands. Examples of simple ligands with respect to the charge and with respect to the number of unshared electron pairs. The charge of a co-ordination unit. Geometric shapes of complex units. Nomenclature of complex compounds. Reactivity of complex compounds. Occurence of complex compounds (in nature, analytical chemistry, photography, etc.). Blue vitriol, Hem, chlorophyll. 13. Organic Chemistry I Chemistry of carbon compounds. A tetravalent carbon atom. Functional groups of carbon A tetravalent carbon atom. compounds. Oxidation number of carbon in organic molecules. Representation of molecules of organic compounds: molecular models, perspective formula, wedge-and-dash projections, Newman projection, structural projection formula, condensed structural formula, bond line representation (skeletal drawing). Empirical formula. Hydrocarbons: alkanes, alkenes, alkynes, cycloalkanes, arenes. Nomenclature. Aliphatic and cyclic hydrocarbons. Conformational and constitutional isomerism of hydrocarbons. Geometric isomerism of alkenes: designations cis-, trans- and Z- and E-. Physical and chemical properties of hydrocarbons; substitution and addition reactions. Current concept of aromaticity: Hückel's rule. Organohalogen compounds, the most important representatives of organohalogen compounds. Substitution and elimination reactions. Alcohols and phenols. The most important representatives of the group, nomenclature. Primary, secondary and tertiary alcohols. Divalent, trivalent, multivalent alcohols. Physical and chemical properties; substitution reactions to the O−H and C−O bonds. Ethers. The most prominent representative of the group, the nomenclature. Physical and chemical properties, flammability of ether. Substitution reactions. Aldehydes and ketones. The most important representatives of the group, the nomenclature. Physical and chemical properties. Preparation of aldehydes and ketones from alcohols. Oxidation and reduction reactions on the carbonyl group. Substitution reactions on α-carbon atom. Tollens and Fehling reactions to prove an aldehyde group. Carboxylic acids; the most important representatives, the nomenclature. Carboxylic acid derivatives: esters, acyl halides, carboxylic acid anhydrides, amides. Physical and chemical properties of carboxylic acids and derivatives. Substitution reactions on the carboxyl group. Amine. Primary, secondary and tertiary amines, quaternary ammonium salts. Nomenclature. Physical properties. Alkalinity of amines. Substitution reactions with carboxylic acid derivatives. 14. Organic Chemistry II Heterocyclic compounds, an overview of the simple heterocyclic compounds. Aromatic and non-aromatic heterocyclic compounds. Heterocyclic compounds with condensed rings. Organic compounds with sulfur. Review of groups of compounds with sulfur instead of oxygen atoms. Chirality and optical activity. Chiral carbon atom, enantiomers, diastereoisomers. Rules for determining the absolute configuration of an asymmetrically substituted C-atom (Cahn-Ingold-Prelog priority rules). Absolute configuration and direction of rotation of the plane of polarized light. Wedge-and-dash formula, Fischer’s projection formula. Racemic, meso-

	compounds, number of geometric isomers with respect to the number of asymmetric carbon atoms. 15. Natural organic compounds Lipids: triglycerides, phospholipids, lipid waxes; steroids, terpenes, fat-soluble vitamins, icosanoids. Carbohydrates; monosaccharides, oligosaccharides, polysaccharides. Glucose and fructose. Fischer projection formulas and relative configuration. Chain and cyclic structures of monosaccharides. Disaccharides and polysaccharides. Glycosidic bond. Amino sugars, chitin. Amino acids, peptides, proteins. α-amino acids and structures of important natural amino acids, character of side branches. Zwitter-ion, acid-base properties of amino acids. Protein structure: primary, secondary, tertiary and quaternary. α-helix and β-sheet. Simple and conjugated proteins. Nucleic acids. Polynucleotide chain components: heterocyclic bases, pentoses, phosphate ion. Nucleosides and nucleotides. The double helix of a DNA molecule. RNA. Other natural organic compounds; alkaloids. EXERCISES: 1. Conversion of units of measurement: decimal to non-decimal; non-decimal to decimal; derived unnamed units. 2. Representation of structures of simple molecules by Lewis symbols. Correlation of physical properties with chemical bonds and intermolecular interactions. 3. Number-of-moles calculation on the bases of number-of-units or mass data. Calculation of empirical and molecular formula. 4. Calculation of the mass / number-of-moles / volume of the required reaction participant on the basis of data on the reaction participant of a known quantity. Calculation of reaction yield. Determination of the limiting reactant. 5. Calculation of standard reaction enthalpy based on reaction equation and tabulated values for ΔfH°. Calculation of ΔrH° using the values of enthalpy of chemical bonds. Hess's law. Constructing of an enthalpy diagram. Calculation of reaction entropy and Gibbs energy. 6. General gas equation. Stoichiometry of chemical reactions with gas participant (s). 7. Calculation of a quantitative composition of the solution. Calculation of the amounts of ingredients required to prepare a solution of the required concentration, proportion or molarity. 8. Conversion of expression of the composition of a solution from one intensive to another intensive physical quantity. Relationship between mass and molar concentration. Dilution of solutions - calculation of (i) the concentration of the solution prepared by dilution or (ii) the volume of the initial solution. 9. Derivation of the expression for the concentration or pressure equilibrium constant based on the reaction equation, derivation of an appropriate unit of measurement. Calculation of the equilibrium constant value based on the values of the concentrations of the reaction participants. Calculation of equilibrium concentrations of reaction participants based on initial concentrations and equilibrium constant values. 10. Writing acid and base ionization equations. Writing compound formulas on the basis of the names and vice versa. 11. Writing acid-base reactions. Derivation of salt hydrolysis equations. Calculation of pH of aqueous solutions of strong and weak acids and bases. Solubility calculation based on Ksp. 12. Determination of oxidation numbers in various examples of simple inorganic compounds and ions. Balancing redox reaction equations that take place in an acidic or basic medium, with and without the participation of H+ and OH− ions. 13. Derivation of carbon compound names on the basis of the structure. Representation of structures of organic compounds on the basis of the names. Predicting the products of chemical reactions of simple representatives of the above groups of organic compounds and writing the equations. 14. Determination of the absolute configuration of chiral compounds. Fischer’s projection formulas.

<table>
<tr><td></td><td colspan="9">15. Demonstration of the structure of simple lipids, carbohydrates and amino acids. Demonstration of acid-base amino acid reactions.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">V. Roje, The lectures of the Basis of Chemistry, ppt-presentations (in Croatian)</td><td colspan="2">NO</td><td colspan="2"></td></tr>
<tr><td colspan="5">M. Sikirica, B. Korpar-Čolig, Chemistry with Exercises 1 (in Croatian), Školska knjiga, Zagreb, 1991. and later editions</td><td colspan="2">NO</td><td colspan="2"></td></tr>
<tr><td colspan="5">M. Sikirica, B. Korpar-Čolig, Chemistry with Exercises 2 (in Croatian), Školska knjiga, Zagreb, 1991. and later editions</td><td colspan="2">NO</td><td colspan="2"></td></tr>
<tr><td colspan="5">M. Sikirica, B. Korpar-Čolig, Organic Chemistry (in Croatian), Školska knjiga, Zagreb, 1996. and later editions</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">P.W. Atkins, M.J. Clugston, Basics of Physical Chemistry (translation in Croatian), Školska knjiga, Zagreb, 1992.

V. Rapić, Nomenclature of organic compounds (in Croatian), Školska knjiga, Zagreb, 1991. and later editions

M. Sikirica, Stoichiometry (in Croatian), Školska knjiga, Zagreb</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Azra Tafro, PhD.	1.7. Number of ECTS credits	7
1.2. Course title	Mathematics	1.8. Number of hours in semester (L+E+F+e-learning)	45+45+0
1.3. Course code	33780	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 course objectives are mastering the skills of mathematical modelling, development of abstract and analytical thinking and precision of expression and mathematical inference. Course contents are adapted to students of forestry studies. Overall material relating to functions, differential and integral calculus and basics of linear algebra is preserved in integral form, with a simplified approach.		
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. Applied approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and independently draw conclusions based on analyzed data.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Interpretation of basic notions and facts of sets and functions when solving mathematical problems (graphs of elementary functions, sequence limits, domain of a function, properties of functions, composition of functions, inverse functions, function limits, function continuity). 2. Applications of derivatives (tangents, elementary and compound function derivatives, derivative rules, function growth and decay, extremes of functions, graphs). 3. Interpretation of two variable functions (partial derivatives, extremes). 4. Interpretation of indefinite integrals (concept of primitive function and indefinite integral, integrating, basic properties of indefinite integrals, integration methods). 5. Analysis of definite integrals (basic concepts, Newton-Leibnitz formula, calculating areas of plane figures using definite integrals, calculating the volume of a solid of revolution, centroid coordinates, double integral, first order differential equations). 6. Interpretation of vectors and matrices (vectors in two- and three-dimensional space, operations with vectors, matrices and matrix calculus, determinants).		
2.5. Course content (syllabus)	Lectures and exercises: • Number sets. Real numbers. • Equations and inequalities • Functions. Linear and quadratic function. • Elementary functions. • Properties of functions. • Function domain and inverse. • Continuous functions and limits.		

<table>
<tr><td></td><td colspan="9">• Derivative. Derivations of elementary functions. Differential calculus.
• Function analysis.
• Functions of more than one variable.
• Integral. Indefinite integral. Some integration methods.
• Definite integral. Applications of integral calculus (areas, volumes, moments, centroid).
• Differential equations.
• Vectors in a two- and three-dimensional space. Vector operations.
• Matrices and matrix calculus.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
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☐ field work</td><td colspan="3">☒ independent assignments
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☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>7</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Attendance and active participation in class, solving homework and partial exams.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Bradić T. et al: Matematika za tehnološke fakultete, Element, Zagreb, 1998.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">Javor, P.: Matematička analiza 1, Element, Zagreb, 2003.</td><td colspan="3">NO</td><td colspan="2">Online</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Hitrec,V. :Matematika (analiza funkcija), skripta. Šumarski fakultet, Zagreb, 1986
2. Hitrec,V. :Matematika (funkcije od dvije varijable, integriranje i primjena), skripta, Zagreb, 1994.
3. Štambuk Lj.: Matematika, Veleučilište u Rijeci, 2010.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Bojan Matoš, PhD. Assist. Prof. Duje Smirčić, PhD. Ivica Pavičić, PhD. Šime Bilić, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Petrology with Geology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+0
1.3. Course code	33781	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 program of this course is designed to offer students of Forestry studies basic knowledge in the fields of mineralogy, petrology and geology, providing 1) basic classification of minerals and rocks; 2) understanding the principles of petrogenesis of igneous, sedimentary and metamorphic rocks; 3) understanding processes in rock weathering and erosion on the Earth's surface; 4) understanding of landscape and soil formation processes; 5) usage of basic geological maps; 6) understanding of the hydrogeological properties of surface and ground waters; 7) understanding of the geological role in the environmental protection and sustainable 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	A1. apply aproach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyse data and conclude individually based on analysed data B3. acquire basic principles of protection of forests from abiotic and biotic factors, especially fires and apply basic procedures and means in protection of forests B7. perform professional field works in the melioration and management of forest areas in the Mediterranean region B8. collaborate in preparation of ecological studies and spatial plans
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Explain the Earth's architecture and formation of minerals (Earth's interior, endogenic processes in the Earth's interior, Earth's crust and lithosphere, tectonic plate theory, minerals, crystallinity, crystal lattice, crystal systems, chemical composition of minerals, petrogenic minerals, and genesis and physical properties of minerals). 2. Identify and classify igneous, sedimentary and metamorphic rocks (a) magma/lava, classification of igneous rocks according to their place of formation, chemical and mineralogical composition, Bowen's crystallisation series from magma systems, classification of igneous bodies, post magmatic stages of crystallisation; (b) sedimentary rock genesis, basic characteristics and classification of sedimentary rocks; (c) metamorphism, structural and mineralogical changes in metamorphic rocks, metamorphic stages and classification of metamorphic rocks.

<table>
<tr><td></td><td colspan="9">3. Differentiate difference between relative and absolute dating methods and explain classification systems and principles in determination of geological time: lithostratigraphic, biostratigraphic, chronostratigraphic and geochronological systems.
4. Apply basic geological principles to identify relative age order of geological events and features.
5. Classify primary and secondary (deformational) geological structures/features in rocks types of the Earth's crust.
6. Address the effect of surface and ground water on mechanical and chemical weathering of minerals and rocks, and landscape formation.
7. Characterize the principles of earthquake occurrences, its manifestation, arrangement, frequency and intensity of earthquakes as well as slope gravitational processes (e.g., landslides, creeping, etc).</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">L1 Introduction; Structure of the Earth
L2 Minerals, mineral structure and their physical characteristics; E1 Examples of minerals with characteristic physical features
L3 Mineral systematics; E2 Mineral examples of characteristic groups and their physical-chemical features, silicate minerals and their crystal structure
L4 Igneous rocks – origin and systematics; E3 Classification and examples of igneous rocks, minerals in igneous rocks, igneous rock texture
L5 Sedimentary rocks; E4 First partial exam
L6 Metamorphic rocks; E5 Classification of sedimentary rocks, clastic sedimentary rocks and sediments, carbonate sedimentary rocks; Metamorphic rocks, classification of metamorphic rocks, characteristic rocks for different metamorphic stage
L7 Geological time; E6 Second partial exam
L8 Geological structures; E7 Concepts of determination of geological time, geological structures, basic geological map
L9 Corrections of first and second partial exam; E8 Understanding of the elements found in the basic geological map, faults, folds, layer position elements
L10 Surface water, Hydrology; E9 Measuring and drawing layer positional elements
L11 Groundwater, Hydrogeology; E10 Construction of the geological profile – drawing the topographic features
L12 Tectonic plate boundaries and earthquakes - seismotectonic features of earthquakes, mechanisms and causes of earthquakes and cogenetic deformations; E11 Construction of the geological profile – drawing of the faults
L13 Gravitational transport of rocks and soils along the slopes; E12 Construction of the geological profile – drawing of the layers and layer elements
L 14 Third partial exam; E13 Construction of the geological profile – determination of the fault character and calculation of the fault heave and throw
L15 Corrections of the third partial exam; E14 Evaluation of the constructed geological profile
E15 Evaluation of the constructed geological profile</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
</table>

<table>
<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>5</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">The student is obligated to attend the exercises of the course. The student is obligated to construct and submit the exercise task for evaluation. The task is done during the semester in the frame of exercise lectures and is referred to the construction of a simple geological profile based on the data from the geological map. During the semester, three partial exams will be organised, enabling the final grade, in case all three are positive. If all three partial exams are not positive, the student is obligated to have at least one partial exam with a positive grade to get the possibility of undertaking the final exam during the exam period.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td>Availability via other media</td></tr>
<tr><td colspan="5">Pavelić, Davor (2014): Opća geologija. Rudarsko-geološkonaftni fakultet, Zagreb</td><td colspan="2">YES</td><td></td></tr>
<tr><td colspan="5">Vrkljan, Maja (2012): Uvod u mineralogiju i petrologiju Rudarsko-geološkonaftni fakultet, Zagreb</td><td colspan="2">YES</td><td></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Plummer, C.C., McGeary, D. & Carlson, D.H (1999): Physical geology. 8th Edition, WCB - McGraw-Hill Publishers, Boston – Toronto.
Tišljar, Josip (1994): Sedimentne stijene. Školska knjiga, Zagreb, 422 str.
Vrkljan, Maja (2001): Mineralogija i petrologija – osnove i primjena. 1-207, Udžbenici Sveučilišta u Zagrebu, izd. RGN fakultet Zagreb</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Marko Vucelja, PhD. Prof. Josip Margaletić, PhD. Linda Bjedov, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Applied zoology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+8
1.3. Course code	33783	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 main goal of the course is transfering knowledge about the importance of fauna in maintaining the stability of forest, urban and protected areas in Croatia. Starting from understanding the basic principles of animal organism functions, students will learn about groups of invertebrates (eg arthropods) and vertebrates (eg amphibians, reptiles, birds and mammals) important in various aspects of forest or urban forest management and also in protected areas. Furthermore, one of the goals will be gaining knowledge about the most important animal species of invertebrates and vertebrates (eg morphology, biology, ecology, behavior) that occur in various habitat types throughout Croatia (eg lowlands, swamps, floodplains, hills, mountains, mediterranean forests, karst, human settlements). Another goal will be to raise students' awareness of the impact of invasive animal organisms, which is becoming more common, both in Europe and in our country.
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. recognize and determine the most important types of xylophage's bacteria, insects and funghi on trees species and detect wood defects incurred due to their activity B9. collaborate in preparation of ecological impact studies and spatial plans C4. conduct monitoring of the environment
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Identify, name and group typical representatives of different groups of animals (eg invertebrates: molluscs, arthropods; vertebrates: reptiles, birds, mammals, etc.) 2. Identify, describe and give an example of basic representatives of different groups of animals (eg invertebrates: molluscs, arthropods; vertebrates: reptiles, birds, mammals, etc.) according to different habitat types that occur in Croatia (eg lowlands, swamps, floodplains, hills, mountains, Mediterranean forests, karst, human settlements, etc.). 3. Illustrate the biodiversity of Croatian fauna and its importance for preserving the stability of different habitat types (eg lowlands, swamps, floodplains, hills, mountains, Mediterranean forests, karst, human settlements, etc.). 4. Demonstrate what impact invasive animal species can have on autochthonous fauna
2.5. Course content (syllabus)	Lectures: 1. Zoology and animals - basic definitions, areas, history, basic characteristics of animal organisms, evolution, classification

<table>
<tr><td></td><td colspan="10">2. Animal body systems: skeletal, muscular, integumentary system
3. Animal body systems: respiratory, circulatory, digestive system
4. Animal body systems: urinary, reproductive, immune, lymaphatic, endocrine, nervous system
5. Diversity of fauna in Croatia
6. Groups of animals: invertebrates: roundworms, earthworms, molluscs
7. Groups of animals: invertebrates: arthropods: arachnids
8. Groups of animals: invertebrates: arthropods: crustaceans, centipedes
9. Groups of animals: invertebrates: arthropods: insects: morhology and anatomy
10. Groups of animals: invertebrates: arthropods: insects: systematics
11. Groups of animals: vertebrates: jawless, cartilaginous, bony fish
12. Groups of animals: vertebrates: amphibians
13. Groups of animals: vertebrates: reptiles
14. Groups of animals: vertebrates: birds
15. Groups of animals: vertebrates: mammals

Exercises:
1. Introduction: Microscope, binocular, microscopy preparations
2. Porifera (morphology, anatomy), Cnidaria: (morphology, anatomy)
3. Parasites: Nematode, Platyhelminthes (morphology, anatomy)
4. Mollusca (morphology, anatomy)
5. Arachnida: Scorpiones, Araneae, Acari (morphology, anatomy)
6. Crustacea (morphology, anatomy)
7. Myriapoda (morphology, anatomy)
8. Insect: Hemiptera, Coleoptera, Lepidoptera (morphology, anatomy)
9. Insecta: Lepidoptera: oral apparatus, structure of tentacles, structure of wings (scales)
10. Annelida: Lumbricus terrestis (morphology, anatomy)
11. Acari: Ixodes ricinus (morphology, anatomy), morphology of the oral apparatus
12. Osteichthyes, Chondrichthyes: shells of different species of both classes
13. Amphibia: larva, tadpole, frog (morphology)
14. Aves: the structure of the stomach, the structure of the feathers
15. Mitosis, meiosis

Field work:
Visit to the Zagreb Zoo: introduction to the representative species of the most important animal groups in Croatia</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Making drawings of microscopic slides during the exercises. The created drawings are submitted at the end of each thematic unit of exercises and are evaluated. Exercise material is not included in the exam, and the grade of the exercises makes up 25% of the final grade</td></tr>
<tr><td rowspan="4">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>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>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>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
</table>

	Project		NO	Written exam	YES		ECTS credits (total)	5	
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, attending exercises, participating in field work								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Oštrec, Lj., 1998: Zoologija, štetne i korisne životinje u poljoprivredi. Zrinski d.d., Čakovec, 232 str.				YES		e-learning platform Merlin (PDF)		
	Matoničkin, I., Klobučar, G., Kučinić, M., 2010: Opća zoologija, Školska knjiga, Zagreb, 467. str.				NO		e-learning platform Merlin (PDF)		
	Matoničkin, I., Habdija, I., Primc- Habdija, B., 1999: Biologija viših avertebrata, Školska knjiga, Zagreb, 609. str.				NO		e-learning platform Merlin (PDF)		
	Uhlenbroek, C., 2009: Svijet životinja, Profil, 512. str.				NO		e-learning platform Merlin (PDF)		
	Šafarek, G., 2014: Životinje Hrvatske, Mozaik knjiga, Zagreb, 330. str.				NO		e-learning platform Merlin (PDF)		
2.12. Optional literature	1. 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. 2. Tutiš, V., Kralj, J., Radović, D., Ćiković, D., Barišić, S. (ur.), 2013: Crvena knjiga ptica Hrvatske, Ministarstvo zaštite okoliša i prirode, Državni zavod za zaštitu prirode, Zagreb, 258 str. 3. Jelić, D., Kuljerić, M., Koren, T., Treer, D., Šalamon, 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. 4. Mrakovčić, M., Brigić, A., Buj, I., Ćaleta, M., Mustafić, P. i Zanella, D., 2006: Crvena knjiga slatkovodnih riba Hrvatske. Ministarstvo kulture i Državni zavod za zaštitu prirode, Zagreb, 256. str. 5. Janicki, Z., Slavica, A., Konjević, D., Severin, K., 2007: Zoologija divljači, Udžbenici Sveučilišta u Zagrebu, Veterinarski fakultet, Zagreb, 209. str.								

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Sara Ursić, PhD.	1.7. Number of ECTS credits	3
1.2. Course title	Sociology of urban and protected areas	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	33784	1.9. Expected enrolment in the course	30-50
1.4. Study programme	University undergraduate 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	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	Introducing students to the basic settings of contemporary urban-sociological topics in the global and socio-ecological context. Understand the cause-and-effect relationships of today's urbanization context in which urban, social, economic, and ecological dichotomies predominate. Possible solutions and existing models that are applicable to our cities will be able to get acquainted with the concept of urban sustainability and Europeanization models (successful or less successful examples of implementation) at the level of EU cities and beyond.
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	A 1 - Distinguish definitions and stages of development of the urbanization process in the modern world and the cause-and-effect relations between global, national and local (urban) processes A 2 - Interpret the postmodern and information context of today's cities and how information technology enables a new division and evaluation of work and new migrations of the working population. Understand the phenomenon of globalization and global development in a neoliberal context. A 3 - Understand the concept of sustainable development (Kyoto Protocol and Paris Agreement). Analyze the state of ecological crisis and ecological footprint according to environmental sustainability.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define the phenomenon of urbanization and hyperurbanization in the modern world and the basic phases of the urbanization process. 2. Understand the growth of the world's urban population, urban poverty and urban problems, and the phenomenon of slum (favelization) and spatial segregation. 3. Get acquainted with the first sociological theories about the city that are based on the phenomena of industrialization and urbanization and lead to the development of the modern city (industrial and modern cities of the 19th and 20th centuries) 4. Understand the post-industrial and postmodern phase of urbanization (late 20th and 21st centuries) and the emergence of information and global cities as a result of the process of globalization and digitalization 5. Analyze the state of socio-ecological crisis and sustainable development that have arisen due to anthropogenic impacts on the ecosystem and the socio-ecological paradigm 6. Get acquainted with the models of urban sustainability (urban sustainability) - compact city, green capital, smart city - models of the Europeanization process for possible application in the local context.

<table>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">1. Students will be introduced to the phenomenon of urbanization and hyperurbanization in the modern world (urban population growth, urban poverty and urban problems).
2. The position of Croatia in today's urbanization context, the cause-and-effect relationship between global, national and local (urban) processes will also be explained.
3. It will also inform about more important urban-sociological theories from the beginning of the 19th century. to today's postmodern phase, that is, how the postmodern and informational context of today's cities enables a new evaluation of the city and the quality of life in it.
4. The phenomenon of modernization and globalization and global (glocal) development in a neoliberal context will also be analyzed.
5. Highlight the phenomena and processes of urban renewal and revitalization of cities in which the processes of gentrification and commercialization of space have a special role (the example of post-socialist cities, especially Zagreb).
6. The concept of sustainable development will be presented, as well as the importance and role of international agreements and documents that seek to resolve the socio-ecological crisis (eg the Kyoto Protocol and the Paris Agreement), as well as environmental footprint measures.
7. Analyze the elements of environmental crime (ways and types that have led to the destruction of natural and public spaces by anthropogenic impacts and activities on the environment) (apartmentization and tourism of urban centers and coastal areas)
8. The importance of urban sustainability for improving the quality of life in cities today (EU models of sustainable cities) will be emphasized, especially at the level of local areas and smaller urban communities (the importance of the process of citizen participation in the decision-making process).
9. Examples of the green capital concept at the European level and a comparison of the city of Zagreb with Ljubljana as a successful example and title holder.
10. Examples of urban forestry and urban gardening for the sustainability of today's urban space (Zagreb urban gardens).</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☒ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="4">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☒ work with mentor
☐ (other)</td><td>2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>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>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>3</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Cifrić, I.(2003):Okoliš i održivi razvojugroženost okoliša i estetika krajolika,HSD, Zagreb</td><td colspan="2">YES</td><td colspan="2">YES</td></tr>
</table>

	Šarinić, J. i Čaldarović, O. (2015). Suvremena sociologija grada. Od „nove urbane sociologije“ prema „sociologiji urbanog“, Sociološka biblioteka, Naklada Jesenski i Turk, Zagreb	NO	City's Libraries
	Davis, M. (2011). Planet slumova, VBZ, Zagreb	NO	City's Libraries
	Svirčić Gotovac, A. i Zlatar Gamberožić, J. (2020). Obrana javnih prostora u zagrebačkim slučajevima „Čuvamo naš park“ i „Vratite magnoliju“. Sociologija i prostor, 58 (1), 5-31.	NO	www.idi.hr and hrcak.srce.hr
	Svirčić Gotovac, A., Kerbler, B. (2019). From Post-socialist to Sustainable: The City of Ljubljana. Sustainability, 11 (7126), 1–16.		www.idi.hr
	Presentations from lectures	YES	Merlin
2.12. Optional literature	1. Girardet, H. (1999). Creating Sustainable Cities, 1st ed.; Green Books; Totnes, UK, 1999. 2. David Harvey (2013). Kratka povijest neoliberalizma, VBZ, Zagreb. 3. Vladimir Lay (Ed.). (2007.) Razvoj sposoban za budućnost. Prinosi promišljanju održivog razvoja Hrvatske. Zagreb: Institut društvenih znanosti Ivo Pilar., 2007. 4. Naomi Klein (2000). No logo. Flamingo. Great Britain. 5. Berrini, M.; Bono, L. (2010). Measuring Urban Sustainability: Analysis of the European Green Capital Award 2010 & 2011 Application Round, 1st ed.; Ambiente Italia: Milan, Italy		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Škvorc, PhD. Assist. Prof. Martina Temunović, PhD.	1.7. Number of ECTS credits	3
1.2. Course title	Botany – Plant Morphology	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	226104	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 are introducted to basic botanical terms which are the base for senior-year courses. In addition, they get acquainted with the anatomical and morphological structure and function of plant cells, tissues and organs. All of that develops their understanding of the functioning and role of particular parts in different ecosystems they will work in after their graduation.
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. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To present the plant cell structure and function and plant function and plant histology (cytology, cytoplasm, plastids, mitochondria, cell wall, pits, cell nucleus, chromosomes, DNA, mitosis, meiosis, primary, secondary meristems, phellogen, vascular cambium, permanent or final cells, dermal and vascular tissue). 2. To interpret the anatomy of vegetative plant organs (leaf, stem structure, structure of Gymno- and Angiosperms, bark anatomy, root anatomy, phylogeny of stele). 3. To interpret the morphology of vegetative organs (structure, types, transformations and growth of stems, roots and leaves). 4. Interpret the morphology of reproductive organs (structure and classification of flowers, inflorescences, fruits and seeds) and explain the alternation of generations and plant reproduction.
2.5. Course content (syllabus)	Lectures 1. Introduction, historical development. Basic organization of the plant body. (1h) 2. Cytology - Protoplast, Cell wall. Cell nucleus - chromatin, chromosomes, DNA. Plant cell division - mitosis, meiosis. (2h) 3. Histology - general characteristics, cell types. Primary meristems. Secondary meristems. Permanent cells. Skin cell. Vascular cell - development of conducting vessels, types and structure of conducting vessels. (2h) 4. Morphology of vegetative organs. Primary and secondary growth. Increase in thickness. Root - root structure, root types, root transformations. Shoot - shoot structure, shoot

<table>
<tr><td></td><td colspan="9">transformations, wood anatomy. (2h)
5. Morphology of vegetative organs. Leaf - structure, shape, polymorphism, leaf duration, leaf transformations. Morphological adaptations to environmental stress conditions. (2h)
6. Morphology of reproductive organs. Alternation of generations. Sporangia and sporophiles, Gametophyte, (2h)
7. Morphology of reproductive organs. Flower. Pollen. Inflorescence. (2h)
8. Pollination and fertilization. Seed. Fruit - anatomical structure, classification. Fruit dispersal. Germination and seedling. (2h)

Exercises
1. Introduction to practicum work. The construction of the microscope. Basics of microscopy. Specimen preparation. Observation of plant cells at low magnification. (1h)
2. Cytoplasmic motion. Living and non-living parts of a plant cell. The apical shoot on the longitudinal section. Tissue classification. Primary meristem, initial cells. (1h)
3. The structure of the tetracytic and gramineous type of stomata. Observation of leaf epidermis. Observation on greater magnification. Opening and closing of stomata. (1h)
4. Parts of a leaf. Leaf shapes. Anatomical structure of dorsiventral and concentric leaf. Assimilation and transpiration parenchyma. Leaves of light and shade. (2h)
5. Shapes and appearance of the shoot. Buds. Stem transformations. (1h)
6. Primary structure of dicot-gymnosperm stem on the cross-section. Stem primary cortex. Stem central cylinder. Types of vessel tissues. Open collateral vessel. (1h)
7. Primary structure of monocot stem. Closed collateral vessel. (1h)
8. Types and root transformations. Primary root structure. The apical root. Root hairs. Radial vessel. (1h)
9. Periderm structure. Bark structure and function. Lenticels. (1h)
10. Wood structure - gymnosperms and angiosperms. Characteristic wood sections. (2h)
11. Flower morphology. Anatomical structure of flower parts. Pollen morphology. (1h)
12. Seed structure - gymnosperms, angiosperms. (1h)
13. Fruit types. Fruit structure. (1h)</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>3</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Passing preliminary exams, exams.</td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Franjić, J., Škvorc, Ž., Trinajstić, I., 2008: Anatomija bilja (interna skripta), 1-62.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
</table>

	Zagreb.		
	Franjić, J., 1998: Praktikum iz anatomije bilja (interna skripta), 1-22. Zagreb.	NO	YES, Merlin
	Franjić, J., Ž. Škvorc, 2010: Šumsko drveće i grmlje Hrvatske. Sveučilište u Zagrebu Šumarski fakultet.	YES	YES, Merlin
	Franjić, J., Ž. Škvorc, 2014: Šumsko zeljasto bilje Hrvatske. Sveučilište u Zagrebu Šumarski fakultet.	YES	YES, Merlin
	Franjić, J., Ž. Škvorc, 2020: Šumsko drveće i grmlje Hrvatske (Novo izdanje). Sveučilište u Zagrebu – Šumarski fakultet, 516 str. Zagreb.	YES	YES, Merlin
2.12. Optional literature	1. Nikolić, T., 2017: Morfologija biljaka – razvoj, građa i uloga biljnih tkiva i organskih sustava. Alfa d. d. Zagreb. 2. Idžojtić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp. 3. Glimn-Lacy, J., Kaufman, P. B., 2006: Botany Illustrated. Introduction to Plants, Major Groups, Flowering Plant Families. Springer. 146 p.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović prof. kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 1	1.8. Number of hours in semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226038	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 Physical and Health Culture is the acquisition of theoretical and practical kinesiological knowledge in order to train students for independent physical exercise and the adoption of healthy living habits. Through various forms of physical exercise, the goal is to meet the daily needs for movement and improve the motor, functional and cognitive abilities of the student population. Through attending classes, students are educated about the importance of daily physical exercise, or about all the good things that physical activity means for a person and his health. The aim is to simultaneously acquire knowledge about the harmfulness of various forms of addiction to health, especially their impact on intellectual and physical capabilities, the importance of quality nutrition and the most interesting results of previous research on the student population in the segment: physical activity as disease prevention, healthy eating , sports diagnostics, stress management, physical activity as a means of relief.		
2.2. Enrolment requirements and/or entry competences required for the course	health status		
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 To continue training at the graduate university studies of the Faculty of Forestry, Department of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the structure of the physical exercise class 2. Explaination of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises with regard to kinesiologic activity 5. Organize constructive free time 6. Assess personal diet and physical exercise habits. 7. Demonstrate general preparatory exercises and stretching exercises. 8. Understanding kinesiology programs and their target orientation 9. Control emotions and strengthen self-control.		
2.5. Course content (syllabus)	1. Athletics Walking - Walking at different paces, Nordic walking, brisk walking, hiking Running - theoretical knowledge and divisions, cyclic movements at different paces, fast running short distances, running down a slope, running along a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads,		

<table>
<tr><td></td><td colspan="9">relay running, running with hurdles of different height
2. Martial arts- Judo, Karate
Basic techniques of Judah - falls, hand throws, belt throws, foot throws, choking techniques, levers
Basic techniques - karate - kicks, punches, defense
3. Sports games-
Basketball - Keeping the ball in place, keeping the ball in motion, basic throwing, pivoting, jumping shot, passing in place and moving
Football - passing in place, passing to the first, passing in motion, technique with the ball, cooperation of two and three players, shots on goal from the move, shot on goal after the ball is added, volley kick, headers, stops
Volleyball - Passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, technique of attack, technique of defense
Handball - guiding the ball in a straight line and with a change of direction, Passing in place, passing in motion, crossings, passing for a counterattack, cooperation of two and three players, goal kick after the lead, goal shot on the added ball
4. Racket sports
Badminton-forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand punch under the arm, high serve, backhand serve, short serve, field movements, single play, pair play
5. Shooting-classification of shooting disciplines and shooting equipment, maintenance of weapons, breathing techniques, air rifle 10m
6. Fitness programs - Circuit strength training, functional training, intensive cardio training, Pilates, -
Exercises for warming up and preparing the locomotor system, stretching exercises, muscle strengthening exercises, exercises for reducing subcutaneous fat, exercises for increasing muscle endurance, exercises for increasing muscle mass, stretching exercises
7. Hiking tours - hiking on flat terrain, hiking hiking tours, interval hiking methods
8. Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Classes are conducted exclusively in the form of exercises. Students teach only from the content or teaching unit to which they are registered. If necessary, it is possible to conduct classes partially or completely online.</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
</table>

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	D. Pavović (2010): Script for students of the Faculty of Forestry, course Physical and Health Culture		Faculty of Forestry and Wood Technology website, Merlin e-learning system
2.12. Optional literature	1. Z. Šatalić, M.Sorić, M Mišigoj-Duraković(2015):Sportska prehrana, Znanje, 2. B.Neljak, R.Caput-Jogunica: Kineziološka metodika u visokom obrazovanju 3. Bos, K. (2004.) Hodanjem do zdravlja, Mozaik knjiga 2. Colwin, C., M. (1998) 4. Sertić, H. (2005) Osnove borilačkih vještina, Kineziološki fakultet Sveučilišta u Zagrebu 5. Ćurković, S. (2010). Kineziološke aktivnosti i rizična ponašanja studenata, Disertacija. Kineziološki fakultet Sveučilišta u Zagrebu		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Daniel Krstonošić, PhD. Prof. Željko Škvorc, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Botany – Plant Systematics	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+24
1.3. Course code	226109	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 are introducted to basic botanical terms which are the base for senior-year courses. Furthermore, they are introduced to a great diversity of the world of plants, principles and methods of plant identification as well as to basic characteristics of particular systematic groups. All of that develops their understanding of the functioning and role of particular parts of different ecosystems they will work in after their graduation.
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. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To present the plant systematics and the systemic life division (systemic units (taxa), artificial and phylogenetic systems, plant evolution, speciation, hybridization, plant reproduction, general characteristics and division of Cormophyta). 2. To explain the general characteristics, systematic division, morphology and ontogenetic development of Pteridophyta. 3. To explain the general characteristics, systematic division, morphology and ontogenetic development of Gymnosperms. 4. To explain the general characteristics, systematic division, morphology and ontogenetic development of Angiosperms (vegetative and reroductive plant organs, function, basic forms, plant organs transformations). 5. To apply the principles and methods of plant identification using keys. 6. Show the most important families and genera of the Croatian flora (diversity, taxonomic status, distribution, significance).
2.5. Course content (syllabus)	Lectures 1. Introduction. Historical development of plant systematics. (1 h). 2. Nomenclature and plant identification. Keys. (3h) 3. Sources of taxonomic data and plant classification. Preparation of herbarium collection. (3h) 4. Plant evolution and phylogeny. Speciation. (3h) 5. Plant systematic division. Basic characteristics and phylogenetic relationships of

<table>
<tr><td></td><td colspan="9">embryophytes. Mosses. (2h)
6. Basic characteristics and division of Lycopodiophyta and Pterydophyta. Basic characteristics and division of Spermatophyta. (2h)
7. Gymnosperms - morphology, ontogenetic development, systematic division, overview of significant genera. (2h)
8. Angiosperms - morphology, ontogenetic development, systematic division. (2h)
9. Magnolianae - overview of significant genera. (1h)
10. Monocotyledons - overview of significant families and genera. (3h)
11. True dicotyledons - overview of significant families and genera. (6h)
12. Plant diversity of Croatia - main characteristics, endemism, endangerment. (2h)

Exercises
1. Collecting and preparing herbarium. (2h)
2. Morphological characteristics of selected gymnosperm families. Plant identification with keys. (3h)
3. Morphological characteristics of selected angiosperm families - dicotyledons. Species identification of these families with keys. (8h)
4. Morphological characteristics of selected angiosperm families - monocotyledons. Species identification of these families with keys. (2h)

Field work
1 In the lowland to the colline area of continental Croatia where students gather herbarium material characteristic for a large number of termophilous and mesophilous forest plant communities. (1 day, 8 h)
2. In the mountain and Mediterranean area of Croatia where students gather herbarium material characteristic for a large number of mountain, sub-Mediterranean and Mediterranean forest plant communities. (2 days, 16 h)</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Preparation of herbarium collection. Passing preliminary exams, exams.</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="4">Vidaković, M., J. Franjić, 2004: Golosjemenjače. Sveučilište u Zagrebu Šumarski fakultet. Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">Trinajstić, I., 1976: Sistematika bilja (opći</td><td colspan="2">NO</td><td colspan="2">YES, Merlin</td></tr>
</table>

	dio, bakterije i gljive), (interna skripta), 1-43. Zagreb.		
	Trinajstić, I., 1976: Sistematika bilja (Embriobyonta), (interna skripta), 1- 117. Zagreb.	NO	YES, Merlin
	Franjić, J., Ž. Škvorc, 2010: Šumsko drveće i grmlje Hrvatske. Sveučilište u ZagrebuŠumarski fakultet.	YES	
	Franjić, J., Ž. Škvorc, 2014: Šumsko zeljasto bilje Hrvatske. Sveučilište u Zagrebu Šumarski fakultet.	YES	
	Franjić, J., Ž. Škvorc, 2020: Šumsko drveće i grmlje Hrvatske (Novo izdanje). Sveučilište u Zagrebu – Šumarski fakultet, 516 str. Zagreb.	YES	
	Nikolić, T., 2019: Flora Croatica 4 - Vaskularna flora Republike Hrvatske. Alfa d.d.	YES	
2.12. Optional literature	1. Nikolić, T., 2013: Sistematska botanika: raznolikost i evolucija biljnog svijeta, Alfa, Zagreb. 2. Nikolić, T., 2013: Praktikum sistematske botanike - Raznolikost i evolucija biljnog svijeta. Alfa d.d. 3. Nikolić, T., 1996: Herbarijski priručnik, 1-167. Zagreb. 4. Nikolić, T., 2020: FLORA CROATICA Vaskularna flora Hrvatske 5. Alfa d.d. 262 str. 5. Nikolić, T., Kovačić, S., 2008: Flora Medvednice. 250 najčešćih vrsta Zagrebačke gore. Školska knjiga d.d. & Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu, Zagreb, 4-543. 6. Kovačić, S., Nikolić, T., Ruščić, M., Milović, M., Stamenković, V, Mihelj, D., Jasprica, N., Bogdanović, S., Topić, J., 2008: Flora jadranske obale i otoka - 250 najčešćih vrsta. Školska knjiga d.d. & Prirodoslovno-matematički fakultet Sveučilišta u Zagrebu, Zagreb, 4-558. 7. Idžojtić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp. 8. Šugar I., 1990: Latinsko-hrvatski i hrvatsko-latinski botanički leksikon. JAZU, Zagreb. 9. Simpson, M. G., 2010: Plant Systematics. Academic Press. Elsevier. 10. Glimn-Lacy, J., Kaufman, P. B., 2006: Botany Illustrated. Introduction to Plants, Major Groups, Flowering Plant Families. Springer. 146 p. 11. Moore, R., W. D. CLARK, K. R. STERN, D. VODOPICH, 1995: Botany. WCB Dubuque. 12. Nikolić, T., ur. 2020: Flora Croatica baza podataka. On-Line (http://hirc.botanic.hr/fcd). Botanički zavod, Prirodoslovnomatematički fakultet, Zagreb.		

COURSE DECRIPTION

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 science	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+24
1.3. Course code	33787	1.9. Expected enrolment in the course	35
1.4. Study programme	University undergraduate 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 subject is to provide general knowledge of the most important and most complex components of forest ecosystem to students. Furthermore, the aim is to prepare the student for the new knowledge necessary for forest ecosystem management, especially in terms of stability and protection from soil degradation. Therefore, the main goal is for students to learn how soil is formed - what are the factors and processes of soil formation, what are the key processes in soil and what are the physical, chemical, biological and morphological properties of soil.
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	A3. apply skills in solving practical side of business, either by control measuring, calculations or testing verification B4. participate in the realization of programs for the management of protected natural areas B8. perform professional field works in forest nurseries including planting and seeding D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Compare the role of soil and pedosphere. Identify the global significance of soil. Interpreted the specificity of forest soil. Group primary soil minerals and compare their properties. Group the most usually rocks and compare their properties that are most important to soil properties. Explain to weathering of minerals and rocks. Explain the properties of rocks and minerals. Enumerate and classify the most important soil organisms. Describe the accumulation of organic residues - quantity and quality. Describe the method of degradation of organic residues and the formation of humus. Describe composition and properties of humus. Analyze a soil humus acidity and character of humus Describe biological circulating of matter and role of soil. Identify specific cycles of some biogenic elements.

	Explain the principles of soil sorption. Explain the composition and role of the colloidal complex of soil. Analyze the sorption characteristics of soil. Explain the solid soil phase composition. Enumerate and distinguish the properties of mechanical particles of soil. Particle size distribution and soil structure Enumerate and distinguish the properties of shapes and elements of the soil structure. Soil porosity and soil densities. Enumerate and explain the soil consistency indicators. Natural dynamic water in soil. Describe water forms in soil. Analyze the soil water constants. Explain quantity and quality of soil air. Analyze soil air capacity. Explain thermal properties of soil. Explain chemical properties of soil solution. Analyze and interpret soil reaction. Explain the significance and nature of the redox potential of the soil. Describe the dynamics of biogenic elements in the soil solution Soil-forming factors. Identify the nature of some soil-forming factors in Croatia. Enumerate and explain some soil-forming processes. Identify the role of sol-forming factors and processes on a specific soil profile. Soil horizons. Explain the properties of some soil horizons. Soil classification system. Enumerate the sections, classes and types of soil. Explain the basic characteristics of the most important soils at the class level and type of soil. Classify soil according to taxonomic affiliation. Plan, ways and purpose of soil sampling. Representative soil samples. Describe the types of soil samples. Describe sampling and mark of soil samples. Enumerate and describe field observations of soil parameters. Explain the plan, ways and purpose of soil sampling. Explain a representative soil samples. Describe the types of soil samples. Describe sampling and mark of soil samples. Enumerate and describe field observations of soil parameters
2.5. Course content (syllabus)	Lectures: 1. Introduction - definition, soil functions, soil specificity and the importance of soil in forestry and environmental protection 2. Sources, composition and dynamics of the mineral component of the soil: Minerals and rocks 3. Sources, composition and dynamics of the mineral component of the soil: Weathering of minerals and rocks 4. Soil organisms and soil organic matter: Soil biology 5. Soil organisms and soil organic matter: Soil organic matter – sources, changes and properties. 6. Soil organisms and soil organic matter: Forest biogeochemistry 7. Physical properties of soil: The solid phase of soil 8. Physical properties of soil: Soil liquid phase – water and soil water regime 9. Physical properties of soil: The gaseous phase – soil air and thermal properties of soil 10. Sorption properties of soil 11. Soil solution chemistry and chemical elements in soil: concentration and osmotic pressure of soil solution; important elements in soil solution and their dynamics in soil and

<table>
<tr><td></td><td colspan="9">ecological features
12. Soil solution chemistry and chemical elements in soil: reaction of the soil solution - acidity, basicity and buffering of the soil solution
13. Soil genesis and soil evolution
14. Soil morphology
15. Soil classification and properties of soil
Laboratory exercises:

1. Field and laboratory survey of soil: Soil sampling plan; types of soil sampling; sampling depth of soil; number and layout of soil samples, types of soil samples
2. Field and laboratory survey of soil: soil sampling and soil sample marking; transport and storage of soil samples; field observations of soil parameters; soil sampling report
3. Pretreatment of samples for physical-chemical analysis (according to ISO 11464, 1994)
4. Determination of stability of soil macro-aggregates
5. Determination of dry matter and water content on a mass basis — Gravimetric method (according to ISO 11465, 1993)
6. Determination of the particle size distribution by International B method
7. Determination of soil reaction (according to ISO 10390,1994)
8. Determination of carbonate content – volumetric method (according to ISO 10693, 1995)
9. Determination of acidity (character) of humus
10. Determination of humus (organic carbon) by Tjurin
11. Determination of water content as volume fraction using coring sleeves – gravimetric method (according to ISO 11461, 2001), Determination of water-retention characteristic
12. Determination of dry bulk density (according to 11272, 1998)
13. Determination of particle size density (according to 11508, 1998)
14. Determination of soil porosity
15. Determination of air capacity of soil
16. Determination of organic and total carbon (according to ISO 10694, 1995) and total nitrogen (according to ISO 13878, 1998) by dry combustion - demonstration exercise
17. Determination of effective cation exchange capacity and base saturation level using barium chloride solution (according to ISO 11260) - demonstration exercise
18. Determination of the particle size distribution in mineral soil material (according to ISO 11277) - demonstration exercise
19. Determination of water-retention characteristic – Laboratory methods (according to ISO 11274, 1998) - demonstration exercise
20. Determination of water permeability - demonstration exercise

Field courses:

1. Presentation of soil sampling (composite and individual samples) and explanation of soil morphological characteristics and soil classification on the open soil profile (1 day)
2. Explanation of soil-forming factors on different examples and the specifics of the soil in terms of the soil functions (2 days).</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="2">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>Experimental</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
</table>

<table>
<tr><td></td><td>work</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td></td><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td></td><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises and field work. Passing preliminary exams, exams.</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="5">Pernar, N., 2017: Tlo; nastanak, značajke, gospodarenje. Šumarski fakultet, Zagreb, XVIII + 799 p.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="5">Pernar, N., D. Bakšić, I. Perković, 2013: Terenska i laboratorijska istraživanja tla. Šumarski fakultet, Zagreb, 192 p.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Blume, H. P., G. W. Brümmer, H. Fleige, R. Horn, E. Kandeler, I. Kögel-Knabner, R. Kretzschmar, K. Stahr & B.-M. Wilke, 2016: Scheffer/Schachtschabel Soil Science.Springer, 629 p.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Anamarija Jazbec, PhD. Assist. Prof. Ernest Goršić, PhD. Assoc. Prof. Mislav Vedriš, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Biometrics for Spatial Valorizations	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33788	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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	Introduce and train students to collect, analyze and graphically display the collected data. Train students to be able to discuss and draw conclusions based on analyzed data.		
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. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Explain types of variables: numeric (continuous and discrete) and categorical (dichotomous, ordinal i nominal); graphical presentation and frequency tables, classification of graphs according to data types: bar chart, histogram, frequency polygon, line chart, pie chart, scatterplot, stem-and-leaf plot, Box-Whisker plot; relative frequencies, cumulative absolute and cumulative relative frequencies, calculation and analysis 2. Describe measures of central tendency and measures of position (arithmetic mean, geometric mean, harmonic mean, quadratic mean, minimum, maximum, median, lower and upper quartile, mode) 3. Explain measures of variation (data range, interquartile range, standard deviation, variance, coefficient of variation) 4. Interpret theoretical distributions or models of population distributions (normal Gaussian distribution, Student's t-distribution, binomial distribution, chi-square distribution, F-distribution, definition of density function and distribution function, calculating probability (area) under the density function for normal and t-distribution, calculating probability for binomial distribution, normal approximation to the binomial distribution) 5. Explain point estimates of arithmetic mean, variance and proportion (central limit theorem, sampling distribution, standard error) Distinguish population parameters from their sample estimates; estimate population arithmetic mean (expected value), variance and proportion based on the sample 6. Present hypothesis testing of arithmetic mean and proportion (rules and procedure of		

<table>
<tr><td></td><td colspan="9">testing, type I (α) and type II (β) errors, power of the test (1- β), testing (assumed constant) arithmetic mean and proportion of population
7. Present interval estimates of expected value and proportion, testing of proportion, variances (F-test) and arithmetic mean (Student t-test) from two independent samples and testing difference of arithmetic means from two dependent samples (paired t-test)
8. Present analysis of observed and expected frequencies for categorical variable using chi-square test</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Lectures and exercises:
1. Basic biometric terms (observations, data, population). Types of variables. Graphical tools.
2. Descriptive statistics. Frequency table.
3. Measures of central tendency. Measures of position.
4. Measures of variation, asymmetry and skewness.
5. Empirical distribution. Basics of probability.
6. Normal distribution.
7. Binomial distribution. Normal approximation to a binomial distribution.
8. Sampling methods. Central limit theorem. Estimators. Standard error.
9. Confidence interval. Interval estimation of the mean and proportion. T-distribution.
10. Hypothesis testing and inference. Testing expected value of mean. Testing proportion.
11. Testing two population variances. F distribution. Testing two population means.
12. Testing two population proportions. Paired t-test.
13. $\chi 2$ distribution. Chi-square test.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Part of the exercises are performed on computers</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Passing preliminary exams, exams.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Jazbec, A (2009) BASIC STATISTICS, 2nd ed. Faculty of Forestry, Zagreb. (University textbook)</td><td colspan="2">DA</td><td colspan="3">YES. All teaching materials in written and video form are on the Merlin platform</td></tr>
<tr><td colspan="4">Teaching materials for the whole subject (script)</td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Sokal RR, Rohlf FJ. (1995) Biometry. Freeman and Company. New York
Zar J.H.(1999) Biostatistical analysis, Prentice Hall</td></tr>
</table>

	Pranjić A. (1986) Šumarska biometrika, ŠF, Zagreb. Prodan M. (1968) Forest Biometrics, Pergamon press, Oxford.

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Renata Pernar, PhD. Assist. Prof. Mario Ančić, PhD. Prof. Ante Seletković, PhD. Assist. Prof. Jelena Kolić, PhD.	1.7. Number of ECTS credits	6
1.2. Course title	Ground surveying with basics of cartography	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+24
1.3. Course code	226110	1.9. Expected enrolment in the course	65
1.4. Study programme	University undergraduate 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	Make a student acquainted with the need for ground surveying and cartography in forestry and nature conservation and environment protection. Apart from that, students must be acquainted with the fundamentals of cartography and ground surveying, so as to prepare them for studying and practical use of mapping and terrain surveying methods in practice.
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. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data B5. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Explain cartography and its tasks. Extract objects of display and object names (toponyms) on different cartographic views (TK 50000, 25000, 5000). Describe and explain the difference between topographical and thematic maps. Specify a measurement definition, used measuring units, specify standards, and explain measurement errors. Explain the difference between direct and indirect measurements. Determine scale. Construct linear and transverse scale. Calculate allowed deviations and measurements. Adopt the basics of orthogonal and quoted projections. Explain the quoted projection of the topographic plane and its application. Calculate the largest slope line and constant slope line. Explain and make a cross section of the topographic plane with the vertical plane and direction. Create a terrain profile. Explain and share map projections.

	Explain the coordinate systems. Specify the types of coordinates. Calculate coordinates on different topographic maps ((TK 50000, 25000, 5000). Measure the size on topographic maps 1: 50.000 and 1: 5.000 (angle, length, altitude difference, gradient, ..). Describe cadastre and its organization Describe the land registry and its organization State and explain the difference between the old and the new cadastre. Explain and describe the indirect method of determining the surface on cadastral maps. Calculate area with the different methods (dot grid, grid squares grid and analytical calculation of area). Explain triangulation, polygonometry. Calculate the direct and indirect geodetic task. Describe the methods of direct and indirect length measurements. Determine azimuths, distances, height differences, and inclinations between the points. Mapping certain points in the default scale. Collect data, calculate and explain measurements with the compass. Describe and perform the recording of the details by a polar and orthogonal method. Calculate the altitude difference, explain and enumerate type of leveling. Describe the global positioning system and its parts. Indicate GPS application in forestry. Explain GPS measurement errors. Apply GPS to determine spot positioning in terrain.
2.5. Course content (syllabus)	Lectures: 1. Cartography - definition and division, showing terrain, objects and phenomena on maps, types of maps - topographic and thematic maps 2.Measurement, scales, measuring units, norms, the errors and corrections of measurement, measurment methods 3.Presentation of the topographic surface by projection. Types of projections. Fundamentals of orthogonal and quoted projection, application of the quoted projection, plane and line crossings 4.Earth shape and size, ellipsoids, coordinate types 5.Map projections, Gauss – Krüger projection, HTRS96/TM projection, geodetic datums 6.Cadastre, scales, old cadastre, new cadastre, land register 7.Cadastral plans, direct and indirect measuring of surface, types of indirect measurements 8.Elements of terrain measurement. Methods measurement of points, lengths, angles, surfaces, altitude difference. Geodetic points, triangulation, polygonometry, theodolites 9.Lengths measurements, reduction an lengths on the horizon, indirect length measurements, instruments for measuring distances (distometers) - optical, electronic 10.Angle types, polygon angle, directional angle, azimuth, declination, orientation, convergence of meridian, elevation angle, depressive angle, zenith distance 11. Measurement of altitude differences, types of leveling (general and detailed, linear and surface, geometric and trigonometric leveling) 12. Recording of detail - polar and orthogonal method. Orthogonal method – pentagonal prism, rectangular coordinates (abscissa and ordinate). Polar method – tacheometry, polar coordinates (horizontal and vertical angle, inclined length) 13. Types of compass. Measuring and mapping with the compass. 14. Global navigation satellite system (GNSS) – satellite positioning (GPS, GLONASS, GALLILEO), system organization 15. Global positioning system (GPS), measurement methods, accuracy and application in urban forestry, nature conservation and environmental protection Exercises: 1. Types of letters on maps. Cartographic signs and symbols. Paper formats, line types, bending paper 2. Scale types – numerical, graphical, determining the scale, calculating the distance between objects depending on the scale of the map / plan

<table>
<tr><td></td><td colspan="9">3. Construction of graphical scale – linear and transversal scale, calculating of allowed deviations and corrections of measurement
4. Cross section of a topographic surface with a vertical plane, cross section of a topographic surface with a direction, observations. Create a terrain profile
5. Determining the slope of the terrain. Calculating the largest slope of the line, construction of a constant slope line. Determination of altitudes of points.
6.Ways of displaying individual objects and occurrences on maps. Reading and interpretation of maps. Extracting objects of display and object names (toponyms) on topographic maps of different scales.
7.Determination of coordinates on topographic maps of scale 1: 5000 and 1: 50000. Measurement the sizes (angle, length, altitude difference, slope, ..) on topographic maps
8. Use of cadastral plans. Measurement of shrinkage old cadastral plans. Determination of allowed deviations and corrections of measurements when calculating areas of parcels.
9. Indirect methods of determining the area of parcels with dot grid and square grid (statistical methods)
10. Indirect methods of determining the area of parcels with coordinates (analytical method)
11. Geodetic calculations. Direct and indirect geodetic task. Determining the coordinates of points based on angle and length. Determining angle and length based on coordinates.
12. Measuring azimuth on the map. Map orientation. Point mapping based on azimuth and length.
13. Orthogonal method - recording and mapping details. Compass - measurement and mapping. Creation of stakes on the maps. Staking out points and lines. Repairs staking.
14. Measurement of height differences. Calculation of height differences from trigonometric and geometric levelling. Creating terrain profiles based on measurement of height differences.
15. Using a GPS receiver, Determining the position of points by GPS, Point mapping based on GPS measurements
Field work:

1. Orientation on the terrain, finding objects by using maps, finding objects using a compass, finding objects using GPS.
2. Setting up and measuring polygons. Compass - measurement and mapping. Lengths measurements on flat and sloping terrain, determining the slope of the terrain.
3. Setting and measuring detailed leveling, line and surface leveling, measurement and calculation.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student</td><td colspan="9">In the course with regular attendance of lectures, exercises and field work student will</td></tr>
</table>

responsibilities	produce 10 individual programs (tasks), and 3 projects tasks on field work. Exam through two midterm exam or written and oral exams.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Benčić, D., Solarić, N. (2008): Mjerni instrumenti i sustavi u geodeziji i geoinformatici, Školska knjiga, Zagreb		YES
	Pernar, R. (2019): Prezentacije s predavanja		YES
	Niče, V.: Deskriptivna geometrija (odabrana poglavlja), Školska knjiga Zagreb (bilo koje izdanje)	YES	
	Lovrić, P. (1988): Opća kartografija, SNL Zagreb, 291 str.	YES	
	Pribičević, B. i D. Medak (2003): Geodezija u građevinarstvu (odabrana poglavlja), V.B.Z., Zagreb, 223 str.	YES	
	Neidhardt, N. i Tomašegović, Z.: Geodezija u šumarstvu, Zagreb, 266 str.	YES	
2.12. Optional literature	1. Brinker and Minnick, R. (1995): The surveying handbook (second edition), New York, 840 str. 2. Möser, M.; Müller, G.; Schlemmer, H.; Werner, H. [2000]: Handbuch der Ingenieurgeodäsie - Grundlagen. 3. Neubearbeitete Auflage, Wichmann, Heidelberg 3. Mulahusić, A., Topoljak., J, Tuno, N. (2017): Geodezija za građevinske inžinjere. Politehnički fakultet, 295 str. 4. Macarol, S.: Praktična geodezija, (bilo koje izdanje) Zagreb 5. Šumarska enciklopedija: Geodezija, Geodetski instrumenti, Zagreb		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivan Mlinar, PhD.	1.7. Number of ECTS credits	4
1.2. Course title	Introduction to urbanism	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	33791	1.9. Expected enrolment in the course	53
1.4. Study programme	University undergraduate 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	Acquiring basic knowledge in the field of urbanism and developing the perception of space as a prerequisite for urban analysis, valorization and intervention.		
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. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans C3. apply actual legislation in management of protected natural areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Describe and sketch historical, modern, contemporary and ideal examples of cities and housing developments; interpret and analyze urban planning legislation, physical and urban planning documents, planning maps, functional and physical structures and city infrastructure; interpret and analyze urban planning legislation, physical and urban planning documents, and planning maps.		
2.5. Course content (syllabus)	Lectures / Exercises 1. Introduction to the Course / Sketch of the Road to the Faculty of Forestry 2. History and Culture of Cities / Sketches of Cities 3. History and Culture of Cities in Croatia / Sketches of Cities in Croatia 4. Ideal Cities of the 19th and 20th Centuries / Sketches of Ideal Cities 5. Cities of the 20th Century / Sketches of Cities of the 20th Century 6. Housing Estates / Sketches of Housing Estates 7. Urban Legislation / Instructions for Preparing a Seminar Paper 8. Spatial Planning Documents / Sketch of Zagreb 9. Planning Documentation / Sketch of Ban Josip Jelačić Square in Zagreb 10. Functional Structure of the City / Sketch of the Layout of Functions in the City 11. Physical Structure of the City / Sketches of Positives and Negatives of the City Structure 12. City Infrastructure / Sketch of Zagreb's Public City Transport 13. Urban-architectural Competitions / Sketches of Competitions Works 14. Current Urban Topics / Guidelines for Writing a Seminar Paper 15. Recapitulation of Lectures / Submission and presentation of Seminar Paper		
2.6. Format of instruction	☒ lectures	☐ independent	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises, preparation and submission of exercises and seminar work within the given deadline. Taking the final exam.</td></tr>
<tr><td rowspan="6">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Mlinar, Ivan (2016), Uvod u urbanizam, Udžbenici Sveučilišta u Zagrebu, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Pegan, Srečko (2007), Urbanizam : Uvod u detaljno urbanističko planiranje, Acta architectonica : Udžbenici i priručnici, Zagreb.</td><td colspan="2">YES</td><td colspan="2">Faculty of Architecture, Study Archive</td></tr>
<tr><td colspan="5">Prinz, Dieter (2006), Urbanizam, Svezak 1. : Urbanističko planiranje, Golden marketing – Tehnička knjiga; Sveučilište u Zagrebu : Arhitektonski fakultet, Zagreb.</td><td colspan="2">YES</td><td colspan="2">Faculty of Architecture, Study Archive</td></tr>
<tr><td colspan="5">Prinz, Dieter (2008), Urbanizam, Svezak 2. : Urbanističko oblikovanje, Golden marketing – Tehnička knjiga; Sveučilište u Zagrebu : Arhitektonski fakultet, Zagreb.</td><td colspan="2">YES</td><td colspan="2">Faculty of Architecture, Study Archive</td></tr>
<tr><td colspan="5">Neufert, Ernst (2002), Elementi arhitektonskog projektiranja, Golden marketing, Zagreb.</td><td colspan="2">YES</td><td colspan="2">Faculty of Architecture, Study Archive</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Milić, Bruno (1994), Razvoj grada kroz stoljeća I : Prapovijest – antika, Udžbenici Sveučilišta u Zagrebu, Zagreb.
2. Milić, Bruno (1995), Razvoj grada kroz stoljeća II : Srednji vijek, Udžbenici Sveučilišta u Zagrebu, Zagreb.
3. Milić, Bruno (2002.), Razvoj grada kroz stoljeća III : Novo doba, Udžbenici Sveučilišta u Zagrebu, Zagreb.
4. Pegan, Srečko (2006), Osnove urbanističkog i graditeljskog zakonodavstva s tumačenjem stručnih pojmova, Sveučilište u Zagrebu : Arhitektonski fakultet, Zagreb.
5. Evers, Bernd (2003), Architectural Theory: From the Renaissance to the Present, Taschen, Köln.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Marko Rukavina, PhD. Ana Sopina, M. Eng. Arch	1.7. Number of ECTS credits	4
1.2. Course title	Heritage of Landscape Architecture	1.8. Number of hours in semester (L+E+F+e-learning)	15+30+0
1.3. Course code	226112	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	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	By attending the course, students gain insight into the historical development of landscape architecture, with special emphasis on the artistic, aesthetic and functional features of selected examples from all historical periods. Landscape architecture is considered in the context of history, in the context of its architectural and urban environment in which it is created and in the context of the protection and preservation of cultural heritage.
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	B4 participate in the realization of programs for the management of protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the development of park art from antiquity to the end of the 19th Century (ancient and medieval gardens, Islamic, Chinese, Japanese, Italian, French and English park traditions). 2. Interpret the features of park design of the 20th and 21st centuries and modernist and contemporary park architecture. 3. Analyze the park heritage of Zagreb and Croatia (renaissance park, Maksimir park in Zagreb, castle parks and park heritage of cities in Croatia). 4. Describe the public urban gardens of Europe and the world (19th and 20th centuries).
2.5. Course content (syllabus)	The course gives an overview fo the history of landscape architecture in the world and in Croatia, in the context of the general history of art and in the context of evaluation and preservation of the landscape heritage of Croatia. Lectures: 1. Introduction to the course and landscape architecture, 2. Ancient gardens, 3. Medieval gardens, 4. Traditional Islamic gardens, 5. Italian Renaissance and Mannerist gardens, 6. Dubrovnik Renaissance gardens, 7. French Renaissance and Baroque gardens, 8 English landscape parks, 9. Public parks of the 19th century, 10. Landscape heritage of Croatian towns, Manor parks in Croatia, 11. Maksimir Park in Zagreb, 12. Landscape architecture of the 20th century (Art Nouveau and Modernism), 13. Contemporary landscape architecture (late 20th and early 21st century), 14. Traditional landscape architecture of China, 15. Traditional landscape architecture ofJapan. Exercises:

<table>
<tr><td></td><td colspan="9">1. Introduction and study visit: Zagreb Green Horseshoe
2. Introduction and study visit: Maksimir Park
3. Introduction to field work and study visit : Novi Zagreb
4.-15. Research method - instruction to seminar work and seminar presentations</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regularly attending and actively participating in lectures ad exercises, creating and submitting a seminar paper in the given period. Taking exams.</td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Obad Šćitaroci, Mladen. 2016. Povijest perivojne arhitekture – sažetci predavanja</td><td colspan="2"></td><td colspan="3">YES, Merlin</td></tr>
<tr><td colspan="4">Maruševski, Olga. Jurković, Sonja. 1992. MAKSIMIR, Zagreb: Školska knjiga.</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td colspan="4">Obad Šćitaroci, Mladen. 1997. VRTOVI, PERIVOJI I PARKOVI, Tehnička enciklopedija, sv. 13, str. 566-577, Zagreb: Leksikografski zavod Miroslav Krleža.</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td colspan="4">Bojanić Obad Šćitaroci, Bojana; Obad Šćitaroci, Mladen. 2004. GRADSKI PERIVOJI HRVATSKE U 19. STOLJEĆU – JAVNA PERIVOJNA ARHITEKTURA HRVATSKIH GRADOVA U EUROPSKOM KONTEKSTU, Zagreb: «Šćitaroci» d.o.o. i Arhitektonski fakultet Sveučilišta u Zagrebu</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Obad Šćitaraoci, Mladen. 1991. DVORCI I PERIVOJI HRVATSKOGA ZAGORJA, Zagreb: Školska knjiga
2. Obad Šćitaroci, Mladen; Bojanić Obad Šćitaroci, Bojana. 1998. DVORCI I PERIVOJI U SLAVONIJI, Zagreb: «Šćitaroci» d.o.o.
3. Obad Šćitaroci, Mladen. 1992. HRVATSKA PARKOVNA BAŠTINA - ZAŠTITA I OBNOVA, Zagreb: Školska knjiga; sveučilišni udžbenik.
4. Knežević, Snješka. 1996. ZAGREBAČKA ZELENA POTKOVA, Zagreb: Školska knjiga, ISBN 953-0-60-524-2
5. Obad Šćitaroci, Mladen; Bojanić Obad Šćitaroci, Bojana. 2003. VRBANIĆEV PERIVOJ U KARLOVCU – STUDIJA ZAŠTITE I OBNOVE PERIVOJA, Zagreb: «Šćitaroci» i Arhitektonski fakultet Sveučilišta u Zagrebu, ISBN 953-97121-2-2</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović prof. kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 2	1.8. Number of hours in semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226042	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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 Physical and Health Culture is the acquisition of theoretical and practical kinesiological knowledge in order to train students for independent physical exercise and the adoption of healthy living habits. Through various forms of physical exercise, the goal is to meet the daily needs for movement and improve the motor, functional and cognitive abilities of the student population. Through attending classes, students are educated about the importance of daily physical exercise, or about all the good things that physical activity means for a person and his health. The aim is to simultaneously acquire knowledge about the harmfulness of various forms of addiction to health, especially their impact on intellectual and physical capabilities, the importance of quality nutrition and the most interesting results of previous research on the student population in the segment: physical activity as disease prevention, healthy eating , sports diagnostics, stress management, physical activity as a means of relief.		
2.2. Enrolment requirements and/or entry competences required for the course	health status		
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 To continue training at the graduate university studies of the Faculty of Forestry, Department of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the structure of the physical exercise class 2. Explaination of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises with regard to kinesiologic activity 5. Organize constructive free time 6. Assess personal diet and physical exercise habits. 7. Demonstrate general preparatory exercises and stretching exercises. 8. Understanding kinesiology programs and their target orientation 9. Control emotions and strengthen self-control.		
2.5. Course content (syllabus)	1. Athletics Walking - Walking at different paces, Nordic walking, brisk walking, hiking Running - theoretical knowledge and divisions, cyclic movements at different paces, fast running short distances, running down a slope, running along a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads,		

<table>
<tr><td></td><td colspan="9">relay running, running with hurdles of different height
2. Martial arts- Judo, Karate
Basic techniques of Judah - falls, hand throws, belt throws, foot throws, choking techniques, levers
Basic techniques - karate - kicks, punches, defense
3. Sports games-
Basketball - Keeping the ball in place, keeping the ball in motion, basic throwing, pivoting, jumping shot, passing in place and moving
Football - passing in place, passing to the first, passing in motion, technique with the ball, cooperation of two and three players, shots on goal from the move, shot on goal after the ball is added, volley kick, headers, stops
Volleyball - Passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, technique of attack, technique of defense
Handball - guiding the ball in a straight line and with a change of direction, Passing in place, passing in motion, crossings, passing for a counterattack, cooperation of two and three players, goal kick after the lead, goal shot on the added ball
4. Racket sports
Badminton-forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand punch under the arm, high serve, backhand serve, short serve, field movements, single play, pair play
5. Shooting-classification of shooting disciplines and shooting equipment, maintenance of weapons, breathing techniques, air rifle 10m
6. Fitness programs - Circuit strength training, functional training, intensive cardio training, Pilates, -
Exercises for warming up and preparing the locomotor system, stretching exercises, muscle strengthening exercises, exercises for reducing subcutaneous fat, exercises for increasing muscle endurance, exercises for increasing muscle mass, stretching exercises
7. Hiking tours - hiking on flat terrain, hiking hiking tours, interval hiking methods
8. Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Classes are conducted exclusively in the form of exercises. Students teach only from the content or teaching unit to which they are registered. If necessary, it is possible to conduct classes partially or completely online.</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
</table>

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	D. Pavović (2010): Script for students of the Faculty of Forestry, course Physical and Health Culture		Faculty of Forestry and Wood Technology website, Merlin e-learning system
2.12. Optional literature	1. Z. Šatalić, M.Sorić, M Mišigoj-Duraković(2015):Sportska prehrana, Znanje, 2. B.Neljak, R.Caput-Jogunica: Kineziološka metodika u visokom obrazovanju 3. Bos, K. (2004.) Hodanjem do zdravlja, Mozaik knjiga 2. Colwin, C., M. (1998) 4. Sertić, H. (2005) Osnove borilačkih vještina, Kineziološki fakultet Sveučilišta u Zagrebu 5. Ćurković, S. (2010). Kineziološke aktivnosti i rizična ponašanja studenata, Disertacija. Kineziološki fakultet Sveučilišta u Zagrebu		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Dario Baričević, PhD. Assist. Prof. Irena Šapić, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Phytocenology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	226115	1.9. Expected enrolment in the course	25
1.4. Study programme	University undergraduate 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 objectives of the course are to introduce students with the methods and techniques of collecting and processing phytocenological data, which they will later be able to apply in practice. Based on knowledge and skills, they will be able to determine the crucial abiotic and biotic factors important for the functioning and arrival of various forms of forest vegetation, determine its condition and changes, general benefits and importance in the urban area and areas under various forms of protection and make recommendations for further management. The principles of naturalness, sustainability, ecological balance and biodiversity shall be applied.
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. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data B1. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B5. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans C2. plan and organize professional works in realization of programs for the management of protected natural areas C4. conduct monitoring of the environment D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Explain phytocenology and ecosystems (role and tasks, division and historical development of phytocenology, phytochenological directions and schools, biocenosis and natural and anthropogenic ecosystems). Interpret the vegetation synmorfology and synecology (qantitative and qualitative indicators, data collection, analytical processing and synthetic development, synmorphology (structure and composition) of plant communities, classification of synecological factors, relation of plant species and plant communities to the synecological factors of their adherence - soil, climatic, geomorphological and biotic factors)

	Interpret the syndynamics of plant communities (vegetation succession, syndynamics units, initial, transitional, permanent and climatic communities, practical importance). Present the synhorology of plant communities (definition and types of area of distribution of plant communities, floral geoelements and area, spatial distribution and zoning of vegetation, altitude and horizontal distribution, disorders and disturbance of vegetation). Explain systematics of vegetation (historical development, nomenclature rules, associations, higher and lower systematic units). Present the forms of vegetation, development and their distribution in Croatia (vegetation of halophytes and ridges, water vegetation, mountainous rocks, rockery, rocks, climatogenic grasslands, anthropogenic grasslands, weed vegetation, ruderal vegetation, forest vegetation, most important forest communities, forests of urban areas and protected areas, plant fossils, pollen analysis, vegetation development). Explain the application of phytocenology in urban and protected areas (role and application of phytocenology in urban planning, protected areas, ecological studies and Natura 2000 project implementation).
2.5. Course content (syllabus)	Lectures: 1. Definition and task of phytocenology. Division of phytocenology. Historical development. Phytochenological directions and schools. 2. Biocenosis. Natural and anthropogenic ecosystems. Quantitative and qualitative indicators. 3. Analytical processing. Data collection. Synthetic elaboration. Meaning of species in synthesis. Statistical methods of processing phytocenological releves. 4. Sinecology. Classification of factors. Distribution of plant vegetation in relation to climate factors (light, heat, water, wind) 5. Plant species and forest communities in relation to soil properties. Relationship of soil types and plant communities. Geomorphologic factors - altitude, exposure, slope, relief and their impact on the distribution of various forms of vegetation. 6. Influence of biotic factors (phytogenic, zoogenic) on the distribution of plant communities. Human impact on the development of forest vegetation in the past and today. 7. Succession of vegetation - definition, types, methods of research and display. Sindynamics units, initial, transitional, permanent and climatic communities, 8. Examples of vegetation successions in natural and urban areas. Practical importance of syndynamics in understanding the vegetation of a particular area. 9. Sinchronology. Plant fossils. Pollen analysis. The development of vegetation in the ancient times. Europe in the Ice Age. 10. The development of forest vegetation after the Ice Age. Development of the vegetation of the Panonian area. Development of late glacial and postglacial vegetation in Central Europe. Development of Mediterranean vegetation. 11. Synchorology. Definition and types of area of distribution of plant communities. Floral geoelements - types, distribution, spectrum. Floristic regions on Earth. 12. Spatial distribution and zoning of vegetation. Altitude and horizontal distribution. Disorders and disturbance of vegetation. Biogeographical division of Europe. 13. Plant communities systematics. Nomenclature rules. Systematic units. Systematization of the most important plant communities in Croatia. 14. Phytogeographical stratification of forest vegetation in the Republic of Croatia. Mediterranean vegetation region. Eurasian-North American vegetation region. The most important forest communities in the Republic of Croatia. 15. Other forms of vegetation and their distribution. Natural ecosystems - vegetation of halophytes and ridges, water vegetation, springs, bogs, muddy banks, mountainous rocks, rockery, rocks, grindstones, climatogenic grasslands. Human-influenced ecosystems - anthropogenic grasslands, agroecosystems, weed vegetation, ruderal vegetation.

<table>
<tr><td></td><td colspan="10">Exercises:
1. Introduction to exercise. Sinmorfology. Phytocenological indicators. Entering general data. Floristic composition. Braun-Blanquet's scale.
2. Field research methodology. Choice and size of phytochenological releves, phytocoenological recording and data entry into the forms.
3. Specifically phytosociologically recording of forest and grassland vegetation in the field.
4. Examples of phytocoenological releves and their synthetic elaboration through the phases, the meaning of species in synthetic elaboration.
5. Using new methods of phytochenological releves synthesizing. Entering phytocoenological releves to the database Turboveg.
6. Application of numerical multivariate analysis of phytocenological releves. Using the software package Syntax 2000. Cluster analysis - method with examples.
7. Application of multidimensional scaling - method with examples.
8. Applying eco-indicator scales according to Ellenberg. Processing of environmental data using a computer program Juice 7.0. Characteristic plant species of forest and grassland habitats.
9. Morphological characteristics of the most important hydrophilic, hygrophilous, mesophilic and xerophilous plant species and their eco-indicator values. Representative plant communities in relation to humidity. Analysis of indicator values of humidity in computer programs.
10. Morphological characteristics of the most important neutrophil, basophil and acidophilic plant species and their eco-indicator values. Plant communities in relation to soil acidity. An analysis of indicator values of soil acidity in computer programs.
11. Examples of determining the biological spectrum and spectrum of floristic geo-elements.
12. Changes in the floral composition of the most important types of succession.
13. Methodology of classical mapping of forest vegetation. Field work. Work in the office. Examples.
14. New methods of vegetation research and mapping. Remote sensing of vegetation. Aero-photos and their application.
Satellite imaging (sensors for vegetation research) and their application in the mapping of forest vegetation. Vegetation sensors. GIS - technology, examples.
15. Digitization of vegetation maps - process, examples and advantages. Use in practice.
The exercises are held in the computer room by using computer programs.

Field work (two days):
1. Introduction to the most important plant communities in urban areas, their synecology, syndynamics, plant species and systematics, and especially with their value and importance for urban areas.
2. Introduction to the most important plant communities in protected areas, their synecology, syndynamics, plant species and systematics, and especially with their value and importance in protected areas.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="4">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ computer classroom
(other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="3">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
</table>

<table>
<tr><td></td><td>Preliminary exam</td><td>YES</td><td></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></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures, exercises and field teaching. Passing the preliminary exams, final exams.</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="4">Vukelić, J., Rauš, Đ.,1998: Šumarska fitocenologija i šumske zajednice u Hrvatskoj. Šumarski fakultet Sveučilišta u Zagrebu, 310 str.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">Skender, A., 1990: Fitocenologija u spontanim i antropogenim ekosistemima. Sveučilište u Osijeku, Poljoprivredni fakultet, 239 str</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. van der Maarel, E., J. Franklin (eds.), 2013: Vegetation Ecology – Second Edition. Wiley-Blackwell, Chichester, UK, 557 pp.
2. Glavač, V., 1996: Vegetationsökologie - Grundfragen, Aufgaben, Methoden. Gustav Fischer, Jena, Stuttgart, 385 str.
3. 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.
4. Kovačević, J., 1979: Poljoprivredna fitocenologija. Nakladni zavod Znanje, 269 str.</td></tr>
</table>

COURSE DECRIPTION

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	5
1.2. Course title	Remote sensing and GIS of protected and urban areas	1.8. Number of hours in semester (L+E+F+e-learning)	30+30
1.3. Course code	33812	1.9. Expected enrolment in the course	40
1.4. Study programme	University undergraduate 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 acquire knowledge on latest achievements in the field of application of remote sensing methods in protected and urban areas in our country and in the world, theoretical fundamentals of remote sensing, types of photographing and methods of photographing, as well as possibilities for the application of aerial and satellite images in nature conservation and environment protection. Methods for establishment of geographic information systems in urban forestry, as the aid for data saving, processing and analysis, as well as their maintenance and integration with other disciplines.		
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	A3. apply skills in solving practical side of business, either by control measuring, calculations or testing verification B5. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans C4. conduct monitoring of the environment D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Pronounce the definition of remote sensing Describe the historical development of remote sensing. Compare digital and analog photography. Explain ways of stereoscopic observation. Identify the basic principles of remote sensing and their physical and technological basics. Explain and describe parts of the electromagnetic spectrum. List reflection and emission properties of natural objects. Describe the spectral characteristics of objects on Earth surface. List the types and characteristics of photography Describe procedures of aerial survey and errors that occur in aerial surveying. Describe and demonstrate the preparation of images for measuring and orientation procedure of the aerial photographs. Perform visual, measurement and digital photo interpretation on aerial photographs.		

	Specify the application of aerial photographs for urban forestry, nature conservation and environmental protection purposes. Specify the types of satellites and their classification according to purpose and orbit. Explain ways of interpretation of satellite images. Carry out a visual interpretation of satellite imagery. Show and explain the procedure of digital interpretation of satellite image (supervised and unsupervised classification). Specify the application of satellite images in urban forestry. Pronounce the definition of the geographic information system (GIS). Specify a historical overview of GIS development. Explain the GIS organization. Show the establishment of a database in GIS. Apply different forms of data for displaying objects. Carry out linking of the attribute database with geometric data. Explain the difference and the basic features of raster and vector GIS. Compare and describe the analysis of vector and raster data. Create thematic maps based on the interpretation of the images. Explain the application of RS and GIS in urban forestry, nature conservation and environmental protection.
2.5. Course content (syllabus)	Lectures: 1. Introduction to Remote sensing. Classification of RS. Historical development (photography, aviation, photogrammetry, satellite technology) 2. Physical and technological basics of remote sensing. Electromagnetic radiation. Global radiation. Remission and Reflection 3. Spectral characteristics of objects on Earth's surface (vegetation, soil, water). A distribution form of directions of reflection 4. Photographic Systems. Recording systems. Photographic images, types and characteristics. Quality and error of images 5. Aerial photographs (ground preparation, flight plan, recording time, scale). Unmanned aerial vehicles (drones), photograph types, law regulations 6. Methods of interpretation in remote sensing (visual, measurement, digital). Application of aerial images in urban forestry, nature conservation and environmental protection 7. Non-photographic systems. Active and passive processes in remote sensing. LIDAR - historical development, methods of work, application in urban forestry, nature conservation and environmental protection. Satellite classification according to orbit and purpose 8. Satellite image resolutions, color composite, methods of interpretation and characteristics of satellite imagery, application of satellite imagery in urban forestry, nature conservation and environmental protection 9. Introduction to geographic information system (GIS). Definitions of terms. Historical development 10. Types of geographic information systems. Methods and terms of system design. Types and characteristics of computer technology and software support GIS 11. Format of records for different databases. Creating and maintaining databases 12. Data Formats in GIS (geometric, attributive, graphic). Data sources in GIS (primary and secondary) 13. Vector and Raster GIS. Advantages and disadvantages Operations on raster and vector thematic layers 14. Thematic mapping. Data analysis in GIS for urban forestry, nature conservation and environmental protection purposes 15. Linking RS and GIS products, digital relief model, digital orthophoto, applications in urban forestry, nature conservation and environmental protection Exercises: 1. Stereoscopic observation, stereoscopic observation tests 2. Recognition way of recorded objects to different images, photointerpretation keys 3. Preparation of images for measuring, orientation of aerial images, map scale assessment

<table>
<tr><td></td><td colspan="9">4. Stereoscopic measurement (analog and digital images), parallaxes, flight high, altitude, slope, exposition, etc.
5. Photointerpretation by measuring, (area, number of trees, width canopy of tree, assembly, tree height, etc.)
6. Visual photo interpretation (damage of tree, biotopes of urban areas, ...)
7. Visual interpretation of satellite image (land use, biodiversity, wetland habitats, etc.)
8. Digital processing of satellite images (unsupervised classification)
9. Digital processing of satellite images (supervised classification)
10. Introduction and work with GIS programs (ArcGIS, QGIS, etc.)
11. Creating a GIS database, data processing and analysis
12. Displaying objects with different data types (point, line, polygon) and shapes (geometric, attribute, graphic)
13. Connection a database to geometric data
14. Creating thematic maps for the needs of urban forestry, nature conservation and environmental protection
15. Connection between RS and GIS products (vector and raster data models)</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td>Availability via other media</td></tr>
<tr><td></td><td colspan="5">Weng, Q. (2009): Remote sensing and GIS integration, theories, methods and applications. McGraw- Hill Education. 416 str.</td><td colspan="2"></td><td>YES</td></tr>
<tr><td></td><td colspan="5">Lillesand T.M., Kiefer R.W. and j. W. Chipman (2004): Remote sensing and image interpretation, Wiley & Sons, 763 str.</td><td colspan="2"></td><td>YES</td></tr>
<tr><td></td><td colspan="5">Pernar R. (2019): Prezentacije s predavanja</td><td colspan="2"></td><td>YES</td></tr>
<tr><td></td><td colspan="5">Oštir, K. Mulahusić, A. (2014): Daljinska istraživanja. Građevinski fakultet, Univerzitet u Sarajevu, 343 str.</td><td colspan="2"></td><td>YES</td></tr>
<tr><td></td><td colspan="5">Oluić, M. (2001): Snimanje i istraživanje Zemlje iz svemira, HAZU, Zagreb, 580 str.</td><td colspan="2">YES</td><td></td></tr>
<tr><td></td><td colspan="5">Konecny, G. (2002): Geoinformation: Remote Sensing, Photogrammetry and</td><td colspan="2"></td><td>YES</td></tr>
</table>

	Geographic Information Systems. CRC Press. 280 str.		
2.12. Optional literature	1. Scally, R. (2006): GIS for Environmental Management. ESRI Press, USA. 187 str. 2. Braum, F. (1989): Fotogrametrija u urbanizmu i prostornom planiranju, Geodetski fakultet, Sveučilište u Zagrebu 3. Jurišić, M., Plašćak, I. (2009): Geoinformacijski sustavi: GIS u poljoprivredi i zaštiti okoliša. Sveučilište J.J. Strossmayera, Poljoprivredni fakultet, Osijek. 227 str. 4. Horning, N., Robinson, J. A., Sterling, E. J., Turner, W., Spector, S. (2010): Remote sensing for ecology and conservation, Handbook of Techniques. Oxford University Press. 496 st. 5. Pernar R., 1996: Primjena rezultata interpretacije aerosnimaka i GIS-a za planiranje u šumarstvu, Disertacija, Zagreb,156 str.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivica Tikvić, PhD. Assoc. Prof. Damir Ugarković, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	General and landscape ecology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	226119	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	Acquiring knowledge about the main types of organisms in forest ecosystems, their condition and endangerment. Introduction to the life processes of plants, animals and microorganisms and ecological processes that affect them in forest ecosystems. Training for defining ecological problems of endangered species of organisms in forest ecosystems, causes, consequences and measures for their solution or mitigation. Introduction to measures for the protection of endangered organisms and their habitats in forest ecosystems. Introduction to the possibilities of improving the services of forest 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	B3. acquire basic principles of protection of forests from abiotic and biotic factors, and apply basic procedures and means in protection of forests 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 C2. plan and organize professional works in realization of programs for the management of protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Adopt basic principles for the protection of forests against abiotic and biotic factors and to apply the basic procedures and means for forest protection. Participate in the realization of a program of management of protected nature facilities. Collaborate on the development of environmental studies and environmental spatial plans. Plan and organize an integrated environmental management. Plan and organize professional tasks of the implementation of economic programs of protected nature facilities.
2.5. Course content (syllabus)	Lectures 1. Introduction to General and Landscape Ecology. Fundamentals of general and landscape ecology. History of general and landscape ecology. 2. Organisms, environment and habitats in forest ecosystems 3. Life processes of organisms and the environment in forest ecosystems. 4. Ecological processes and functioning of forest ecosystems. 5. Relationships of organisms and light in forest ecosystems. Relationships of organisms and heat in forest ecosystems.

<table>
<tr><td></td><td colspan="9">6. Relationships between organisms and water in forest ecosystems. Relationships between organisms and air in forest ecosystems.
7. Relationships of organisms and chemicals in forest ecosystems. Relationships of organisms and mechanical factors in forest ecosystems.
8. Relationships between organisms and climate in forest ecosystems. Relationships of organisms and relief in forest ecosystems.
9. Relationships between organisms and soil in forest ecosystems. Relationships of organisms and geological substrates in forest ecosystems.
10. Relationships of organisms in forest ecosystems - plants, animals, microorganisms and humans.
11. Ecological problems in forest ecosystems.
12. Protection of organisms and their habitats in forest ecosystems.
13. Improving the condition of forest habitats and forest organisms.
14. Forest ecosystem services
15. Monitoring the condition of forest ecosystems.

Exercises
1. Ecological projects in the field of urban forestry, nature protection and environment (2 hours)
2. Biological relations between organisms in the ecosystem – mycorrhiza (2 hours)
3. Monitoring, protection and improvement of forest habitats - National Ecological Network (3 hours)
4. Improving the general useful functions of forests and forest ecosystem services (3 hours)
5. Environmental impact study (2 hours)
6. Biodiversity indices of forest ecosystems (3 hours)

Field work
1. Protection and preservation of forest habitats within NATURE 2000
2. Ecological problems of trees in urban areas</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Attending lectures and exercises, attending field classes, making exercises, taking colloquia and exams</td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Ekološki leksikon, gl. ur. Oskar Springer, 2001., Barbat, Ministarstvo zaštite okoliša i</td><td colspan="2">YES</td><td colspan="3"></td></tr>
</table>

	prostornog uređenja Republike Hrvatske, str 361.		
	Vjekoslav Glavač, 1999., Uvod u globalnu ekologiju, Državna uprava za zaštitu prirode i okoliša	YES	
	Pregled stanja biološke i krajobrazne raznolikosti RH, 1999., Ministarstvo zaštite okoliša i prirode.	YES	
	Tikvić, I., D. Ugarković, 2020: Opća i krajobrazna ekologija. Skripta, Šumarski fakultet Sveučilišta u Zagrebu	YES	
	Priroda kao zadaća – priručnik raktične zaštite prirode u općinama, 1994., Državna uprava za zaštitu kulturne i prirodne baštine, Zagreb, str. 297.	YES	
	Priroda Hrvatske Riznica za bolju budućnost, 2015., Državni zavod za zaštitu prirode, str. 52		Website of the Ministry of Economy and Sustainable Development, Merlin
2.12. Optional literature	Daniel B. Botkin, Edward A. Keller; : ENVIRONMENTAL SCIENCE EARTH AS A LIVING PLANET (1-649 str.) Eugene P. Odum, 1971.: FUNDAMENTALS OF ECOLOGY (1- 574 str.) Robert E. Ricklefs, 1990.: ECOLOGY (1-885 str.) BIOLOŠKA I KRAJOBRAZNA RAZNOLIKOST HRVATSKE, Državna uprava za zaštitu prirode i okoliša, Zagreb 1999, str. 151. Richard T.T. Forman, Michel Godron, 1986: LANDSCAPE ECOLOGY. John Wiley and Sons, Inc. New York, p. 1-620. BIODIVERSITY, E.O.Wilson, Editor, National Academy of Science, 1988, p. 521 Mackenzie, A., A. S. Ball, S. R. Virdee, 2001: Ecology. BIOS Scientific Publishers Limited, UK, str. 339 Crveni popis ugroženih biljaka i životinja Hrvatske, 2004., Državni zavod za zaštitu prirode, str. 112.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Saša Bogdan, PhD. Assist. Prof. Ida Katičić Bogdan, PhD. Marko Bačurin, mag. ing. silv.	1.7. Number of ECTS credits	4
1.2. Course title	Genetics of Forest Trees	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+8
1.3. Course code	226122	1.9. Expected enrolment in the course	50
1.4. Study programme	University undergraduate 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	Interpretation of the theoretical basics of genetics of forest tree species (basics of inheritance, functioning of genes, interaction of genes, control of gene expression, influence of genes on phenotype). Basics of work in molecular biology laboratory (DNA extraction, PCR, electrophoresis). Characterization and monitoring of genetic constitution and genetic structure of forest tree species (concepts and definitions, genetic characterization of a population, population genetic constitution, Hardy-Weinberg equilibrium and effective population size, inbreeding, evolutionary-adaptation factors, racial differentiation). Interpretation of the polygenic inheritance basics and application of quantitative genetics (set up and analysis of a genetic test).
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	B8 – to carry out professional tasks of nurseries and seedings B9 – to collaborate on environmental and spatial plans C1 – to plan and organize integrated environmental management C2 – to plan and organize professional tasks of implementing economic programs of protected facilities Nature C3 – to apply the current legal regulations in the management of protected objects of nature C4 – to conduct environmental monitoring C5 – to calculate basic business performance indicators, draw up basic financial statements, identify types of costs, define and analyze costs
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1.To discuss the interaction of genes and the impact of the environment on phenotypic traits. 2.To carry out basic field and laboratory procedures in the context of DNA analysis (collection of plant material, extraction of DNA from plant tissue, PCR method, production of agarose gel, electrophoresis). 3.To discuss the usefulness and procedures of using different types of genetic markers for genetic characterization of a population and calculate the relevant parameters; To calculate relevant parameters and assess the basic genetic condition of a population.

<table>
<tr><td></td><td colspan="7">4.To explain the importance of genetic diversity, methods of its determination and the impact of evolutionary factors on genetic diversity; To calculate different parameters describing: the level of genetic diversity of a population, the level of genetic differentiation among populations and the effective size of a population; To analyze genetic diversity of a population based on calculated parameters.
5.To design genetic test for analysis of quantitative phenotypic traits and describe the process of collecting data from a genetic test; To calculate basic parameters of quantitative genetic diversity based on data from a genetic test.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="7">Lectures:
1. Fundamental laws of inheritance.
2. Deviations from Mendel's laws (multiple allelism, letal alleles, gene interactions).
3. Structure of DNA molecules and chromosome. Repetitive DNA. The replication of DNA molecules.
4. DNA function. Genes, genetic code, transcription, translation.
5. Regulation of gene expression.
6. Cell division (mitosis, meiosis) – the perspective of genetics.
7. Introduction to population genetics. Population genetic constitution and genetic structure.
8. Hardy-Weinberg's equilibrium, Crossing-over, Inbreeding.
9. Evolutionary-adaptation factors.
10. Effective population size. Genetic markers.
11. Genetic diversity of forest trees - introduction.
12. Introduction to quantitative genetics. Definitions, settings.
13. Genetic testing (provenance test, progeny test).
14. Determination of quantitative genetic parameters.
15. Genotype by environment interaction.
Exercises:
1. Introduction to molecular biology laboratory (laboratory).
2. Extracting DNA from plant tissue (laboratory).
3. Functioning of genes; creating a mental map (practicum).
4. Cell division (practicum).
5. The use of DNA markers (PCR method, electrophoresis) - laboratory.
6. Determination of genetic constitution of a population (practicum).
7. Calculation of the inbreeding coefficient and the inbreeding depression (practicum).
8. Calculation of the effects of evolution/adaptation factors on the genetic composition of a population (practicum).
9. Calculate the effective size of the population (practicum).
10. Calculation of parameters of genetic diversity (practicum).
11. Analysis of quantitative traits. Calculation of genotypic and additive values of individuals (practicum).
12. Designing a genetic test (practicum).
13. Genetic testing (data collection, statistical analysis, calculation of quantitative genetic parameters) - practicum.
14. Genetic testing (determination of racial variability) - practicum.
15. Selection of forest reproductive material based on genetic testing (practicum).
Field class:
Examples of good practice of analysis and management of genetic resources of forest trees (ex situ facilities, gene bank, seed savings bank, conservation of nature monuments</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☐ (other)</td><td>2.7. Comments:</td></tr>
<tr><td>2.8. Monitoring student</td><td>Class</td><td>YES</td><td></td><td>Research</td><td></td><td>NO</td><td>Oral exam</td><td>YES</td><td></td></tr>
</table>

<table>
<tr><td rowspan="5">work</td><td>attendance</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Attending lectures and exercises, attending field classes, making exercises, taking partial exam and exams</td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Bogdan, S. and I. Katičić Bogdan, 2016. Genetics and breeding of trees and shrubs. Internal peer-reviewed script. 224. p. (selected chapters)</td><td colspan="2"></td><td colspan="2">Yes, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">White, T. L., W. T. Adams, D. B. Neale, 2007: Forest Genetics. Wallingford, UK, Cambridge, CAB International. p682.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Marija Gligora Udovič, PhD.	1.7. Number of ECTS credits	3
1.2. Course title	Environmental Microbiology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+0
1.3. Course code	226124	1.9. Expected enrolment in the course	30-35
1.4. Study programme	University undergraduate 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	The aim of the course is to familiarise students with the types of microorganisms, their specific ways of life in different ecosystems through their catalytic activity in the transformation of organic compounds and the circulation of matter in the biosphere, and to demonstrate their importance for urban ecology and economic and social 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	A1 - Application of the approach of experimental observation and mathematical modelling, mathematical solution of research and practical problems, statistical processing, presentation and analysis of data and independent conclusions based on the analyzed data. B4 - Perform biological and technical work on the design of parks and green areas. B5 - To participate in the implementation of programs for the management of protected natural objects. B9 - Participate in the development of environmental impact studies and spatial plans. C1 - Plan and organize integrated environmental management. C3 - Perform environmental monitoring. D1 - Continuing education as part of 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)	1. classify and determine the types of micro-organisms (autotrophs, heterotrophs, amphitrophs) (with the appropriate technical literature), and apply their role in the circulation of matter in nature 2. link the anatomy and morphology of micro-organisms to their way of life by listing and explaining their adaptations and significance in ecosystems by means of characteristic species 3. to critically analyze and discuss the effects of micro-organisms on humans and to present the use of certain species in certain branches of science and industry. 4. use highly specialized theoretical and practical knowledge to plan solutions to problems in ecosystems, using standard and new research methods and an interdisciplinary approach 5. interpret biogeochemical processes at all trophic levels and apply the acquired knowledge to the restoration of individual ecosystems 6. analyze the influence of physical, chemical and biological processes on the formation and development of the pedosphere and their impact on the biology of living organisms

	and justify the need for interdisciplinary cooperation in the study of different ecological systems 7. apply the principles of ecological and physiological processes to the interaction of micro-organisms with environmental conditions and identify the interactions of abiotic and biotic factors in the environment in order to assess the ecological status of individual types of ecosystems 8. distinguish between basic and specific methods used in the study of different types of ecosystems and identify their potential and limitations 9. search contemporary scientific and technical literature for the purpose of collecting specific data with the object of study 10. argue your own position with a critical review of modern concepts in ecosystem microbiology		
2.5. Course content (syllabus)	The teaching material includes scientific knowledge about the species and general properties of microorganisms, principles of microbial ecology (taxonomy, metabolic activities, interaction with other organisms) in water, soil and air as well as the role of microorganisms in the living world, their ecological importance and application. In the field/laboratory classes students master the basic laboratory procedures used in the collection, cultivation and identification of microorganisms (bacteria, protists), study the sensitivity of microorganisms to antimicrobial agents and sterilization techniques, deepen the knowledge of the role of microorganisms in the environment and the consequences of their presence. Lectures: 1. introductory lecture - historical overview of discoveries and general properties of microorganisms (2 hours), 2. basics of microbial ecology (4 hours), 3. physico-chemical factors and microorganisms (2 hours), 4. circulation of elements in nature (2 hours), 5. forms, species, food types and position of microorganisms in nature (4 hours), 6. ecological growth factors and metabolic activity of microorganisms (4 hours), 7. biochemical cycles and circulation of elements in nature (2 hours), 9. microorganisms in water, soil and air (4 hours), 10. microbial cycle (2 hours), 11. applied microbiology from the point of view of urban ecology (4 hours). Exercises: 1. field preparation, collecting samples in the Botanical Garden: introduction to field and laboratory equipment and measuring instruments, sampling procedures, field samples, storage and preparation of samples for analysis (4 hours), 2. bacteriology - types of culture media, sample inoculation, dilutions, isolation and identification, quantitative methods of sample analysis (2 hours) 3. plankton - microscopy, species identification, quantitative methods, the influence of physical-chemical factors (2 hours) 4. Benthos - microscopy, species identification, quantitative methods, the influence of physical-chemical factors (2 hours) 5. application of the index in the assessment of trophy, saprobity, ecological status (2 hours) 6. nitrogen cycle - isolation of nitrogen fixers from the soil, ammonification, nitrification, denitrification (2 hours) 6. Winogradsky column analysis - observation of representatives of different types of metabolism of living organisms in relation to the source of carbon, energy and electrons and their compounds (1 hour)		
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ field work	☒ independent assignments ☐ multimedia and the internet ☒ laboratory ☐ work with mentor ☐ (other)	2.7. Comments:

2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work	YES		Report	YES		Homeworks	YES	
	Essay		NO	Seminar paper		NO	Short knowledge quizzes)	YES	
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)	3	
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 all forms of teaching (contact and mixed teaching). Preparation of an independent project task, regular submission of homework (online) and short knowledge tests (online). Participation in colloquia, examinations.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Microbiology Laboratory Theory and Application - Fourth Edition - Customized for Broward Collerge - South Campus Loose Leaf – January 1, 2015 by Michael J. Leboffe				YES		YES		
	Environmental Microbiology 3rd Edition 2014. Academic Press. Editors: Ian Pepper Charles Gerba Terry Gentry				YES		YES		
2.12. Optional literature	Microbiology Laboratory Theory and Application - Fourth Edition - Customized for Broward Collerge - South Campus Loose Leaf – January 1, 2015 by Michael J. Leboffe								

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Škvorc, PhD. Assist. Prof. Krunoslav Sever, PhD.	1.7. Number of ECTS credits	3
1.2. Course title	Plant physiology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+0
1.3. Course code	226125	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	Development of basic knowledge necessary for evaluation of research on plant physiology and its integration into the models of plant functioning. Development of abilities of critical insight into plant physiology, as well as development and improvement of skills in experiment design and analysis.
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. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B8. perform professional field works in forest nurseries including planting and seeding D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	To explain the relationship between water and plants (water potential, plant water uptake and conductivity, root pressure, water loss, transpiration, embolism, plant water status). To explain plant metabolism and mineral nutrition (the structure and activity of enzymes in plant cells, the physiological role of mineral nutrients in the plant, assimilation, mycorrhiza). To interpret photosynthesis and respiration (chemoautotrophy, photoautotrophy, the structure of photosynthetic apparatus, photosynthetic reactions, photorespiration, photosynthesis types, influence of environmental factors, aerobic and anaerobic cellular respiration, whole-plant respiration, the regulation of cellular metabolism). To present physiological processes of plant growth and differentiation in relation to key environmental factors (plant hormones, auxins, gibberellins, cytokinins, abscisic acid, bud, seed and embryo dormancy, phytochromes, photomorphogenesis). To interpret the physiology of stress, as well as physiology of movements.
2.5. Course content (syllabus)	Lectures 1. Introduction. Cell metabolism. Chemical composition of a plant body. Enzymes. 2. Water and plant cells. Absorption, movement and loss of water in the plant. 3. Mineral nutrition - absorption and availability of nutrients, mycorrhiza. Assimilation. 4. Chemoautotrophy, photoautotrophy, structure of the photosynthesis apparatus. 5. Photosynthetic reactions, impact of environment on photosynthesis, heterothropic nutrition.

<table>
<tr><td></td><td colspan="9">6. Cell respiration - aerobic, anaerobic. Respiration of a whole plant. Regulation of metabolism within the cell.
7. Growth, differentiation. Plant senescence. Abscission.
8. Plant hormones, auxins, gibberelins, cytokinins, abscisins and other physiologically active substances.
9. Temperature impact on growth and development of plants, dormancy.
10. Impact of light upon growth and development of plants, phytochromes, photomorphogenesis, flowering control.
11. Fertilization and germination.
12. Stress physiology, temperature stress.
13. Drought physiology, extreme pH values of the soil.
14. Lack of oxygen in the soil, pollution of water, soil and air, resistance of plants to diseases.
15. Physiology of plant movement.

Excersises
1. Staining of plant cells. Permeability of cell membranes.
2. Plasmolysis and deplasmolysis of plant cells.
3. Relative content of free, hygroscopic and total water in plant tissue.
4. Determining the water status of plants using a potometer.
5. Determination of transpiration intensity by weighing using a potometer.
6. Stomata number and size.
7. Physiological and morphological characteristics of leaves (dry matter content, specific leaf area).
8. Germination of pollen and the energy of its germination.
9. Monitoring the development of plant organs based on phenological changes (phenophases).
10. Application of a portable pressure chamber for measuring water potential in leaves.
11. Application of a portable device for measuring the exchange of gases between the plant and the atmosphere.
12. Measurement of chlorophyll fluorescence with interpretation of the obtained results.
13. Calibration of an optical chlorofilmeter with the aim of non-destructive assessment of the content of photosynthetic pigments in leaves.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>Experimental work</td><td>YES</td><td></td><td>Report</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>3</td><td></td></tr>
<tr><td></td><td colspan="8"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Taking colloquia, exams.</td></tr>
</table>

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Škvorc, Ž., Sever, K., Franjić, J., 2013: Fiziologija šumskoga drveća (interna skripta), Šumarski fakultet. Zagreb	NO	YES, Merlin
2.12. Optional literature	Larcher, W., 2003: Physiological Plant Ecology. 3rd ed. Springer. Berlin. Pevalek-Kozlina, B. 2002: Fiziologija bilja. Profil international. Zagreb		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Krešimir Krapinec, PhD. Prof. Marijan Grubešić, PhD. Assist. Prof. Kristijan Tomljanović, PhD.	1.7. Number of ECTS credits	4
1.2. Course title	Wildlife Management	1.8. Number of hours in semester (L+E+F+e-learning)	30+15
1.3. Course code	226139	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	To build up basic knowledge for wildlife management. Developing the ability for population status assessment of particularly wildlife species, evolve assessment methods of human and society attitude toward some animal species and apply appropriate measures for particularly species population control or population restoring.
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	B3. acquire basic principles of protection of forests from abiotic and biotic factors, and apply basic procedures and means in protection of forests B4. participate in the realization of programs for the management of protected natural areas B9. collaborate in preparation of ecological impact studies and spatial plans D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define criterion for wild animal classification (conservation and use of wild animals) 2.Feeding strategy (niche, habitat and ecosystem, competition, ecophysiological adaptations of ruminants and carnivores, splitting according to feeding strategy 3. To explain wild animals behaviour and habitat-animal interactions (displaying of behaviour, reproductive behaviour, communication, home range and territory, migrations and migratory species, habitat selection, dispersion patterns and dispersal). 4. Assessment of population dynamic, capacity (limiting factors and the law of tolerance, population structure, sustainable use) 5. Find out types of animal population management on the local and global point of view (population control, causes of extinction or endangerment of populations, introduction, reintroduction, translocation, recovery plans, management plans and legislative).
2.5. Course content (syllabus)	LECTURES: 1. Grounds for managing of animals, general and antropological overview of human-wild animals interactions around the World. – 2 hours 2. Niche, competition, guilds, habitat assessment. – 3 hours 3. Feeding behaviour and feeding strategies – 3 hours 4. Animal behaviour, home range, territoriality with emphasizes to reproductive behaviour and reproductive strategies – 3 hours

<table>
<tr><td></td><td colspan="9">5. Population ecology and capacities – 3 hours
6. Human-animal interaction, spotting and forecasting potetntial problems and problematical species. – 3 hours
7. Population control, techniques for preventing damages. – 3 hours
8. Endangered species and recovery plans (agrocenosis, woody habitats). – 4 hours
9. Legislative, management plans. – 3 hours
10. Hunting legislative and organisation of hunting in Croatia – 3 hours
EXERCISES:
1. Criterions for animal classification – 1 hour
2. Taxonomy of birds and mammals – 2 hours
3. Sexing and aging big game – 3 hours
4. Sexing and aging small game – 2 hours
5. Census techniques – 3 hours
6. Census techniques, practical work – 2 hours
7. Hunting museum visiting – 2 hours</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Atendance on lectures and active contribution on excersises. Passing exam.</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="4">Scalet, C.G., Flake, L.D., Willis, D.W., 1996: Introduction to Wildlife and Fisheries: An Integrated Approach; W.H. Freeman and Company; New York; 512 pp.</td><td colspan="2">YES, Department for Forest Protection and Wildlife Management</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">Bolton, M., 1997: Conservation and the use of wildlife resources. Chapman & Hall; London; 278 pp</td><td colspan="2">YES, Department for Forest Protection and Wildlife Management</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">DeGraaf, R.; Miller, R.I., 1996: Conservation of Faunal Diversity in Forested Landscapes. Chapman & Hall; 633 pp.</td><td colspan="2">YES, Department for Forest Protection and Wildlife Management</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">Sutherland, W.J., 2006: Ecological Census</td><td colspan="2">YES, Department</td><td colspan="2"></td></tr>
</table>

	Techniques – a handbook, second edition. Cambridge University Press, The Edinburgh Building, Cambridge, 432 pp.	for Forest Protection and Wildlife Management	
2.12. Optional literature	1. Williams, B. K.; Nichols, J. D.; Conroy, M. J. 2001: Analysis and Management of Animal Population .– modeling, estimating and decision making. Acadmic Press. 817 pp. 2. Schwartz, M.W., 1997: Conservation in higly fragmented landscapes; Chapman & Hall; New York; 436 pp. 3. Wagenknecht E., 1971: Bewirtschaftung unserer Schalenwildbestände. VEB Deutscher Landwirtschaftsverlag, Berlin 386 pp. 4. Garms, H., Borm,L., 1981: Fauna Europe; Mladinska knjiga, Ljubljana, 550 pp.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović prof. kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 3	1.8. Number of hours in semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226043	1.9. Expected enrolment in the course	40
1.4. Study programme	University undergraduate 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 aim of the course Physical and Health Culture is the acquisition of theoretical and practical kinesiological knowledge in order to train students for independent physical exercise and the adoption of healthy living habits. Through various forms of physical exercise, the goal is to meet the daily needs for movement and improve the motor, functional and cognitive abilities of the student population. Through attending classes, students are educated about the importance of daily physical exercise, or about all the good things that physical activity means for a person and his health. The aim is to simultaneously acquire knowledge about the harmfulness of various forms of addiction to health, especially their impact on intellectual and physical capabilities, the importance of quality nutrition and the most interesting results of previous research on the student population in the segment: physical activity as disease prevention, healthy eating , sports diagnostics, stress management, physical activity as a means of relief.
2.2. Enrolment requirements and/or entry competences required for the course	health status
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 To continue training at the graduate university studies of the Faculty of Forestry, Department of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the structure of the physical exercise class 2. Explaination of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises with regard to kinesiologic activity 5. Organize constructive free time 6. Assess personal diet and physical exercise habits. 7. Demonstrate general preparatory exercises and stretching exercises. 8. Understanding kinesiology programs and their target orientation 9. Control emotions and strengthen self-control.
2.5. Course content (syllabus)	1. Athletics Walking - Walking at different paces, Nordic walking, brisk walking, hiking Running - theoretical knowledge and divisions, cyclic movements at different paces, fast running short distances, running down a slope, running along a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads, relay running, running with hurdles of different height 2. Martial arts- Judo, Karate

<table>
<tr><td></td><td colspan="9">Basic techniques of Judah - falls, hand throws, belt throws, foot throws, choking techniques, levers
Basic techniques - karate - kicks, punches, defense
3. Sports games-
Basketball - Keeping the ball in place, keeping the ball in motion, basic throwing, pivoting, jumping shot, passing in place and moving
Football - passing in place, passing to the first, passing in motion, technique with the ball, cooperation of two and three players, shots on goal from the move, shot on goal after the ball is added, volley kick, headers, stops
Volleyball - Passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, technique of attack, technique of defense
Handball - guiding the ball in a straight line and with a change of direction, Passing in place, passing in motion, crossings, passing for a counterattack, cooperation of two and three players, goal kick after the lead, goal shot on the added ball
4. Racket sports
Badminton-forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand punch under the arm, high serve, backhand serve, short serve, field movements, single play, pair play
5. Shooting-classification of shooting disciplines and shooting equipment, maintenance of weapons, breathing techniques, air rifle 10m
6. Fitness programs - Circuit strength training, functional training, intensive cardio training, Pilates, -
Exercises for warming up and preparing the locomotor system, stretching exercises, muscle strengthening exercises, exercises for reducing subcutaneous fat, exercises for increasing muscle endurance, exercises for increasing muscle mass, stretching exercises
7. Hiking tours - hiking on flat terrain, hiking hiking tours, interval hiking methods
8. Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Classes are conducted exclusively in the form of exercises. Students teach only from the content or teaching unit to which they are registered. If necessary, it is possible to conduct classes partially or completely online.</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
</table>

	D. Pavović (2010): Script for students of the Faculty of Forestry, course Physical and Health Culture		Faculty of Forestry and Wood Technology website, Merlin e-learning system
2.12. Optional literature	1. Z. Šatalić, M.Sorić, M Mišigoj-Duraković(2015):Sportska prehrana, Znanje, 2. B.Neljak, R.Caput-Jogunica: Kineziološka metodika u visokom obrazovanju 3. Bos, K. (2004.) Hodanjem do zdravlja, Mozaik knjiga 2. Colwin, C., M. (1998) 4. Sertić, H. (2005) Osnove borilačkih vještina, Kineziološki fakultet Sveučilišta u Zagrebu 5. Ćurković, S. (2010). Kineziološke aktivnosti i rizična ponašanja studenata, Disertacija. Kineziološki fakultet Sveučilišta u Zagrebu		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Boris Hrašovec, PhD. Assist. Prof. Milivoj Franjević, PhD.	1.7. Number of ECTS credits	6
1.2. Course title	Applied entomology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	226126	1.9. Expected enrolment in the course	50
1.4. Study programme	University undergraduate 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 acquire special skills and knowledge needed in pest suppression systems in urban environment based on a concept of basic education in the grdauate level courses. Also they learn the basics of synecological relations between insects and their environment and acquire the concept applying biodiveristy principles in the management of protected forest 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	B2. recognize and determine the most important types of xylophage's bacteria, insects and funghi on trees species and detect wood defects incurred due to their activity		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	To learn taxonomy, morphology, physiology and nutrition of forest insects, and the importance of insects in the forest ecosystem and urban areas Present growth and ontogenetic development in insects (developmental stage, types of larvae, pupae, physiology of metamorphosis , apolysis, eclosis, ecdosis, hormone system, endocrine glands). Describe the insect sense and communication with the environment in function survival in forest habitat and urban space (sensations of tastes, sight, hearing, smell and taste, intrinsic and interpersonal communication, sexual and aggregate attractants, insect attack symptoms). Define the foundations of the insect ecology of the populations, endangered and rare insect species (fluctuations, oscillations, gradations, gradation types, antagonistic relations and symbiosis, predation and parasitism, endangered and rare insect species, the concept of species preservation through conservation of habitats). Show the most significant pests of urban timber from the group of sucking insects (species from the order of Orthoptera, Thysanoptera and Hemiptera, bionomy, ecology and significance). Define the most important xylophages and urban wood destroyers woody plants (xylophagic butterflies, bark beetles, primary and secondary pests in forestry, bionomy, ecology of species and their impact on forest ecosystem). Present insects as molestants and causes allergic reactions to the forest		

	and urban space. Analyze invasive quarantine insect species and their correlation with urban space.
2.5. Course content (syllabus)	LECTURES: 1. The history of forest entomology in Croatia, scope and goals of the curriculum, insects in urban environment as very adaptive and capable pests and molestants (general biological, ethological and ecological traits of insects). Domestic and international cases of dramatic influences of insects on forest cover, special emphasis on urban green, connectivity of the curriculum with the courses following in the graduate courses (2 hr.) 2. Insect taxonomy with an overview of insect orders and their main morphological features. Main body parts, exoskeleton, competitive advantages and constrains emerging from the body structure (2 hr.). 3. Anatomy of an insect, physiology (haemolymph, breathing, food intake, excretion), feeding types, supplementary feeding, importance and repercussions in the insect population control, sexual and parthenogenetic reproduction, polygamy, sexual indices and ecological meaning of protandry or protoginy (2 hr.) 4. Growth and development (onthogenesis), developmental stages (egg, larva, pupa, adult), larval and pula types, physiology of metamorphosis, eclosion, ecdysis, endocrinal regulation of moulting (2 hr.) 5. Senses in insects (palpation, sight, hearing, smell, taste) communication via semiochemicals, inter- and intra specific communication (pheromones, alomones, kairomones etc.), case examples (2 hr.). 6. Main environmental adaptations of insects to their habitats, the impact of temperature, sunlight, moisture on insect development Fundamental adaptations of insects to the environmental conditions, temperature, moisture and diurnal impacts on development, circadial rhythm, diapause, heterotypic relations between the insects, predation, parasitism, examples (2 hr.) 7. Fundamentals of population ecology in insects, quantitative indices and population distribution patterns, fluctuations, oscillations, outbreaks, outbreak types with examples (2 hr.) 8. 12 most important forest pests that enter outbreaks which can cause immense consequences on the forest ecosystem and imbalance in the areas of protected nature (4 hr) 9. Most important sap sucking urban pests (heteropterans, aphids and thrips) (2 hr.) 10. Most significant defoliators of urban trees I (*Symphita*) (2 hr.) 11. Most significant defoliators of urban trees II (*Lepidoptera*) (2 hr.) 12. Most significant defoliators of urban trees III (*Coleoptera* and other orders) (2 hr.) 13. Most significant xylophages and timber beetles on urban trees (2 hr.) 14. Other insect pests most commonly appearing on urban trees and in urban environment (2 hr.) LAB: 1. Symptoms of abiotic and biotic (insect) damages on trees. Detailed insight in insect impact on urban trees (2 hr.) 2. Sampling methods of plant tissues aimed at identification of insects as potential causal agents (2 hr.) 3. Most important defoliators in Croatian forests: *Lymantria dispar*, *Euproctis chrysoirrhoea*, *Malacosoma neustria*, *Thaumetopoea processionea*, *T. pityocampa*, *Tortrix viridana*. Line drawing of available developmental stages (2 hr.) 4. Bark beetles. Line drawings of the main types of their gallery systems (uniramial, biramial, multiramial, mainly in transverse or longitudinal orientation). Differentiation of maternal and larval galleries, mating chamber and pupal chamber (2 hr.) 5. Ash aphids, aphids on conifers. Plane and birch *Heteroptera*. *Pyrrhocoris apterus* and *Oxycarenus lavaterae*. Line drawings of most common species (2 hr.) 6. *Tomostethus nigritus*, *Diprionidae* on pines, *Cameraria ohridella*, *Argyresthia thuiella*. Line drawings of most common species (2 hr.) 7. *Sesiidae*, *Cerambycidae* and other xylophages on urban trees. Line drawings of most

<table>
<tr><td></td><td colspan="9">common species (2 hr.)
8. Gall inducing insects on urban trees. Line drawings of most common species (1 hr.)
FIELD EXCURSION: (2 days)
During a 2-day excursion, most important insects pests in natural forests and protected areas (National parks and Nature parks) and urban environment are studied in the field.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Atendance on lectures and active contribution on excersises, attending field excursion. Passing exam.</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="5">Hrašovec, B. 2004: Kukci – važni pokazatelji bioraznolikosti ali i povremeni uzročnici kalamiteta u šumskom ekosustavu. Hrvatsko šumarsko društvo, Zagreb, 76 str.</td><td colspan="2">YES</td><td colspan="2">no</td></tr>
<tr><td></td><td colspan="5">Grupa autora: CD rom priručnik za determinaciju štetnika i bolesti u urbanom šumarstvu</td><td colspan="2">YES</td><td colspan="2">YES</td></tr>
<tr><td></td><td colspan="5">Tomiczek, C., D. Diminić, T. Cech, B. Hrašovec, H. Krehan, M. Pernek, B. Perny, 2008: Bolesti i štetnici urbanog drveća. Udžbenici Sveučilišta u Zagrebu, Šumarski institut, Jastrebarsko – Šumarski fakultet Sveučilišta u Zagrebu, Zagreb, 382 str</td><td colspan="2">YES</td><td colspan="2">no</td></tr>
<tr><td></td><td colspan="5">Hrašovec-Franjević, 2020: Primjenjena entomologija - posebni dio - pregled najznačajnijih vrsta šumskih kukaca i njihova osnovna biološka obilježja</td><td colspan="2">YES</td><td colspan="2">YES, Faculty web</td></tr>
<tr><td></td><td colspan="5">Hrašovec, Franjević, 2020: Primjenjena entomologija - opća entomologija – unutarnja i vanjska građa kukaca, fiziologija, opća ekologija i biologija</td><td colspan="2">YES</td><td colspan="2">YES, Faculty web</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Alford, D.A., 1995: A Colour Atlas of Pests of Ornamental Trees, Shrubs and Flowers. Manson Publishing, London, UK, 448 str.
2. Chapman, R.F., 1998: The Insects – Structure & Function. Cambridge University Press, Cambridge, 770 str.
3. Csoka, G., 1995: Lepke-hernyok. Agroinform Kiado es Nyomda Kft., Budapest, 151 str. 4.</td></tr>
</table>

	Csoka, G., 1997: Plant galls. Agroinform Kiado es Nyomda Kft., Budapest, 160 str. 5. Speight, M.R. & D. Wainhouse, 1989: Ecology and Management of Forest Insects. Oxford University Press Inc., New York, 374 str. 6. Zúbrik, M., Kunca, A., Csóka, G., Forster, B., Hâruţa, O., Hoch, G., Hrašovec, B., Koltay, A., Kulfan, J., Leontovyč, R., Nageleisen, L.M., Nakládal, O., Novotný, J., Roques, A., Peña, G.S., Šrůtka, P., Stergulc, F., Sukovata, L., Tomiczek, Ch., Turčáni, M., Vakula, J., Wermelinger, B., 2013: Insects and diseases damaging trees and shrubs of Europe. N.A.P. Editions, ISBN 978-2-913688-18-6, 535 p. 7. Chapman, R.F., 1998: The Insects – Structure & Function. Cambridge University Press, Cambridge, 770 str.

COURSE DECRIPTION

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	Applied phytopathology	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	226127	1.9. Expected enrolment in the course	35
1.4. Study programme	University undergraduate 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 acquire basic knowledge in the field of plant protection - pathology of woody plant species, primarily trees. By knowing the most important diseases of certain genera of urban and forest trees, students gain knowledge about the causes of diseases, their symptoms, disease development, the impact of environmental factors on the host plant and pathogens, and their mutual influence / interaction.
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. Identify and determine the most important species of harmful insects (insects) and fungi on forest species, determine the defects on wood caused by their action. B3. Adopt basic principles of forest protection from abiotic and biotic factors, especially fire, and apply basic procedures and means in forest protection.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Analyze the causes of plant diseases (non-infectious or non-parasitic and infectious or parasitic diseases and fungi as the most numerous and most common causes of diseases of trees and shrubs). 2. Interpret the biology and physiology of fungi (division according to lifestyle - with aprotrophs, parasites and necrophytes, reproduction and specialization of fungi). 3. Present the pathogenesis (origin and course of the disease, infection, incubation, fructification) and resistance of plants to pathogens (passive, active and apparent resistance). 4. Describe diseases of needles and leaves of urban and forest trees (symptoms of the disease, biology and harmfulness of pathogens). 5. Explain diseases of the bark of shoots, branches and trunks and conductive elements of trees and shrubs (symptoms of the disease, biology and harmfulness of pathogens). 6. Interpret the most common rot of urban trees and the characteristics and types of rot (disease symptoms, biology and harmfulness of pathogens). 7. Interpret the most common anthropogenic and abiotic damage to urban (and forest) trees (mechanical damage to the bark, damage from pesticide application, lightning, winter hardiness, damage due to lack of nutrients). 8. Describe harmful semi-parasitic flowering plants on urban trees and trees of protected forest ecosystems (disease symptoms, biology and harmfulness of semi-parasites).
2.5. Course content	Lectures:

<table>
<tr><td>(syllabus)</td><td colspan="6">1. Definition of disease; deviations from normal plant functions; types of diseases. Disease symptoms; onset of disease; anatomical and physiological changes in diseased plants.
2. Causes of plant diseases: non-infectious or non-parasitic diseases; infectious or parasitic diseases. Fungi as the most numerous and most common causes of diseases of trees and shrubs; fungal morphology; fungal reproduction; classification (systematics) of fungi.
3. Division of fungi according to lifestyle. Obligatory or true parasites, facultative parasites; optional saprotrophs; necrophytes. Reproduction of fungi; mushroom nutrition; environmental impact on fungal growth and development. Mushroom specialization.
4. The onset and course of the disease. Infection; infectious potential; pathogen strength; types of infection; sources of infection; infection process. Incubation. Fructification.
5. Definition of resistance. Preinfective or passive resistance. Post-infection or active resistance; plant reaction to a pathogenic organism; congenital relationship; non-congenital relationship: necrotic defense reactions, histological reactions, phytoalexins. Apparent resistance.
6. Diseases of needles and leaves of urban and forest trees (in general). The most common (and new) diseases in Croatia and this part of Europe - the causes.
7. Diseases of the bark of urban and forest trees and shrubs (in general). The most common (and new) diseases of the cortex and conductive elements in Croatia and this part of Europe.
8. The concept and origin of rot; brown and white type of rot. Species of tree rot fungi (in general). The most common rot fungi on urban trees in Croatia and this part of Europe.
9. The most common damage of anthropogenic and abiotic cause on urban (and forest) trees and conditions for their occurrence.
10. Semi-parasitic flowering plants (in general). The most common semi-parasitic flowering plants on urban trees and trees of protected forest ecosystems in Croatia and this part of Europe.

Exercises in the microscopic partikum:
1. Basic structure of fungi: hyphae, mycelium.
2. Examples of needle and leaf disease, appearance and anatomical structure of the fruiting body / body and spores.
3. Examples of diseases of the bark of shoots, branches and trunks, appearance and anatomical structure of fruiting bodies and spores.
4. Examples of forest tree rot, appearance and anatomical structure of fruiting bodies and spores.

Field work:
1. Examples of infected trees explain the occurrence of infection, disease development and the impact (harmfulness) of recorded pathogens on the health of urban trees, and in protected forest ecosystems on individual trees and the ecosystem as a whole.
2. Examples of infected trees explain the occurrence of infection, disease development and the impact (harmfulness) of recorded pathogens on the health of urban trees, and in protected forest ecosystems on individual trees and the ecosystem as a whole.
3. Examples of infected trees explain the occurrence of infection, the development of rot and the impact (harmfulness) of recorded pathogens on the health of urban trees and mechanical stability of infected trees in urban areas and the occurrence of damage from broken branches or bumps / trunks.
4. Examples of infected trees explain the origin of the infection and the impact of pathogens on the health of trees.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="2">☐ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☐ (other)</td><td>2.7. Comments:</td></tr>
<tr><td>2.8. Monitoring student</td><td>Class</td><td>YES</td><td></td><td>Research</td><td></td><td>NO</td><td>Oral exam</td><td>YES</td><td></td></tr>
</table>

work	attendance								
	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)	6	
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
	Glavaš, M., 1996: Osnove šumarske fitopatologije. Sveučilište u Zagrebu, Šumarski fakultet, 140 str.	YES	2nd level of application of e-learning
	Glavaš, M., 1999: Gljivične bolesti šumskoga drveća. Sveučilište u Zagrebu, Šumarski fakultet, 281 str.	YES	2nd level of application of e-learning
	Tomiczek, C., D. Diminić, T. Cech, B. Hrašovec, H. Krehan, M. Pernek & B. Perny, 2007: Bolesti i štetnici urbanog drveća. Šumarski institut, Jastrebarsko, Sveučilište u Zagrebu, Šumarski fakultet, 384 str.	YES	2nd level of application of e-learning
	Diminić, D., 2013-2020: opća fitopatologija te važne i aktualne (nove) bolesti drveća i grmlja (prezentacije svih predavanja u PDF formatu).		2nd level of application of e-learning

2.12. Optional literature	1. Butin, H., 1995: Tree Diseases and Disorders. Oxford University Press, Oxford, 252 str. 2. Strouts, R.G. & Winter, T.G., 1994: Diagnosis of ill-health in trees. HMSO, London, 307 str. 3. Glavaš, M. & D. Diminić, 2001: Mikološki kompleks obične jele. U: Prpić, B. (ed.) 2001: Obična jela (*Abies alba* Mill.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 606–625. 4. Diminić, D., 2003: Gljivične bolesti obične bukve. U: Matić, S. (ed.) 2003: Obična bukva (*Fagus sylvatica* L.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 549–560. 5. Diminić, D., 2005: Mikoze kore i lišća topola i vrba. U: Vukelić, J. (ed.) 2005: Poplavne šume u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 390–397. 6. Glavaš, M. & D. Diminić, 2011: Bolesti šumskoga drveća. U: Matić, S. (ed.): Šume hrvatskoga sredozemlja. Akademija šumarskih znanosti, Zagreb, 533-555. 7. Diminić, D., D. Kajba, M. Milotić, I. Andrić, J. Kranjec Orlović, 2017: Suceptibility of *Fraxinus angustifolia* clones to *Hymenoscyphus fraxineus* in lowland CroatiaBaltic Forestry 23(1): 233-243. 8. Cech, T., D. Diminić, K. Heungens, 2010: *Cylindrocladium buxicola* causes common box blight in Croatia. Plant pathology, 59 (2010), 6; https://bsppjournals.onlinelibrary.wiley.com/doi/full/10.1111/j.1365- 3059.2010.02361.x 9. D. Diminić, J. Kranjec Orlović, I. Lukić, M. Ježić, M. Ćurković Perica, M. Pernek, 2019: First Report of Charcoal Disease of Oak (*Biscogniauxia mediterranea*) on Quercus spp. in Croatia. Plant disease 2019 v.103 no.10 https://apsjournals.apsnet.org/doi/10.1094/PDIS-03-19-0458-PDN

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marilena Idžojtić, PhD. Assist. Prof. Igor Poljak, PhD. Antonio Vidaković, mag. ing. silv.	1.7. Number of ECTS credits	7
1.2. Course title	Dendrology	1.8. Number of hours in semester (L+E+F+e-learning)	45+30+24
1.3. Course code	33819	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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 acquire theoretical and practical knowledge about autochthonous and allochthonous tree and shrub species. Theoretical knowledge encompasses biological features, morphological characteristics, intra-species variability, distribution, special characteristics, and the economical and ecological importance of species. Students acquire practical skills to recognize woody species on the basis of different morphological characteristics: habit, bark, leaves and twigs of deciduous species in winter, flowers, cones, fruits and seeds. They also gain knowledge on the practical use of trees and shrubs in forestry and 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	B1. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	To define and explain biological features and morphological characteristics of the genera of autochthonous gymnosperms (6 genera), allochthonous gymnosperms (18 genera), autochthonous angiosperms (trees - 28 genera, shrubs - 45 genera), allochthonous angiosperms (trees and shrubs - 27 genera), autochthonous and allochthonous angiosperms - vines (10 genera), To identify and describe the autochthonous and allochthonous gymnosperms according to: habit (21 species), bark (12 species), twigs and buds in winter (5 deciduous species), leaves (49 species), cones and/or seeds (41 species); To identify and describe the autochthonous and allochthonous angiosperms according to: habit (41 species), bark (27 species), twigs and buds in winter (72 deciduous species), leaves (196 species), flowers (61 species), fruits and/or seeds (123 species); To use determination keys for autochthonous and allochthonous gymnosperms and angiosperms; To group autochthonous and allochthonous gymnosperms and angiosperms (trees, shrubs and vines) according to biological features, morphological characteristics, distribution, economic, horticultural and ecological importance;		

	To choose autochthonous and allochthonous gymnosperms and angiosperms (trees, shrubs and vines) for various purpose in forestry and urban forestry;
2.5. Course content (syllabus)	Lectures: 1. Biological features, morphological characteristics, number of species and distribution of genera in the families *Ginkgoaceae*, *Araucariaceae*, *Pinaceae* (part one). Biological features, morphological characteristics, distribution and importance of species within these genera. 2. Biological features, morphological characteristics, number of species and distribution of genera in the family *Pinaceae* (part two). Biological features, morphological characteristics, distribution and importance of species within these genera. 3. Biological features, morphological characteristics, number of species and distribution of genera in the families *Taxodiaceae*, *Cupressaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 4. Biological features, morphological characteristics, number of species and distribution of genera in the families *Taxaceae*, *Cycadaceae*, *Ephedraceae*, *Magnoliaceae*, *Lauraceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 5. Biological features, morphological characteristics, number of species and distribution of genera in the families *Ranunculaceae*, *Berberidaceae*, *Platanaceae*, *Hamamelidaceae*, *Ulmaceae*, *Moraceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 6. Biological features, morphological characteristics, number of species and distribution of genera in the families *Juglandaceae*, *Fagaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 7. Biological features, morphological characteristics, number of species and distribution of genera in the families *Betulaceae*, *Tiliaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 8. Biological features, morphological characteristics, number of species and distribution of genera in the families *Cistaceae*, *Tamaricaceae*, *Salicaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 9. Biological features, morphological characteristics, number of species and distribution of genera in the families *Capparaceae*, *Ericaceae*, *Ebenaceae*, *Pittosporaceae*, *Hydrangeaceae*, *Grossulariaceae*, *Rosaceae* (part one). Biological features, morphological characteristics, distribution and importance of species within these genera. 10. Biological features, morphological characteristics, number of species and distribution of genera in the family *Rosaceae* (part two). Biological features, morphological characteristics, distribution and importance of species within these genera. 11. Biological features, morphological characteristics, number of species and distribution of genera in the families *Mimosaceae*, *Caesalpiniaceae*, *Fabaceae*, *Elaeagnaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 12. Biological features, morphological characteristics, number of species and distribution of genera in the families *Myrtaceae*, *Punicaceae*, *Cornaceae*, *Loranthaceae*, *Viscaceae*, *Santalaceae*, *Celastraceae*, *Aquifoliaceae*, *Buxaceae*, *Euphorbiaceae*, *Rhamnaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 13. Biological features, morphological characteristics, number of species and distribution of genera in the families *Vitaceae*, *Staphyleaceae*, *Hippocastanaceae*, *Aceraceae*, *Anacardiaceae*, *Simaroubaceae*. Biological features, morphological characteristics, distribution and importance of species within these genera. 14. Biological features, morphological characteristics, number of species and distribution of genera in the families *Meliaceae*, *Araliaceae*, *Apocynaceae*, *Solanaceae*, *Verbenaceae*, *Lamiaceae*, *Oleaceae* (part one). Biological features, morphological characteristics, distribution and importance of species within these genera. 15. Biological features, morphological characteristics, number of species and distribution of genera in the families *Oleaceae* (part two), *Scrophulariaceae*, *Bignoniaceae*, *Caprifoliaceae*, *Asteraceae*, *Liliaceae*, *Smilacaceae*, *Ruscaceae*, *Agavaceae*. Biological features,

<table>
<tr><td></td><td colspan="9">morphological characteristics, distribution and importance of species within these genera.

Exercises:
1. Determination of leaves, fruits and seeds - exercises using plant material and determination keys - genera and species of Pinaceae.
2. Determination of leaves, fruits and seeds - exercises using plant material and determination keys - genera and species of Taxodiaceae.
3. Determination of leaves, fruits and seeds - exercises using plant material and determination keys - genera and species of Cupressaceae.
4. Determination of twigs and buds in winter - exercises using plant material and determination keys - deciduous gymnosperms. Drawings of gymnosperms: 1-11 (Hempel-Wilchelm).
5. Trees and shrubs of the Arboretum of the Faculty of Forestry and Maksimir - field exercises - gymnosperms.
6. Determination of twigs and buds in winter - exercises using plant material and determination keys - genera and species of Ulmaceae, Fagaceae, Betulaceae.
7. Determination of twigs and buds in winter - exercises using plant material and determination keys - genera and species of Tiliaceae, Salicaceae.
8. Determination of twigs and buds in winter - exercises using plant material and determination keys - genera and species of Aceraceae, Oleaceae.
9. Determination of leaves - exercises using plant material and determination keys - genera and species of Ulmaceae, Fagaceae.
10. Determination of leaves - exercises using plant material and determination keys - genera and species of Tiliaceae, Salicaceae.
11. Determination of leaves - exercises using plant material and determination keys - genera and species of Aceraceae, Oleaceae.
12. Determination of fruits - exercises using plant material and determination keys - genera and species of Ulmaceae, Fagaceae, Tiliaceae.
13. Determination of fruits - exercises using plant material and determination keys - genera and species of Aceraceae, Oleaceae.
14. Trees and shrubs of the Arboretum of the Faculty of Forestry and Maksimir - field exercises - angiosperms.
15. Drawings of angiosperms: 12-60 (Hempel-Wilchelm).

Field work is held for three days in the lowland, mountain and Mediterranean regions of Croatia. During field work students collect herbarium specimens.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☒ independent assignments
☒ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>Homework</td><td>YES</td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>7</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student</td><td colspan="9">Regular attendance at lectures, exercises and field work. Writing exercise and field work</td></tr>
</table>

<table>
<tr><td>responsibilities</td><td colspan="3">reports. Doing and submitting homework. Collecting herbarium specimens and passing herbarium exam. Passing partial and final exam.</td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td>Title</td><td>Availability in the library</td><td>Availability via other media</td></tr>
<tr><td>Idžojtić, M., 2005: Listopadno drveće i grmlje u zimskom razdoblju. Šumarski fakultet Sveučilišta u Zagrebu. 256 pp.</td><td>YES</td><td></td></tr>
<tr><td>Idžojtić, M., 2009: Dendrologija – List. Šumarski fakultet Sveučilišta u Zagrebu. 904 pp.</td><td>YES</td><td></td></tr>
<tr><td>Idžojtić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp.</td><td>YES</td><td></td></tr>
<tr><td>Šumarska enciklopedija Vol. I-III, 1980-1987. JLZ Miroslav Krleža, Zagreb.</td><td>YES</td><td></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="3">1. Anić, M., 1946: Dendrologija. Šumarski priručnik I, Zagreb. 475- 582 pp.
2. Bean, W.J., 1989: Trees and shrubs hardy in the British Isles. John Murray Publ., Ltd., London.
3. Fitschen, J., 2007: Gehölzflora. Quelle und Meyer Verlag, Wiebelsheim. 915 pp.
4. Herman, J., 1971: Šumarska dendrologija. Stanbiro, Zagreb. 470 pp.
5. Hillier, J., Coombes, A. (Eds.), 2007: The Hillier manual of trees and shrubs. A David and Charles Books, Cincinnati.
6. Idžojtić, 2019: Dendrology: Cones, Flowers, Fruits and Seeds. Elsevier – Academic Press, London, San Diego, Cambridge, Oxford. 800 pp.
7. Roloff, A., A. Bärtels, 2008: Flora der Gehölze. Bestimmung, Eigenschaften und Verwendung. Eugen Ulmer KG, Stuttgart. 853 pp.
8. Roloff, A., Weisgerber, H., Lang, U.M., Stimm, B. (Eds.), 1994– weiter: Enzyklopädie der Holzgewächse: Handbuch und Atlas der Dendrologie. Wiley-VCH.
9. Šilić, Č., 1973: Atlas drveća i grmlja. Zavod za izdavanje udžbenika, Sarajevo. 218 pp.
10. Vidaković, M., 1993: Četinjače – morfologija i varijabilnost. GZH i Hrvatske šume, Zagreb. 744 pp.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Daniel Krstonošić, PhD.	1.7. Number of ECTS credits	3
1.2. Course title	Perennial and Annual Ornamental Plants	1.8. Number of hours in semester (L+E+F+e-learning)	30+0+16
1.3. Course code	226128	1.9. Expected enrolment in the course	50
1.4. Study programme	University undergraduate 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 get acquainted with the taxonomic status, biological and morphological characteristics, ecological requirements and variability of autochthonous and allochthonous ornamental annual and perennial plants, as well as the technology of cultivation in nurseries and outdoors. After that, students acquire the ability to independently choose a suitable plant species for certain conditions when arranging 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	B4. participate in the realization of programs for the management of protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To interpret the characteristics of ornamental herbaceous plants (taxonomy, morphology, life form, biological and ecological characteristics, the use of allochthonous species and wild and cultivated taxa, neophytes, conservation of rare and endangered species and the development of new ornamental taxa). 2. To analyze the most important taxa of ornamental annuals (appearance, cultivars, ecological requirements, use, propagation, specific use). 3. To analyze the most important taxa of ornamental perennials (for use in: water and wet habitats, shady and semi-shady habitats, open, sunny habitats, xeric rocky habitats and specific habitats). 4. To select suitable ornamental herbaceous plants for a particular purpose.
2.5. Course content (syllabus)	Lectures 1. Introduction and definitions of basic terms. Horticulture, floriculture. Classification of ornamental plants, annuals, biennials, perennials. The origin of ornamental plants. Use of wild and cultivated taxa. Development of new ornamental taxa. 2. Taxonomy and nomenclature of cultivated plants. Types of cultivars. Problems of using allochthonous species. Neophytes. Conservation of rare and endangered species by their use as ornamental plants. 3. General characteristics of ornamental herbaceous plants - morphology, life form, biological and ecological characteristics. Factors of growth and development of ornamental plants.

<table>
<tr><td></td><td colspan="9">4. Overview of the most important taxa of ornamental annuals (appearance, cultivars, biological characteristics, ecological requirements, variability, method of use - design of flower beds, curbs, propagation, specific use, etc.). Overview of the most important taxa of annual ornamental climbers.
5. Overview of the most important taxa of ornamental biennials (appearance, cultivars, biological characteristics, ecological requirements, variability, method of use - design of flower beds, curbs, propagation, specific use, etc.).
6. Overview of the most important taxa of ornamental perennials used in shady, semi-shady and open sunny habitats.
7. Geophytes. An overview of the most important taxa of ornamental geophytes.
8. Overview of the most important taxa of ornamental perennials used in aquatic and wet habitats.
9. Overview of the most important taxa of ornamental perennials used for rocky and dry habitats.
10. Ornamental grasses and lawns as decorative components.
11. Ornamental plants of traditional gardens.
12. Ornamental herbaceous plants for special purposes: halophytes, close to roads, flowering meadows.
13. Ornamental herbaceous plants for special purposes: therapeutic gardens, spices and aromatic herbs.
14. Ornamental herbaceous plants for special purposes: Roof gardens and green walls.
15. Introducing students to the basic techniques of garden design with perennials, flower beds and curbs, considering soil quality, area size, slope aspect, shade, intensity of care, special desires, views, sceneries, design elements, color combination in composition, etc.

Field work
1. In the area of the city of Zagreb. The aim of fieldwork is to get acquainted with ornamental species and cultivars of herbaceous plants in nurseries, as well as in parks and urban areas, where students encounter concrete examples of the selection of plant material for different purposes. It is held in the nursery of Zrinjevac (Zagreb Holding) and in the park areas of the city of Zagreb.
2. In the area of the city of Ludbreg. The aim of fieldwork is to get acquainted with ornamental herbaceous plants in nurseries, parks and urban areas, where students encounter concrete examples of the selection of plant material for different purposes. It is carried out in private nurseries of members of the Association of Florists of the Ludbreg region and in park areas.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>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>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>3</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student</td><td colspan="9">Regular attendance and active participation in lectures and fieldwork, preparation and</td></tr>
</table>

responsibilities	presentation of seminars. Passing colloquium, exams.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Krstonošić, D., Škvorc, Ž., Franjić, J. 2017: Parkovno perensko i jednogodišnje bilje. Interna skripta. Šumarski fakultet, Zagreb.	NO	YES, Merlin
2.12. Optional literature	Borovac, I., 2008: Cvijeće i ukrasno bilje – Velika ilustrirana enciklopedija, Mozaik knjiga, Zagreb. Crnetić, T., 1996: Moć boja u oblikovanju vrtnih prostora. Zrinjevac, Zagreb. Dole, M. J., Wilkins, H. F., 1999: Floriculture, Principles and Species, Prentice Hall, New Jersey. Franke, W., 2006: Vrt – Enciklopedijski priručnik. Veble Commerce, Zagreb.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Damir Krajnik, PhD. Marin Duić, mag. ing. arch., mag. hist. art.	1.7. Number of ECTS credits	3
1.2. Course title	Landscape design and planning	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	33820	1.9. Expected enrolment in the course	25
1.4. Study programme	University undergraduate 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	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	By attending the course students gain insight into development and contemporary trends of landscape planning and design. Landscape planning and design is placed in the context of spatial and urban planning, nature 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	B9 – to cooperate in the development of environmental impact studies, urbanistic and spatial plans C3 – to apply current legislation in the management of protected nature objects
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Pronounce definitions of the term landscape, analyse and identify categories of landscape values, draw the analysis of visual features of the landscape as a basis for its evaluation Identify contemporary principles of waterscapes and trafficscapes planning, transformation of Brownfield areas, recognize and apply principles of modern large scale parks design and practice. Categorize protected natural values (protected areas) in the Republic of Croatia, identify basic features and permitted activities in certain categories of protected natural area in the Republic of Croatia, Enumerate environmental protection instruments.
2.5. Course content (syllabus)	Methodological units: 1. Landscape - definition, types, values and characteristics (1 hour) 2. Methods for assessing landscape features and values (2 hours) 3. Cultural landscape (1 hour) 4. River landscapes, hydrotechnical interventions (2 hours) 5. Landscapes of large traffic corridors (1 hour) 6. Post-industrial landscapes (2 hours) 7. Post-mining landscapes (2 hours) 8. Landfill transformation (1 hour) 9. Modern large scale parks (1 hour) 10. Land art (1 hour) 11. Protection of natural values, ecological systems and the environment (1 hour)

<table>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">2.8. Monitoring student work</td><td>Class attendance</td><td>YES</td><td></td><td>Research</td><td>YES</td><td></td><td>Oral exam</td><td>YES</td><td></td></tr>
<tr><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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>3</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Lectures attendance, preparation of a seminar paper, holding a presentation of a seminar paper</td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="3">Title</td><td colspan="3">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td></td><td colspan="3">Gašparović Sanja: Landscape planning – lecture abstracts, Zagreb, 2010</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Bell Simon: Elements of visual design in the Landscape, Spon Press, London, 2004</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Marsh William M.: Landscape Planning: Environmental Applications, University of British Columbia, 2005</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Dumbović Bilušić Biserka: Landscape as cultural heritage, Ministry of Culture, 2015</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Spellman Catherine, ed.: Re - Envisioning Landscape / Architecture, Actar, Barcelona, 2003.,</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Selman Paul H.: Planning at the Landscape Scale, Routledge, 2006.</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td></td><td colspan="3">Jellicoe, Geoffrey and Susan. 1987. The Landscape of Man, London: Thames and Hudson.</td><td colspan="3"></td><td colspan="3">YES</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1) MAGAZINES: Architectural Review, Garten+Landschaft, Landscape Architecture, Topos;
2) INTERNET:
* Virtual Landscape Gallery: 1100 european parks and gardens - www.vilar.com
* European Landscape Architecture News - www.elanews.com
* ELASA - European Landscape Architecture Students Association - www.stud.uni-hannover.de/-voell/elasa
* René Pechere Virtual Library, Multimedia Garden Library - www.bvrp.net
* GA-LA-NET: Das Fachforum für Landschaftsarchitektur und Garten -und Landschaftsbau - www.ga-la-net.de</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Lea Petrović Krajnik, PhD.	1.7. Number of ECTS credits	4
1.2. Course title	Introduction to physical planning	1.8. Number of hours in semester (L+E+F+e-learning)	15+30+0
1.3. Course code	62455	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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 basics of physical planning. Introduction to physical planning theory, practical issues related to physical planning and landscape architecture of larger 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	B9. collaborate in preparation of ecological impact studies and spatial plans
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the spatial planning basics and the relationship between man and space (functional characteristics and processes in space). 2. Interpret urbanization (basic generators of contemporary area structure, urban agglomeration, conurbation and megalopolis, village and region, opening up of traffic, industrial areas, tourist regions and agricultural areas). 3. Interpret the landscape and area identity (consequences of human activity, endangerment of the natural environment, natural reserves, national and nature parks). 4. Present physical planning documentation.
2.5. Course content (syllabus)	Lectures 1. Introduction. Physical planning definition. Levels and types of physical plans. 2. Man and space. Functional characteristics and processes in space. Basic questions about space. Space planning and protection. 3. Methods and technologies in project engineering of physical plans. Physical plans and practical issues related to design and implementation of physical plans. 4. Primary and secondary urban development Geographical conditions determining position and development of towns. Transport and geography related conditions of positioning of towns. Urban functions of town settlements. City agglomeration, conurbation and megalopolis. 5. Social genesis of the village. Industry in a rural environment. Symbiosis of urban and rural. 6. Basic generators of contemporary area structure. Region. Regionalization. Principles of defining the region. 7. Opening up of traffic. Traffic goals. Traffic line. Cost-effectiveness assessment. Transport systems.

<table>
<tr><td></td><td colspan="9">8. Water pollution. Flood protection. Water management. Hydropower.
9. Factors of localization of industrial units. Industrial zones. Industrial regions.
10. Stages of tourism development. Tourist centers and regions. Principles of tourism planning. Harmful impacts of tourism.
11. Landscape and identity of space. Consequences of human action on the appearance of landscapes with essential conservation principles. Endangerment of the natural environment and protection of space. Areas of special features: nature reserves, national parks and nature parks.
12. Spatial planning and sustainable development
13. Selected topic
14. Selected topic
15. Selected topic

Exercises
1. Organization of course exercises
2. Space
3. Block of exercises with the theme of the process of elaboration and adoption of physical planning documentation
4.Urban Areas
5. Rural Areas
6. Region
7. Traffic
8. Water. Block of exercises with the topic of reading physical planning documentation.
9. Industry
10. Tourism
11. Cultural and Natural Heritage.
12. Spatial planning and sustainable development
13. Blocks of exercises on selected spatial problems
14. Blocks of exercises on selected spatial problems
15. Blocks of exercises on selected spatial problems</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
</table>

	Uvod u prostorno planiranje, e-kolegij na sustavu Merlin		YES, Merlin
	Marinović-Uzelac, A.: Prostorno planiranje. Zagreb, 2001.	YES	
2.12. Optional literature	1. Marinović-Uzelac, A.: Naselja, gradovi, prostori. Tehnička knjiga, Zagreb, 1986. 2. Mc Laughlin, J.B.: Urban and Regional Planning. Faber & Faber, London, 1960. 3. Šimunović, I.: Grad i regija. Pogledi, Split, 1986. 4. Vresk, M.: Grad i urbanizacija. Školska knjiga, Zagreb, 2002. 5. Vresk, M.: Grad u urbanom i regionalnom planiranju. Školska knjiga, Zagreb, 1990		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović prof. kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 4	1.8. Number of hours in semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226045	1.9. Expected enrolment in the course	40
1.4. Study programme	University undergraduate 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 aim of the course Physical and Health Culture is the acquisition of theoretical and practical kinesiological knowledge in order to train students for independent physical exercise and the adoption of healthy living habits. Through various forms of physical exercise, the goal is to meet the daily needs for movement and improve the motor, functional and cognitive abilities of the student population. Through attending classes, students are educated about the importance of daily physical exercise, or about all the good things that physical activity means for a person and his health. The aim is to simultaneously acquire knowledge about the harmfulness of various forms of addiction to health, especially their impact on intellectual and physical capabilities, the importance of quality nutrition and the most interesting results of previous research on the student population in the segment: physical activity as disease prevention, healthy eating , sports diagnostics, stress management, physical activity as a means of relief.		
2.2. Enrolment requirements and/or entry competences required for the course	health status		
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 To continue training at the graduate university studies of the Faculty of Forestry, Department of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the structure of the physical exercise class 2. Explaination of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises with regard to kinesiologic activity 5. Organize constructive free time 6. Assess personal diet and physical exercise habits. 7. Demonstrate general preparatory exercises and stretching exercises. 8. Understanding kinesiology programs and their target orientation 9. Control emotions and strengthen self-control.		
2.5. Course content (syllabus)	1. Athletics Walking - Walking at different paces, Nordic walking, brisk walking, hiking Running - theoretical knowledge and divisions, cyclic movements at different paces, fast running short distances, running down a slope, running along a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads,		

<table>
<tr><td></td><td colspan="9">relay running, running with hurdles of different height
2. Martial arts- Judo, Karate
Basic techniques of Judah - falls, hand throws, belt throws, foot throws, choking techniques, levers
Basic techniques - karate - kicks, punches, defense
3. Sports games-
Basketball - Keeping the ball in place, keeping the ball in motion, basic throwing, pivoting, jumping shot, passing in place and moving
Football - passing in place, passing to the first, passing in motion, technique with the ball, cooperation of two and three players, shots on goal from the move, shot on goal after the ball is added, volley kick, headers, stops
Volleyball - Passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, technique of attack, technique of defense
Handball - guiding the ball in a straight line and with a change of direction, Passing in place, passing in motion, crossings, passing for a counterattack, cooperation of two and three players, goal kick after the lead, goal shot on the added ball
4. Racket sports
Badminton-forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand punch under the arm, high serve, backhand serve, short serve, field movements, single play, pair play
5. Shooting-classification of shooting disciplines and shooting equipment, maintenance of weapons, breathing techniques, air rifle 10m
6. Fitness programs - Circuit strength training, functional training, intensive cardio training, Pilates, -
Exercises for warming up and preparing the locomotor system, stretching exercises, muscle strengthening exercises, exercises for reducing subcutaneous fat, exercises for increasing muscle endurance, exercises for increasing muscle mass, stretching exercises
7. Hiking tours - hiking on flat terrain, hiking hiking tours, interval hiking methods
8. Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Classes are conducted exclusively in the form of exercises. Students teach only from the content or teaching unit to which they are registered. If necessary, it is possible to conduct classes partially or completely online.</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
</table>

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	D. Pavović (2010): Script for students of the Faculty of Forestry, course Physical and Health Culture		Faculty of Forestry and Wood Technology website, Merlin e-learning system
2.12. Optional literature	1. Z. Šatalić, M.Sorić, M Mišigoj-Duraković(2015):Sportska prehrana, Znanje, 2. B.Neljak, R.Caput-Jogunica: Kineziološka metodika u visokom obrazovanju 3. Bos, K. (2004.) Hodanjem do zdravlja, Mozaik knjiga 2. Colwin, C., M. (1998) 4. Sertić, H. (2005) Osnove borilačkih vještina, Kineziološki fakultet Sveučilišta u Zagrebu 5. Ćurković, S. (2010). Kineziološke aktivnosti i rizična ponašanja studenata, Disertacija. Kineziološki fakultet Sveučilišta u Zagrebu		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Španjol, PhD. Prof. Ivica Tikvić, PhD. Prof. Damir Barčić, PhD. Assoc. Prof. Roman Rosavec, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Environmental protection	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+8
1.3. Course code	33822	1.9. Expected enrolment in the course	45
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Describe the state of the environment at the local, regional or national level. Define the issue of environmental protection in the forestry sector Interpret environmental changes caused by climate change, with an emphasis on impact analysis on forestry. Define and show the structure of air, soil and water pollutants; to classify pollution that is important to the environment (especially the impact on forest ecosystems). Categorize and assess the impact of waste on the state of the environment.
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. recognize and determine the most important types of xylophage's bacteria, insects and fungi on trees species and detect wood defects incurred due to their activity B7. perform professional field works on protection of plants and trees in urban areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Present the issue of environmental protection and biodiversity in forest ecosystems and urban areas (environmental management and sustainable development, environmental problems, biodiversity protection in forest and urban ecosystems). Respond to climate change and water protection in forestry, urban forestry and nature conservation (causes of climate change, adaptation measures, protection of water forests with forests). Present the protection of air and forest soils (sources of atmospheric pollution, soil protection, use and preservation). Improve adverse impacts on the environment (environmental pollution and legal issues of environmental protection, primary activity, energy production, heavy metals, organic matter, radiation, noise, fossil fuels, nuclear energy, radiation, renewable energy sources). Improve environmental protection and waste management.
2.5. Course content (syllabus)	Lectures 1. Basics of environmental protection - an overview of the development of environmental protection in the world and in Croatia, the growth of the human population and the environment, the sustainability and carrying capacity of the Earth, the urban environment, environmental values. 2. The state of the environment in Croatia, the European Union and the world. Environmental legal issues in Croatia, international conventions, national and European

	regulations in the field of environmental protection related to forest ecosystems. 3. Climate change and forest ecosystems in the context of environmental protection. System equilibrium, biosphere, matter circulation, water circulation, carbon circulation, biogeochemical circulation of matter. 4. Forest ecosystems and environmental protection, ecosystems and ecological communities, food chains, dependence on the environment, energy in the environment, environmental disturbances. Deforestation and environmental impact. 5. Water protection and forest ecosystems in the context of environmental protection. 6. Urban forestry and environmental protection. 7. Pollution and pollution of the environment, heavy metals, organic substances, thermal pollution, radiation, noise, impact of pollution, risks. 8. Methods of environmental impact assessment and measures to improve the state of the environment. 9. Soil protection and conservation in primary activities and urban forestry. Soil protection and rational use, main causes of land degradation, remediation and remediation technologies of pollution and pollution. 10. Marine protection - sources of marine pollution and contamination, marine environment and coastal zone management strategy. 11. Air protection - sources of atmospheric pollution, greenhouse gases, sulfur dioxide, nitrogen oxides, carbon dioxide and monoxide, photochemical oxidants, urban areas and air pollution. 12. Sustainable development and environmental protection. Energy and environment, fossil fuels and environment, oil, natural gas, coal. 13. Renewable energy sources and the environment, geothermal energy, solar energy, energy from water and wind, energy from biomass and the environment. Green technologies and green infrastructure. 14. Waste management and administration at local, county and national level. Recycling, treatment and recovery of waste, landfill issues. 15. Waste management in forestry and urban forestry. Technologies of biological processing, composting. Exercises 1. Implementation of legislation in environmental protection, environmental policy. 2. Institutions and area of activity in the field of environmental protection. 3. Green infrastructure projects in the context of urban forestry. 4. Sources of soil pollution and pollution, protection measures. 5. Monitoring of pollutants in watercourses and impact on forest ecosystems. 6. Pollution and pollution of water and sea, water and sea quality, categorization, chemical and biological indicators of water quality, wastewater management and treatment. 7. Monitoring changes in the state of the environment in forest ecosystems in Croatia. 8. Air pollution and pollution, sources (emissions) that affect changes in air composition, major air pollutants and pollutants. 9. Monitoring the condition and quality of air in urban areas and the impact on urban forests. 10. Environmental projects, civil services dealing with environmental protection, non-governmental organizations dealing with environmental protection. 11. Use of renewable, alternative energy sources in Croatia, national energy programs (PLINCRO, ENWIND, SUNEN, MAHE, etc.). 12. Example of making an assessment of the acceptability of an intervention for an ecological network. 13. Example of making an environmental impact assessment. 14. Waste management - overview of unregulated landfills, impact on the state of the environment and forest ecosystems. 15. Waste in forestry and urban forestry, composting technologies. Field work Environmental protection in forestry and urban forestry

<table>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Tikvić, I., Barčić, D., Španjol, Ž., 2020: Zaštita okoliša (interna skripta), Faculty of Forestry, Zagreb.</td><td colspan="2">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="5">Report on the state of the environment in the Republic of Croatia for the period from 2013 to 2016.,
2019. Vlada Republike Hrvatske, str. 532.</td><td colspan="2">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">RAUŠ, Đ. 1991: Zaštita prirode i čovjekova okoliša. Šumarski fakultet, Sveučilište u Zagrebu, Zagreb.
CARTER, N. 2004: Strategije zaštite okoliša, Barbat, Zagreb.
ENGER, E., SMITH, B 2000: Environmental Science: a study of interrelationships, seventh edition. McGraw-Hill, Boston.
Priručnik za ocjenu prihvatljivosti zahvata za ekološku mrežu, 2016. Hrvatska agencija za okoliš i prirodu, str. 78
The European Environment – state and outlook 2020. Knowledge for transition to a sustainable Europe, 2019. European Environment Agency, str. 499. Global Environment Outlook GEO-6 – Healthy Planet, Healthy People, 2019. UNEP, str. 745.
GLAVAČ, V., 1999: Uvod u globalnu ekologiju. Državna uprava za zaštitu prirode i okoliša, Hrvatske šume d.o.o. Zagreb.
MARTINOVIĆ, J. 1997: Tloznanstvo u zaštiti okoliša, Državna uprava za zaštitu okoliša. Zagreb.
MILANOVIĆ, Z., RADOVIĆ, S., VUČIĆ, V. 2002: Otpad nije smeće, Gospodarstvo okoliš, Mtg-topgraf. Zagreb.
POTOČNIK, V. 1997: Obrada komunalnog otpada – svjetska iskustva, MTG Consulting, ZGO d.o.o., Državna uprava za zaštitu okoliša. Zagreb.
Climate Change 2001: The Scientific Basis, Contribution of Working Group I tohe Third Assessment Report of the Intergovernmental Panel on Climate hange. Cambridge University Press, Cambridge and New York.
Ekološki leksikon, 2001: Barbat i Ministarstvo zaštite okoliša i prostornog uređenja Republike Hrvatske, Zagreb.</td></tr>
</table>

COURSE DECRIPTION

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	Environmental economics	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+0
1.3. Course code	33823	1.9. Expected enrolment in the course	20
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Presentation the role of the forestry in natural resource economics and environmental economics. Implementation of the methods for the environmental damage estimation and forest evaluation. Advantages and constraints of renewable and non-renewable energy resources. The role of economic instruments for the 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	A1. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data A2. use relevance in maintaining, area and possibilities of basic technical components A3. apply skills in solving practical side of business, either by control measuring, calculations or testing verification
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Interpret the environmental economics and economic consequences of natural resources pollution (basic methods of environmental economics, causes and economic consequences of pollution, impact of climate change, the benefits of forests in urban areas). Present types and methods of evaluating renewable and non-renewable energy sources. Interpret the economics of pollution (impact of natural resources on the pollution assimilation, economic instruments, methods and goals of forest management). Valorize environmental assessment methods (monetary environmental assessment methods). Present the economics of sustainable development and sustainability strategy (environmental protection standards, international policies, goals and strategies of sustainable development, ecological crisis, global change, economic influence, economic-ecological balance and ecological accounting).
2.5. Course content (syllabus)	Lectures: 1. Introduction in natural resources economics 2. Historical development of environmental economics 3. Ekonomic consequences of pollution 4. Causes of pollution 5. Energy resources 6. Evaluation of energy sources 7. Pollution economics

<table>
<tr><td></td><td colspan="9">8. Division of goods and externalities
9. Environment evaluation methods
10. Forest evaluation methods
11. Economic instruments of protection
12. Environment protection standards
13. Sustainable development goals and strategies
14. Financial analysis, environmental balancing
15. The role of forestry in the development of bioeconomy

Exercises:
1. Calculation of compunding interest rate
2. Use of discounting and capitalization methods
3. Example of economic assessment of the value of environmental damage from biotic factors
4. Example of economic assessment of the value of environmental damage from abiotic factors
5. Analysis of the concept of sustainable, continuous economic and social progress and the role of forestry
6. The relationship between supply and demand for environmental services and products
7. Example of estimating the value of a forest management unit
8. Use of methods to assess the value of the environment
9. Economic aspects of environmental protection
10. The role of the state and enterprises in environmental protection, the function of management in environmental protection.
11. Examples of externalities calculation
12. Development strategies and their impact on the environmental economy
13. Overview of ecological and economic problems of environmental pollution.
14. Example of economic-ecological balancing
15. Example of environmental value assessment using selected methods</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
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☐ (other)</td><td colspan="2">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>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>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>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>4</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Črnjar, M.: Ekonomija i zaštita okoliša,</td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

	Školska knjiga Zagreb, Ekonomski fakultet Rijeka, 1997.		
	Figurić, M.: UVOD U EKONOMIKU ŠUMSKIH RESURSA, Šumarski fakultet, Zagreb, 1998.		
	SABADI, R.: VREDNOVANJE ŠUMA U NJIHOVOJ UKUPNOSTI, Hrvatske šume, Zagreb, 1997		
	Malovrh, Špela Pezdevsek; Paletto, Alessandro; Posavec, Stjepan; Dobsinska, Zuzana; Dordevic, Ilija; Maric, Bruno; Avdibegovic, Mersudin; Kitchoukov, Emil; Stijovic, Aleksandar; Trajkov, Pande; Laktic, Tomislav. Evaluation of the Operational Environment Factors of Nature Conservation Policy Implementation: Cases of Selected EU and Non-EU Countries, FORESTS, 2019, volume 10, issue 12		
2.12. Optional literature	GOODSTEIN, E. S.: Ekonomika i okoliš, Prentice-Hall Inc., Mate d.o.o., Zagreb, 2003.		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Milan Oršanić, PhD. Assoc. Prof. Damir Drvodelić, PhD. Assist. Prof. Vinko Paulić, PhD.	1.7. Number of ECTS credits	6
1.2. Course title	Silviculture of special purpose forests	1.8. Number of hours in semester (L+E+F+e-learning)	45+30+16
1.3. Course code	33824	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Aim of subject is to acquaint students with silvicultural procedures which are done in special purpose forests (such as forests in protected areas, forests for seed production, scientific and research forests etc.) and which are managed in specific way. Students are introduced to basics of forest seed and nursery production and with silvicultural tending and regeneration operations. Special purpose forests are usually very valuable types of forests which have significant non-market forest functions which require specific management practice.		
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. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B5. perform biological and technical works in maintenance of parks and green areas B8. perform professional field works in forest nurseries including planting and seeding D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Explain ways of regeneration and forest care of special purpose (characteristics, purpose and significance, sociological role and raising of special purpose forests, restoration and nursing methods). Analyze the types and methods of regeneration of stands of special purpose (natural and artificial regeneration, generative and vegetative regeneration, advantages and disadvantages of choice and regeneration). Describe forestry procedures in the stands of the disrupted structure (in cases of drying and decay of whole stands after natural disturbances). Present forest management planning and sustainable management practices in forests with a distinctive protective function and forests of special purpose (management, biodiversity of forests, sustainable management, sustainable development). Analyze the characteristics of private forests management (management history, present state of the surface, ownership structure, stock and growth and future perspective). Present the basics of forestry and seedlings (seed material and seeds, production facilities,		

	livestock estimation, collection, storage and processing of seed, germination and evaluation of seed quality elements, nursery establishment, technical conditions and seedlings, planting material).
2.5. Course content (syllabus)	During lectures, exercise and field work students are introduced to management of special purpose forests as well as with basics of forest seed and nursery production and silvicultural operations that are done during tending and regeneration of special purpose forests. Lectures: 1. General information about forest seed. Embryo and seed structure, type of seeds, stands for forest seed production, assessment of forest seed maturation, collecting and cleaning forest seed, forest seed storage, dormancy of forest seed, dormancy treatments, seed germination types, estimation of seed quality, seed provenances. 2. Seed production for major forest tree species. Seed production of genus Abies, Acer, Alnus, Betula, Carpinus, Castanea, Fagus, Picea, Pinus, Quercus, Tilia, Ulmus etc. 3. General about forest nurseries. Seedlings, site for forestry nursery, technical preconditions and nursery production. 4. Introduction into special purpose forests. Purpose and significance, sociological role. 5. Silvigenetic development processes. Pioneer, transitional and climax forest. 6. Defining forest and forest land. Forest border, forest products. 7. Forest stand. Definition, size, structure, description, species composition, silvicultural systems and rotation, development phase, age, production, canopy cover percentage and shape, stand density. 8. Forest stand regeneration. Natural and artificial stand regeneration, generative and vegetative regeneration. Natural stand regeneration properties. Artificial stand regeneration properties. Combinative stand regeneration. Advantages and disadvantages of different stand regeneration methods. Choice of stand regeneration method. 9. Natural regeneration with shelterwood method. Preconditions for natural regeneration (physiological, stand, site, biotic). Site preparation for natural regeneration. 10. Uneven-aged Silvicultural System. 11. Artificial regeneration method. Introduction, sowing and planting seeds, planting seedlings, choice of artificial regeneration method, number of seedlings and seed quantity for artificial regeneration, choice between natural and artificial regeneration. 12. Afforestation. Definition. Preparatory works by afforestation. selection of suitable areas, selection of tree species for afforestation, selection of afforestation methods, afforestation season, soil preparation for afforestation, number of plants and planting schedule. Tending of forest cultures and plantations. 13. Introduction into forest tending. Definition, aim and purpose of forest tending. Classification of forest tending operations, tending forest until the first thinning. Thinning forest stand. 14. Silvicultural operations in stand decline. 15. Private forests. History, current state and perspectives. Exercises: 1. Introduction into forest seed production 2. Estimation of seed quality 3. Germination testing of forest seed 4. Types of germination cabinets and germination substrates 5. Determination of forest seed viability with tetrazolium method 6. Morphology of tree 7. Morphology of forest stand 8. Sylvicultural operations in forest seed production stands 9. Basic of soil tillage 10. Basic of forest tree propagation in nursery 11. Intensive cultivation in Christmas tree plantations 12. Protection of seedling in tree shelters 13. Forest fruit trees

<table>
<tr><td></td><td colspan="9">Field work:
1. Silviculture: Field work would be conducted on Faculty of Forestry Zagreb training and forest research centers. Introduction to basic terms in Silviculture such as forest stand, forest stand structure and its main elements etc. Criteria for stand description with special emphasis on stand development phases from biological and economical perspective. Silvicultural tending operations (cleaning, thinning) and regeneration (shelterwood cutting) in stands of different age. Attifical regeneration and afforestation.
2. Forest seed production and nursery production of ornamental trees and shrubs. Field work would be conducted in Croatian Forestry Institute. Nursery production of ornamental tree and shrub seedlings in bare root and container production methods. Container production of seedlings. seed processing facility for cones processing and seed cleaning. Cold storage of seed. Thermotherapy of seed. In vitro propagation. Laboratory for seed testing. Seed storage. Propagation and reproduction of seedlings in greenhouse.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Exercises are partially taken in Laboratory for forest seed and nursery production and practice work. Two days of field work.</td></tr>
<tr><td rowspan="6">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation of students at the lectures, exercises and field work. The student can be absent with a maximum of 20% of lectures and 10% of the exercises. Students need to make report from field works. Taking partial exams and final exam.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Oršanić, M., Uzgajanje šuma posebne namjene (predavanja)</td><td colspan="2">No</td><td colspan="3">Yes, Merlin</td></tr>
<tr><td colspan="4">Anić, I., 2004: Uzgajanje šuma I. Skripta za internu uporabu. Šumarski fakultet, Zagreb</td><td colspan="2">No</td><td colspan="3">Yes, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Burschel, P., J. Huss, 1997: Grundriss des Waldbaus. Parey Buchverlag, 487 str., Berlin. 2. Matthews, J. D., 1991: Silvicultural systems. Clarendon press, 284 str., Oxford
3. Korpel, Š., J. Penaz, M. Saniga, V. Tesar, 1991: Pestovanie lesa. Priroda, 465 str., Bratislava.
4. Matić, S., M. Oršanić, I. Anić, 2003: Uzgojni postupci u niskim i degradiranim bukovim sastojinama. U: S. Matić (ur.), Obična bukva (Fagus sylvatica L.) u Hrvatskoj, Akademija šumarskih znanosti, 393 - 405, Zagreb.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Jura Čavlović, PhD. Assoc. Prof. Krunoslav Teslak, PhD.	1.7. Number of ECTS credits	6
1.2. Course title	Forest regulation of forest for special purposes	1.8. Number of hours in semester (L+E+F+e-learning)	45+30+16
1.3. Course code	33825	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	3	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	In the first part, the aim is to acquire a condensed form of knowledge on the essentials of growth, development and increment for individual trees and stands, and the essentials of forest management. This represents a starting basis for acquiring of knowledge during the special part of course for defining of manners and methods in planning and management of forests as forest objects of special purpose, originating from the contents and basic functions of individual forest objects of special purpose.		
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. 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		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	To describe, to recognize and to classify types of special purpose forests (content and meanings of special purpose forests, types of natural and build objects, categories of park objects) To interpret and explain, and to design functions of special purpose forests (main functions of park objects, function mechanisms of park objects, building/trees relations aimed to save energy) To analyse, to derive (draw) and to calculate elements of tree and stand growth as composition elements of park recreational objects (growth of tree height, dbh and volume; longitudinal tree cross section and growth curves; management systems; growth and volume increment of even-aged stand) To explain and to calculate planning elements of economic forest functions in special purpose forests (elements of regulated even-aged and selection/uneven-aged forests; age-class and diameter-class structure of even-aged and uneven-aged forests; possible (theoretical) cut in regulated even-aged and uneven-aged forest) To present and to explain planning elements of urban forests and special purpose forests (principles of sustainability; influential determinants on development of spatial usage; aims and management guidance according to categories of special purpose forests; spatial categories and zones of park recreational objects) To explain, to analyse and to calculate elements of management plans of urban forests and		

	special purpose forests (levels of management plans; structure and basic components of plans; characteristics of actual park objects; needs for building of new park objects)
2.5. Course content (syllabus)	Lectures 1. Introduction, review of content and literature. Defining of importance and role of special purpose forests and forest regulation in general Uvod, prikaz sadržaja predmeta i literature. 2. Defining of management systems. Characteristics of continuous types of forest stand. Criteria for defining of most appropriate management system in special purpose forests. 3. Categorization of nature and build objects of special purpose forests. Out of cities and settlements (5 categories). Inside cities and settlements (8 groups, 22 types of objects). 4. Functions of city forest objects (introduce, psychological, social, architectural and aesthetic, recreational, habitat providing for animals, climatic functions-introduce) 5. Functions of city forest objects (climatic functions – energy reduction for building heating and cooling, mesoclimate of city, air cleaning, reduction of noise, reduction of light reflection and glitter, erosion protection, hydrologic function, water cleaning). 6. Components of city forest objects (introduce, characteristics and analysis of growth and increment of individual trees, growth of trees in city environments). 7. Components of city forest objects (stand structure characteristics, elements of descriptions of stand state, characteristics of development and changes of stand structure of even-aged and selection/uneven-aged stands) 8. General elements of forest management of economic and of special purpose forests. Principle of sustainable forest management and systems for monitoring and assessment of sustainable management. 9. Methods for defining of theoretical models of even-aged, selection and uneven-aged forests 10. Prescribing of possible (allowed) felling in even-aged, selection and uneven-aged forests. 11. Planning elements of city forests management (planning of open spaces and parks, city green belt, biodiversity in city forests). 12. General structure of management plans of park-recreational objects. Framework of planning. 13. Defining and classification of park objects and spatial planning units and standards (norms). Assessment of actual state of park recreational objects and state of demands on county level and city region. 14. Guidelines, aims and activities for planning period. Specific aims and activities according to category of park recreational object and spatial planning units. Performance of plan. 15. Presentation of plans for actual spatial level (county region, city region, concrete park recreational object). Exercises 1. Forest management plans – types and levels 2. Growth and development of trees – analysis of height and dbh growth 3. Growth and development of trees – analysis of basal area and volume growth. 4. Assessment of attributes of individual city tree – processing of concrete examples 5. Inventory of city forests – data processing 6. Survey of visitors in city forests – processing and analysis of data 7. Elements of volume increment in forest stand. 8. Growth and increment in selection and uneven-aged stands 9. Development of even-aged stand structure elements 10. Theoretic model of even-aged forest. 11. Changes of stand structure elements of selection and uneven-aged stand. 12. Theoretic model of selection forest. 13. Examples of prescribing of allowed cut amount in selection stand 14. Examples of prescribing of allowed cut amount in selection forest. 15. Theoretical model and prescribed cut amount in uneven-aged forest.

<table>
<tr><td></td><td colspan="9">Field work
1. Aim is on concrete example of park recreational object (park forest Maksimir) to present actual characteristics historic development, activities of regularly governance, compositional structure of park, approaches of assessments and measurements of attributes of individual trees in city forest, methods of inventory and assessment of forest area and stands, surveying of park visitors.
2. To present actual objects of special purpose objects of selection management (m.u. Belevine, m. u. Sungerski lug, m.u. Sljeme), planning of management, Management plan, and prescription and realization of management activities, within selection management system.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>6</td><td></td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Čavlović, J. 2005: Uređivanje šuma posebne namjene, 278 slajdova</td><td colspan="2"></td><td colspan="2">Merlin</td></tr>
<tr><td colspan="5">Čavlović, J., 2013: Osnove uređivanja šuma. Šumarski fakultet Sveučilišta u Zagrebu, Zagreb, 322 str.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Klepac, D. Rast i prirast šumskih vrsta drveća i sastojina. Znanje, Zagreb 1963
Meštrović, Š. 1987. Uređivanje šuma s posebnom namjenom. Glas. šum. pok. 3.
Planovi gospodarenja konkretnim parkovno rekreacijskim objektima</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Hrvoje Nevečerel, PhD. Assist. Prof. Kruno Lepoglavec, PhD.	1.7. Number of ECTS credits	4
1.2. Course title	Technical components of park design	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	33826	1.9. Expected enrolment in the course	25
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	The basic objective and task of the subject Technical components of park design is to inform students about the technical component of the landscape and park design. Students obtain theoretical and practical knowledge and skills necessary for planning, designing and performance of technical components of garden and park objects.
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	B4. participate in the realization of programs for the management of protected natural areas B10. apply knowledge about the machines, techniques and technologies used in professional works in urban areas and protected natural areas C1. plan and organize integrated management of the environment C3. apply actual legislation in management of protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe the basic building materials for the construction of park elements or devices (technical features, valid standards and regulations in civil engineering, use of construction stone, concrete, wood and metal, use of organic and inorganic binders). 2. Observing park communications (complete design process (planning and production) and conservation of park and garden communication). 3. Show the types, purpose and features of different types of park devices and garden accessories, drainage and illumination 4. Present the types and purpose of water surfaces, bridges, children's playgrounds and sports facilities in parks.
2.5. Course content (syllabus)	Lectures: Technical characteristics and applicable standards and regulations in civil engineering are considered. Scales, sketches and drawings in construction are described. The basic geodetic works required in the preparation of projects for arranging park / garden areas are explained. Procedures for the preparation of project documentation are defined, with special emphasis on the use of a personal computer. The possibilities of computer programs are presented through the presentation of modern computer programs for design and visualization of park areas. (three lectures – 5 hours)

	The basic building materials used in the construction of an individual park / garden element or device are analyzed. The application of building stone, concrete, wood and metal is described. The need to use organic and inorganic binders is explained. The aesthetic and protective component of paints and varnishes and the application technique in accordance with the used building materials are emphasized. A critical review of the use of plastic in parks. (one lecture – 4 hours) Students are presented with practical solutions related to the planning and construction of park and garden communications. We discuss the types of communication and different techniques of making them and the use of modern technologies. Parking lots, ramps and stairs with all their technical features are also handled. The basic types and sizing of bridges with the principles of static calculation and sizing of wooden bridges are presented. Preservation and maintenance of park and garden communications is processed through the explanation of the need for the construction of retaining and cladding walls as well as surface and underground drainage facilities. (two lectures – 5 hours) Students are introduced to the various park devices we encounter in parks and gardens. Mainly, walls, fences and hedges are described and discussed through an aesthetic-protective function. Different forms of devices used for users' rest (tables and benches) are processed. We talk about decorative devices of parks / gardens such as pergolas and protective devices such as gazebos and canopies. The variety of devices for children's play is explained and special legal regulations related to the safety of children's playgrounds are pointed out. Basic information is provided on how to provide information to users in the parks - info boards, signposts and more. Additional elements of the parks are also processed - haberdashery. (six lectures – 6 hours) Knowledge of water park elements and pools for planting plants is transferred, and pools within gardens are also discussed. Students are explained the need for an irrigation system and soil moisture regulation. The necessity of planning and installation of park and garden lighting is discussed, as well as basic information on lighting effects. The fitting of sports fields into parks is also presented - for individual and team sports. There is also talk about the issue of trim trails and adrenaline parks. (three lectures – 4 hours) Students get acquainted with modern trends in the conversion of neglected spaces. Special attention is paid to the difference of landscaping intact areas and landscaping and conversion of existing abandoned areas. The existing layout of the cities can be further improved by improving the existing areas, and the emphasis is placed on flat (green) roofs. (two lectures – 6 hours) Design exercises: Students are introduced to the subject and examples that we will process, and the basic components of the exercises are defined. The following is an introduction to the basics of technical drawing and technical writing. Drawing scales are processed. Different types of drawings are explained and their purpose is analyzed. The example also shows the types of projections required for the preparation of project documentation. (two exercises – 4 hours) Transverse profile of park / garden communication - construction materials used for the construction of the upper and / or lower machine. Drawing a cross section - gravel. Drawing a cross section - concrete and stone elements. (one exercise – 2 hours) Defining the basic components of horizontal development of park / garden communications. Defining the longitudinal slope and measuring the horizontal distances between the cardinal points. Calculation of divider steps. Fitting the zero line into the prepared layer maps of the appropriate scale. Drawing a type cross section. Sketching and drawing drywall at a given scale. (two exercises – 4 hours)

<table>
<tr><td></td><td colspan="9">Drawing a park bench in scale. Drawing a park bench in different projections. (two exercises – 2 hours)

Drawing different layers when making drainage trenches. Execution of drainage on sports fields. (one exercise – 1 hour)

Preparation of a situation plan in the selected scale based on an excerpt from the cadastre. Development of a conceptual design based on a previously prepared situational design with the implementation of knowledge acquired within this course. (two exercises – 3 hours)

Field work:

1.day (8 hours)
Students will be shown the application of different building materials in the manufacture of park devices with special emphasis on park communications - promenades. Existing park communications will be explained through the aspect of purpose, maintenance and reconstruction.
Students will be presented with the issue of park facilities and devices.
Students will be introduced to the importance of park equipment (drainage, benches, lighting, bridges, water surfaces) on existing examples.
Sports facilities will also be visited with additional clarification of the wide range of possibilities of sports facilities in general.
One of the important segments (today) of the use of parks will be shown through children's playgrounds (concrete examples) and the legal regulations for the construction of these facilities will be clarified.
Finally, students will propose (based on established rules) the improvement of existing facilities and content in the area of field work.

2.day (8 hours)
Students will be acquainted with the former condition of the area and with the course of construction and the works that preceded today's (final) appearance of the selected park.
Special attention will be paid to the conversion of devastated and abandoned areas.
Students will be shown the use of stone material in the construction of park devices - park communications (roads, paths and promenades).
Existing park devices will be explained through the aspect of purpose and a wide range of uses of individual spaces.
Students will be shown rest areas and park water surfaces and their sociological component in the coexistence of the User and the City.
Students will be able to see the construction of individual park devices on existing examples and will get acquainted with different methods of construction of individual park facilities (benches, drainage, lighting, park communications, parking lots).
At the end, children's playgrounds will be visited, to show the diversity of applied techniques and methods, which will be compared with those seen before, followed by a discussion and concluding remarks.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="2">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
</table>

	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work	YES		(other)		
	Project		NO	Written exam	YES		ECTS credits (total)	4	
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 all (3) colloquia with a minimum of 50% correct answers, taking an exam with a minimum of 50% correct answers on the written part of the exam and preparing a seminar.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Pičman, D. 2006: Parkovna tehnika i uređaji (interna skripta), Šumarski fakultet Sveučilišta u Zagrebu, Zagreb, s. 1-82.						Merlin		
	Predavanja i vježbe iz nastavnog predmeta Parkovna tehnika i uređaji, 2020: Nevečerel, H. i Lepoglavec, K. - pptx						Merlin		
	Vojvoda, D., 1972: Vrtni uređaji, Zrinski, Čakovec, s. 1-196.				YES				
2.12. Optional literature	1. Barth, U., Rogers, G. 2004: Design in the garden (Inspiration, planting, structure), David & Charles Books, London, p. 1-134. 2. Bird, R. 2002: Garden Answers Ponds, Hamlyn, p. 1-144. 3. Bridgewater, A., Bridgewater, G. 2003: Stonework. New Holland Publishers (UK) Ltd, London, p. 1-96. 4. Hawthorne, L. 2000: Walls & Fences, Dorling Kindersley Limited, London, p. 1-72. 5. Swift, P., Szymanowski, J. 2001: Paths, steps & patios, New Holland Publishers (UK) Ltd, London, p.1-64. 6. Williams, R. 1995: The garden designer, Frances Lincoln Limited, London, p. 1-207.								

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Španjol, PhD. Prof. Damir Barčić, PhD. Assoc. Prof. Roman Rosavec, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Nature protection	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+16
1.3. Course code	33827	1.9. Expected enrolment in the course	45
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Understanding documents and conventions related to nature protection and their application in the field. Knowledge of the organisation of protection, establishment and functioning of nature protection institutions.
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. perform biological and technical works in maintenance of parks and green areas B9. collaborate in preparation of ecological impact studies and spatial plans C2. plan and organize professional works in realization of programs for the management of protected natural areas C3. apply actual legislation in management of protected natural areas D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Compute the analysis and interpretation of biological and landscape diversity and the classification of protected forest areas. Present spatial plans and management plans in protected areas, structure, division, structure, features and evaluation of national parks and nature parks. Analyze the protection of flora and fauna, the endangerment of plant species and habitats, the evaluation of protected areas (National Habitat Classification and European Ecological Network - NATURA 2000, habitat fragmentation and protected area evaluation).
2.5. Course content (syllabus)	Lectures 1. Historical overview of nature protection in the world and in the Republic of Croatia. 2. Basic principles of nature protection and development of ideas on protection of natural resources. Problems related to acceptance of principles and implementation through legislation. Conditions for declaring and establishing protected areas. 3. Legal regulations related to the field of nature protection. Implementation and supervision measures in national legislation, and international legislation. Special reference to international conventions and regulations accepted into our legislation. 4. Protected natural values according to the Nature Protection Act. 5. National parks, historical development and current aspirations, zoning of national parks, spatial plans and management plans of national parks, divisions and organization of work of national parks in the world.

	6. National parks in Croatia - basic features of management and zoning. 7. Physical planning and management plans for nature parks and other protected areas, organization and structure, management possibilities in the nature park. 8. Nature parks in Croatia - basic features of management and administration. 9. Tourist evaluation of protected areas, problems related to tourism as an economic activity and attitude towards nature protection. 10. Nature protection on the Dinaric karst of Croatia. Endemic hubs of flora and fauna. Relationship between nature protection and economic activities, situation and guidelines towards sustainable development. 11. Protection of flora and endangerment of plant species, legally protected plant species, measures and methods of effective protection and conservation. 12. Fauna protection; fundamental divisions and conservation of fauna within biodiversity. Integrated management system of hunting species in protected areas. 13. Relationship between forestry and nature protection, respect for principles, possibilities of effective protection and management of forest ecosystems. Incentive measures for nature protection (green infrastructure). Preparation and adoption of the environmental program in agriculture and tourism. Financing and investment in nature protection. 14. Biological diversity of Croatia, value in European and world frameworks, conservation methods, shortcomings and needs in the implementation of regulations related to biological diversity. 15. National Habitat Classification and European Ecological Network Natura 2000. Encouraging research and monitoring of the status of target species and habitats in nature. Exercises 1. The meaning and concept of nature protection, the relationship between nature protection and economic development through the situation in our country. 2. Strict reserves; explanation of the term and presentation of protection in that category, conditions and preservation of natural values on the example of strict reserves in Croatia. 3. Special reserves of forest vegetation; explanation of the concept, division, condition and guidelines of forest vegetation development. 4. Special reserves; division of the state and guidelines for the development of botanical, marine reserves, ornithological and ichthyological. 5. Forest Park; condition and problems of conservation, possibilities of park-forest restoration, supervision and management. 6. Significant landscapes and regional parks; protection and valuation problems. 7. Monuments of park architecture; parks, botanical gardens, arboretums, city parks and tree-lined avenues. 8. Monuments of nature; geological, geomorphological, hydrological, botanical. 9. Protected taxa; strictly protected and protected wild taxa, Protected native domesticated taxa. Measures for effective protection of legally protected species, and endangered and rare species. Biological-ecological features and habitat protection. 10. Protected minerals and fossils, definitions and implementation of legislation. 11. Ways and methods of public participation in decision-making processes on nature protection, differences between governmental and non-governmental organizations, opportunities to promote and accept the principles of nature protection. 12. Measures for protection and conservation of biological diversity, ex-situ and in-situ conservation, international and domestic experiences in the implementation of protection measures. 13. Assessment of the acceptability of the project for the ecological network (OPEM). 14. Continuation of the previous exercise. 15. Environmental impact assessments - production methods and examples in the Republic of Croatia. Field work in protected areas (National Parks and Nature Parks)		
2.6. Format of instruction	☒ lectures	☐ independent	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Španjol, Ž., Barčić, D., 2020: Zaštita prirode (interna skripta), Šumarski fakultet, Zagreb.</td><td colspan="2">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="4">RAUŠ, Đ. 1991: Zaštita prirode i čovjekova okoliša. Šumarski fakultet, Sveučilište u Zagrebu,</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">ŠPANJOL, Ž., 1994: Problematika nacionalnih parkova u svijetu i u Republici Hrvatskoj. Glas.šum. pokuse 30: 61-94, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">ŠPANJOL, Ž. 1993: Uloga posebno zaštićenih objekata prirode u turizmu, Glas. šum. pokuse, posebno izdanje 4: 231-242, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Pregled stanja biološke i krajobrazne raznolikosti Hrvatske sa strategijom i akcijskim planovima zaštite, 1999: Državna uprava za zaštitu prirode i okoliša. Zagreb, 151.
Biološka raznolikost - priručnici za inventarizaciju i praćenje stanja, 2006: Državni zavod za zaštitu prirode. Zagreb.
ENGER, E., SMITH, B 2000: Environmental Science: a study of interrelationships, seventh edition. McGraw-Hill, Boston.
MARINOVIĆ-UZELAC, A. 2001: Prostorno planiranje, Dom i svijet, Zagreb.
MARTINIĆ, I., 2010: Upravljanje zaštićenim područjima. Planiranje, razvoj i održivost. Sveučilište u Zagrebu Šumarski fakultet. Zagreb.
MILLER TAYLER, G. 1994: Living in the environment: principles, connections and solutions, eight edition. International Thomson Publishing, Belmont.
NIKOLIĆ, T., TOPIĆ, J., 2005: Crvena knjiga vaskularne flore Hrvatske. Ministarstvo kulture, Državni zavod za zaštitu prirode Republike Hrvatske. Zagreb. 693 str.
SMITHSON, P., ADDISON, K., ATKINSON, K. 2002: Fundamentals of the physical environment, Routledge, London. World Resources 2000-2001: People and Ecosystems: The Fraying Web of life, 2000: Elsevier Science. Oxford.
Crveni popis ugroženih biljaka i životinja Hrvatske, 2004: Državni zavod za zaštitu prirode, Zagreb. 112 str.
http://www.conservation.org
http://www.unesco.org
http://www.greenpeace.org</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marijan Šušnjar, PhD. Assist. Prof. Zdravko Pandur, PhD. Marin Bačić, PhD. Assist. Prof. Kruno Lepoglavec, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Mechanisation of forestry in urban and protected areas	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+24
1.3. Course code	33815	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO
2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire knowledge about the procedures and means of performing mechanized work in protected areas (national parks and nature parks), performing tree tending and maintenance of green areas in urban areas and performing work in nursery production of horticultural seedlings. In addition to basic knowledge of physical quantities, students are introduced to the technical characteristics, methods and consequences of the operation of basic drive devices, chainsaws and electric chainsaws, tractors with tools and forest vehicles.		
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. apply knowledge about the machines, techniques and technologies used in professional works in urban areas and protected natural areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Explain hydraulic systems and devices (pressure in liquids, hydrostatic pressure, Pascal's law, hydrodynamics, Bernoulli equation, flow resistances). Show the principle of the internal combustion engine operation (Otto engine (4-stroke and 2-stroke engine, 4-Mix engine) and Diesel engine). Expound operation of chainsaw, trimmers, and brushcutters (technical features, parts, work principle, hazards to worker health and environmental pollution, noise, vibration). Typify tractors and implements (basic technical features, types, transmission, load distribution, adaptation of tractor for forest work, articulated tractors, three point linkage of tractor, PTO shaft, tractor tools). Interpret the use of forest vehicles in protected areas (forest vehicles - skidders, forwarders, tractors with semi-trailer, transmission, wheel load, methods of soil bearing capacity determination, impact of vehicles on forest soil).		
2.5. Course content (syllabus)	Lectures 1. Unit systems: internationally standardized system of units. Basic units, size and		

	numerical equations; units of measurement, decimal units, some illegal units. 2. Derived measured quantities: for speed and acceleration, force and moment of force, work and energy (law of conservation of energy), for force, pressure and stress. 3. Internal combustion engines. 4. Chainsaws - historical development, technical features, parts, working principle, cutting tools,, development guidelines. 5. Harmfulness of chainsaws - dangers to workers' health and environmental pollution by using chainsaws. 6. Motor trimmers and brushcutters - technical characteristics, parts, working principle, cutting tools, development guidelines. 7. Battery tools in tree care works. 8. Tractors - basic technical features, three-joint tractor drawbar, PTO shaft 9. Machines and tools in the works of nursery production of horticultural seedlings. 10. Pump - definitions, classification, basic technical characteristics, pump parts, mode of operation, application, pump efficiency determination. 11. Hydraulic systems - basic concepts, parts, mode of operation. Hydraulic cranes - parts, technical features, grippers and work platforms, selection of hydraulic cranes and devices for performing various works in urban forestry. 12. Means and tools for transporting liquids. Water pumping. Spraying, dispersion, fogging, dusting. 13. Forest vehicles - skidders, forwarders, tractor assemblies - basic technical features. 14. Estimation of mobility and traction characteristics of forest vehicles based on wheel index. 15. Vehicle impact on forest soil. Types of forest soil damage and consequences. Exercises 1. Computational exercises with tasks from measuring physical quantities and formation of measuring units; mass and weight. 2. Computational exercises with tasks related to the carrying capacity of vehicles and power during rotation. 3. Computational exercises with tasks related to material stress 4. Calculation exercises with tasks from hydraulics, calculation of pump hydraulic power. 5. Preparation for measurement exercise: "Measurement of pump characteristics". 6. Measurement exercise: "Measurement of pump characteristics". 7. Measurement exercise data processing: "Measurement of pump characteristics". 8. Computational exercises: “Engine speed feature“ 9. Preparation for measuring exercise: "Noise and vibrations of chainsaws" 10. Measurement exercise: "Noise and vibrations of chainsaws" 11. Measurement exercise data processing: "Noise and vibrations of chainsaws" 12. Measurement exercise: "Vehicle stability" 13. Computational Exercises: “Timber winching“ 14. Computational Exercises: “Skidder timber extraction“ 15. Calculation exercises: “Determining the wheel index of forest vehicles“ Field work 1. Application of chainsaws in the maintenance of tree lines and trees in urban areas. Application of motor trimmers and brushcutters in the maintenance of urban green areas. 2. Machines and tools in the works of nursery production of horticultural seedlings - self-propelled machine for seedling extraction, tools for primary and additional tillage, drills for planting. Visit to the nursery and demonstration of the work of machines and tools. 3. Application of mechanized means in felling and processing and extraction of wood in the protected area of nature. Procedures for performing forest works according to the requirements of environmental protection.

<table>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
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☒ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
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<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td></td><td colspan="4">Šušnjar, M., Pandur, Z., - Prezentacije predavanja i vježbi iz predmeta Mehanizacija u zaštićenim i urbanim sredinama</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td></td><td colspan="4">Halilović, V., 2017: Karakteristike i upotreba motornih pila u šumarstvu. Šumarski fakultet Univerzitet u Sarajevu. 1-154.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td></td><td colspan="4">Pandur, Z., Zorić, M., Šušnjar, M., 2012: Rad s motornom pilom i održavanje. Gospodarski list 22, 33-43.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td></td><td colspan="4">PRIRUČNIK ZA SIGURNO RUKOVANJE I PRIMJENU SREDSTAVA ZA ZAŠTITU BILJA. Poglavlje 13. Strojevi za primjenu sredstava za zaštitu bilja. Ministarstvo poljoprivrede, Hrvatski centar za poljoprivredu, hranu i selo – Zavod za zaštitu bilja</td><td colspan="2">NO</td><td colspan="3">YES, WEB https://www.vup.hr/_Data/Files/prirucniksz b.pdf</td></tr>
<tr><td></td><td colspan="4">Horvat, D., Šušnjar, M., 2001: Neke značajke poljoprivrednih traktora prilagođenih šumskim radovima Šumarski fakultet Zagreb, Znanstvena knjiga, 535 – 544.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Bell, B., Cousins , S. (1997). Machinery for Horticulture. Ipswich: Farming Press.
Oršanić, M., Horvat, D., Pernar, N., Šušnjar, M., Bakšić, D., Drvodelić, D., 2008: Utjecaj mineralnog i biorazgradivog ulja na rasadničku klijavost i rast sadnica hrasta lužnjaka (Quercus robur L.) (Influence of mineral and bio oil on the germination of acorn and the growth of pedunculate oak (Quercus robur L.) seedlings). Šumarski list 131 (1-2): 3-9. Zorić, M.; Pandur, Z.; Šantek, Ž.; Šušnjar M., 2011: Ocjena indeksa kotača kao pokazatelja okolišne pogodnosti forvardera. Nova mehanizacija šumarstva. 32; 5-13.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Vinko Paulić, PhD. Assoc. Prof. Damir Drvodelić, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Arboriculture	1.8. Number of hours in semester (L+E+F+e-learning)	30+30+16
1.3. Course code	33828	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	The aim of this subject is to acquaint students with methods of management and care of trees and small group of trees in urban areas. By taking this course students would acquire basic knowledge about site suitable for establishment and planting of new woody plantations in urban areas, selection of planting stock, modification and repair of site, planting techniques and special procedures in management of trees and other woody vegetation in urban environments.		
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. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data A3. apply skills in solving practical side of business, either by control measuring, calculations or testing verification B2. recognize and determine the most important types of xylophage's bacteria, insects and fungi on trees species and detect wood defects incurred due to their activity B4. participate in the realization of programs for the management of protected natural areas B6. perform all arboricultural works B10. apply knowledge about the machines, techniques and technologies used in professional works in urban areas and protected natural areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Interpret basic principles of arboriculture (arboriculture and urban forestry, selection of tree species and influence on tree care operations, analysis of desirable tree characteristics from arboriculture point of view, selection of quality plants for planting, basic types of planting material) Explain planting of trees and shrubs (basic types of planting techniques for trees and shrubs in urban areas, planting of seedlings, trees, shrubs and transplanting large trees in urban surroundings) and mulching of plants (use of mulch, mulch materials selection, advantages and disadvantages of certain mulch materials, mulch application and decontamination) Interpret pruning of trees and shrubs (reasons for pruning, pruning effects and reaction of plants, formative pruning of young trees, pruning of old trees, shrubs, hedges, etc.)		

<table>
<tr><td></td><td colspan="9">Explain fertilization and irrigation of urban trees (types, way and time of tree fertilization, use of antitranspirants, difference in irrigation systems for urban greenery)
Interpret root system of urban trees (trees in pavement, soil and other factors that influence growth of trees in urban areas, influence of root growth on infrastructure, remedial treatment for root-pavement conflicts)
Explain hazardous trees in urban areas (hazard form tree failure, biomechanics in arboriculture, optimization of tree form, tree defects and symptoms, tree static, tree vitality, arboricultural instruments for hazardous tree assessment)
Interpret management and inventory of urban greenery (care and management schedule of urban trees, tree sanitation plan, methods for tree inventory and tree cadastre)</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Through this subject student get acquainted with selection of trees for urban areas, planting and care for trees and other woody vegetation in non-forest context.

List of lectures:
1. Introduction into arboriculture and urban forestry
2. Selection of trees for urban areas
3. Planting of trees
4. Transplanting large trees
5. Tree pruning
6. Pruning of other woody vegetation in urban areas (hedges, shrubs, vines)
7. Methods of tree health state assessment
8. Visual tree assessment
9. Modification of urban soil for planting of trees
10. Mulch
11. Application and management of nutrition in arboriculture
12. Tree irrigation in arboriculture
13. Special tree management situations
14. Management and inventarization of urban tree plantings

List of exercises:
1. Planting trees
2. Pruning trees
3. Formative pruning of young trees
4. Symptoms and effects on trees
5. Visual tree assessment
6. Use of tree climbers and climbing technique in arboricultural works
7. Root pavements conflict damage
8. Arboricultural instruments
9. Application of resistance drilling instrument in arboriculture
10. Acoustic tomography

List of field work classes:
1. Visual tree assessment
2. Management of urban trees</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Exercises are partially taken as practice work in Faculty of Forestry nurseries. Two days of field work.</td></tr>
<tr><td rowspan="3">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
</table>

<table>
<tr><td rowspan="2"></td><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation of students at the lectures, exercises and field work. The student can be absent with a maximum of 20% of lectures and 10% of the exercises. Students need to make report from field works. Taking partial exams and final exam.</td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Oršanić, M. Drvodelić, D., 2005: Arborikultura (interna skripta)</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="4">HUA, 2015: Rječnik arborikulturnih pojmova, Glossary of arboricultural terms. Hrvatska udruga za arborikulturu, Zagreb</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">HUA, 2013: Europski priručnik o orezivanju, Hrvatska udruga za arborikulturu, Zagreb</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">Mattheck, C., 2004: Stablo i okoliš, Zrinko tumači život urbanog stabla, Zrinjevac, Zagreb</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Costello , L. R., K. S. Jones, 2003: Reducing Infrastructure Damage by Tree Roots: A Compendium of Strategies, ISA, Champaign, IL, SAD
Ferrini, F., Konijnendijk van den Bosch, C. C., Fini, A., 2017: Routledge Handbook of Urban Forestry, Routledge; 1st edition, Kanada
Gilman, E., F., 2002 : An illustrated guide to pruning, 2nd ed., Delmar, NY, SAD
Harris, R. W., J.R. Clark, N.P. Matheny, 2003: Arboriculture: Integrated Management of Landscape Trees, Shrubs, and Vines, Prentice Hall, New Jersey, SAD
Miller, R. W., 2015: Urban Forestry: Planning and Managing Urban Greenspaces, Third Edition 3rd Edition, Waveland Press, Kanada
Roloff, A., 2016: Urban Tree Management: For the Sustainable Development of Green Cities, Wiley-Blackwell; 1st edition, V. Britanija
Shigo, A. 1998: A New Tree Biology and Dictionary, Shigo and Trees, Associates, Snohomish, WA, SAD
Shigo, A. 1991: Modern Arboriculture, Shigo and Trees, Associates, Snohomish, WA, SAD</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivan Martinić, PhD. Prof. Mario Šporčić, PhD. Assist. Prof. Matija Landekić, PhD. Matija Bakarić, PhD.	1.7. Number of ECTS credits	5
1.2. Course title	Protected areas management and supervision	1.8. Number of hours in semester (L+E+F+e-learning)	30+15+24
1.3. Course code	33830	1.9. Expected enrolment in the course	40-50
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	The aim of the course is to develop students' ability to independently perform various tasks in the functioning of the protected areas: planning and implementation of action plans, design of management measures, organization of the system of visits and operational supervision, management of organizational units, etc. The emphasis is on developing competencies for a team and project approach in protection area management. Students acquire skills in the preparation and implementation of the Management Plan and the preparation and implementation of annual plans, the creation and implementation of species and habitat conservation measures, the establishment of stakeholder networks and the development of programs with local communities. They also master the knowledge and skills to perform the basic and extended tasks of nature conservationists in the protected areas, which, in addition to direct supervision of the area, includes the regulation of visits, supervision of permitted activities in the protected areas. promotion of the protected areas, cooperation with inspection services and various interest groups related to the functions of the protected areas, 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	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	• Explain the role and importance of protected areas in nature protection, ways of valorization (bio-ecological, spatial and economic evaluation), planning models and principles of spatial planning in protected areas. • Interpret the basics of protected area management international standards and

outcomes)	management principles - adaptive management, participation, sustainability • Interpret management documents (Management Plan, Spatial Plan, Annual Program) and financing of protected areas (types and sources of income, general cost structure, tourist user fees, concession permits). • Analyze the supervision of protected areas (authorizations, tasks and qualifications of nature conservationists, legislative framework of supervision, prescribed conservation measures, participation in the management of visits, educational tasks and in the development of partnerships with stakeholders). • Interpret the function of tourism in protected areas (types and intensity of tourism, financial effects and risks, tourism management, visiting systems, reception capacity of the protected area). • Analyze the role and meaning of environmental education and interpretation in protected areas (education topics, target groups, content and principles of interpretation, plan, means and methods of interpretation).
2.5. Course content (syllabus)	• Introduction - theoretical foundations of protected area management. Main aspects and development of management in protected areas • The role and importance of protected areas. General concept of protected area management. Legislative framework and statistics of protected areas in the Republic of Croatia (2 h) V_ Statistics of protected areas in the world and in Croatia according to IUCN categorization • Categorization of protected areas. IUCN management categories. Evaluation of protected areas. Expert bases and databases in evaluation. Valuation of goods and services of the protected area. Cost-benefit analysis methods V_ Analysis of the evolution of the protected area management concept. Croatian categorization system. Protected area statistics in the Republic of Croatia. • Planning of protected areas. General planning scheme. Stages in the establishment of new protected areas. Key planning criteria: area size, existing uses, special international criteria (IUCN, UNESCO) V_ Nature protection information system: general and specialist databases: Habitat map of the Republic of Croatia, Red lists of endangered species, CroFlora, CroFauna, CroWet, Natura 2000 databases . • Spatial planning in protected areas. Spatial plan for the national park. Relationship and differences between the spatial plan and the Management Plan. V_ Content and structure of the spatial plan of the area of special features (PPPPO) - spatial planning according to management objectives (example: PPPPO for nature park) • Basics of protected area management. IUCN matrix of objectives in proteced area management. International management standards. V_ Analysis of protected area management problems in Croatia. Sustainability indicators. • Principles of successful governance: adaptive governance, participation and sustainability. Expected inconsistencies, conflicts and management risks. Stakeholder participation in management V_ Overview of stakeholders and their classification in the procedures of preparation of the management plan for the protected area (individual work) • Zoning of protected areas. Types of zones, principles and criteria of zoning. Basics of the phase in the zoning process V_ Definition of the zone: description, selection criteria, goal, allowed activities, access of visitors - examples of National park (NP)/ Nature park (PP). • Management plans for protected areas. Elements of the plan. Stages in the development of a management plan. Analytical and project phase in the preparation of the plan. Guidelines for the development of a Croatian park management plan. Action plans for the implementation of management plans V_ Application of guidelines for the development of a management plan for a protected area and ecological network areas • Management of protected areas in Croatia. The role and activities of the management institution. Structure of the management institution, sources and models of financing. Monitoring and evaluation of management efficiency: METT method, RAPPAM questionnaire V_ Scheme of internal organization of the NP / PP institution. Management documents: Annual work program of NP / PP institutions and Annual financial plan of NP / PP institutions. • Financing of protected areas. Revenues of protected areas. Use of own revenues.

<table>
<tr><td></td><td colspan="9">Management cost structure. Benefits of management for regional and local communities V_ Evaluation of management effectiveness using the METT method (individual work)
• Environmental education and interpretation. Contents of education and target groups. Principles of interpretation. Guided activities. Visitor Centers V_ Examples of successful educational programs in protected areas (e-quiz). Methods of evaluation of educational programs (examples of in situ evaluation) (individual work)
• Surveillance of protected nature areas. Legislative position, tasks and powers of nature conservationists. Tasks in ecological network monitoring. Prescribed measures in the implementation of supervision; V_ Supervision of the protected areas - the most common offenses and types of conduct of the conservation service in the protected areas Examples of the organization of supervision at the national and regional level
• Tourist function of protected areas. Importance of tourism for protected areas. Risks of tourism development in protected areas. Visiting protected areas. Receiving capacity of the protected area. Visiting risk management V_ Calculation of reception and limit capacity of critically loaded locations in the protected areas (individual work)
• Projects in protected areas. Types of interventions and special conditions of execution. Criteria and assessment of the acceptability of the project for the protected area and ecological network V_ Analysis of the type of environmental impact during the implementation of the project / project. Protection measures</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>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>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>5</td><td></td></tr>
<tr><td colspan="10"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Martinić, I.: Upravljanje zaštićenim područjima prirode – planiranje, razvoj i održivost, Zagreb 2010.</td><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td colspan="5">Smjernice za planiranje upravljanja zaštićenim područjima i/ili područjima ekološke mreže, MZOE/HAOP, Zagreb 2018</td><td colspan="2">YES</td><td colspan="2">YES, Internet</td></tr>
<tr><td colspan="5">Zakon o zaštiti prirode, NN 80/13, 15/18</td><td colspan="2">YES</td><td colspan="2">NO</td></tr>
<tr><td colspan="5">Müller, H., Turizam i ekologija. Povezanost i područja djelovanja. Masmedia, Zagreb, 2004</td><td colspan="2">YES</td><td colspan="2">YES, Internet</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Martinić, I., Dekanić S.: Rendžerske službe u nacionalnim parkovima europe. MZOPU RH, 1-60, Zagreb 2001.</td></tr>
</table>

	Martinić, I., Sladonja, B., Zahtila, E.: Development Prospects of the Protected Areas System in Croatia. In: Protected Area Management, InTech, ur. B. Sladonja, ISBN 978-953-51-0697-5, Rijeka, 2012. Zbornik radova "Vizija i izazovi upravljanja zaštićenim područjima prirode u Republici Hrvatskoj - Aktivna zaštita i održivo upravljanje u Nacionalnom parku "Krka" / Marguš, D. (ur.)., JU "Nacionalni park Krka", 2017. Izvješće o stanju prirode u R. Hrvatskoj 2008-2012, Min. zaštite okoliša i prirode, Zagreb, 2014. **Tourism and visitor management in protected areas, IUCN 2018 Schroder, W., Lhota, S., Gugić, G.: Priručnik za nadzornike i vodiče. JU PP Lonjsko polje, 2004. Strategija i akcijski plan zaštite prirode Republike Hrvatske za razdoblje od 2017. do 2025. godine, NN 72/2017

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ivica Tikvić, PhD. Assoc. Prof. Damir Ugarković, PhD.	1.7. Number of ECTS credits	2
1.2. Course title	Ecology of Forest Tree Species	1.8. Number of hours in semester (L+E+F+e-learning)	15+15+0
1.3. Course code	226129	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Introduction to the main forest tree species in Croatia and Europe. Introduction to the main types of woody urban greenery in Croatia and Europe. Defining the main ecological characteristics of forest and urban tree species. Introduction to the natural distribution of tree species and distribution outside the natural range. Description of ecological and biological characteristics of the main deciduous and evergreen autochthonous and allochthonous species of forest tree and shrub species in urban areas of Croatia and Europe. Overview of the most important adverse factors for indigenous and non-indigenous species of forest trees and shrubs 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	B1. identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B4. participate in the realization of programs for the management of protected natural areas B7. perform professional field works on protection of plants and trees in urban areas C1. plan and organize integrated management of the environment
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Identify tree species on the basis of morphological features, identify tree parts and shapes, and apply theoretical and practical knowledge of economically important indigenous and alohton species of trees and shrubs. Conduct biological and technical works on park and green landscaping. Conduct professional field work on plant protection in urban areas. Conduct environmental monitoring.
2.5. Course content (syllabus)	Lectures 1. Fundamentals of ecology and biology of forest trees and shrubs, ecology and biology of urban woody greenery. 2. Ecological and biological characteristics of beech and birch. 3. Ecological and biological characteristics of pedunculate oak and sessile oak 4. Ecological and biological characteristics of field ash and black alder 5. Ecological and biological characteristics of fir and spruce 6. Ecological and biological characteristics of Aleppo pine and black pine. 7. Ecological and biological characteristics of European larch and Scots pine.

<table>
<tr><td></td><td colspan="9">8. Ecological and biological characteristics of plane, nettle, thuja and patchouli.
9. Ecological and biological characteristics of medunca oak and holm oak.
10. Ecological and biological characteristics of tame chestnut, linden, elm and maple.
11. Ecological and biological characteristics of green Douglas fir and American pine.
12. Ecological and biological characteristics of coastal pine and atlas cedar.
13. Ecological and biological characteristics of common acacia and paulownia.
14. Ecological and biological characteristics of wild chestnut, American liquidambar and forest fruit trees
15. Ecological and biological characteristics of barberry, boxwood, quince.

Exercises
1. Ecology of beech and analysis of phenophases of beech
2. Ecology of cedars, plane trees, thuja, cypress and coastal pine - analysis of habitat conditions in cities
3. Ecology of field ash and black alder - hydrological analysis of habitats
4. Comparative analysis of climatic characteristics of holm oak and medunca forest ecosystems
5. Ecology of chestnuts, elms, lindens and maples - habitat analysis in urban areas
6. Analysis of the intensity of extinction of pedunculate oak, field ash, fir and spruce trees
7. Ecology of forest tree species - Aleppo pine, Scots pine, black pine, Douglas fir, American pine, European larch</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="5">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>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>2</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Tikvić, Ugarković, Ecology of forest trees, script, Faculty of Forestry, University of Zagreb.</td><td colspan="2"></td><td colspan="3">Merlin</td></tr>
<tr><td colspan="4">Forests of the Croatian Mediterranean, Academy of Forestry Sciences, 2011 (selected chapters - related to the ecology of forest tree species).</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td colspan="4">Silver Fir in Croatia, Academy of Forestry Sciences, Hrvatske šume d.o.o. Zagreb, 2001, (selected chapters related to the</td><td colspan="2">YES</td><td colspan="3"></td></tr>
</table>

	ecology of forest tree species).		
	Common beech in Croatia, Academy of Forestry Sciences, Hrvatske šume d.o.o. Zagreb, City of Zagreb, City Office for Agriculture and Forestry 2003, (selected chapters related to the ecology of forest tree species).	YES	
	Pedunculate oak in Croatia, HAZU Center for Scientific Research Vinkovci, «Hrvatske šume» Zagreb, 1996, (selected chapters - related to the ecology of forest tree species).	YES	
	European Atlas of Forest Tree Species		Internet
2.12. Optional literature	Toljan, I., J. Leko, J. Perić, 2015. Greenery of urban areas City of Zagreb. Zagrebački holding d.o.o. Zrinjevac Branch, p. 206. Floodplain forests in Croatia, 2005, Academy of Forestry Sciences (selected chapters related to the ecology of forest tree species).Bruns Pflanzen – Catalogue of trees and shrubs 2018/2019 Forestry Compendium, CD, Cab Abstracts Lakušić, R., 1989: Ekologija biljaka. Zavod za udžbenike i nastavna sredstva, Sarajevo, str. 248		

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)		1.7. Number of ECTS credits	2
1.2. Course title	Professional practice	1.8. Number of hours in semester (L+E+F+e-learning)	5 days
1.3. Course code	226130	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate study Urban Forestry, Nature Conservation and Environmental Protection	1.10. Level of application of e-learning (level 1, 2, 3)	Not applicable
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	3	1.12. Possibility of instruction in English	NO
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 forestry engineers in jobs that require the specified profile of experts. Within the course, students will connect the current 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 apply aproach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyse data and conclude individually based on analysed data A2 use relevance in maintaining, area and possibilities of basic technical components A3 apply skills in solving practical side of buisness, either by control measuring, calculations or testing verification B1 identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B2 recognise and determine the most important types of xylophages bacteria, insects and funghi on trees species and detect wood defects incurred due to their activity B3 acquire basic principles of protection of forests from abiotic and biotic factors, and apply basic procedures and means in protection of forests B4 participate in the realization of programs for the management of protected natural areas B5 perform biological and technical works in maintenance of parks and green areas B6 perform all arboricultural works B7 perform professional field works on protection of plants and trees in urban areas B8 perform professional field works in forest nurseries including planting and seeding B9 collaborate in preparation of ecological impact studies and spatial plans B10 apply knowledge about the machines, techniques and technologies used in professional works in urban areas and protected natural areas C1 plan and organise integrated management of the environment C2 plan and organise professional works in realization of programs for the management of protected natural areas C3 apply actual legislation in management of protected natural areas		

<table>
<tr><td></td><td colspan="9">C4 conduct monitoring of the environment
C5 calculate basic indicators of successful buisness, compose basic financial reports, recognise and analyse types of costs</td></tr>
<tr><td>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</td><td colspan="9">1. independently and responsibly perform entrusted professional tasks in Urban Forestry, Nature Conservation and Environmental Protection
2. apply in practice the knowledge and skills necessary to carry out the entrusted tasks
3. apply in practice legal regulations from the Urban Forestry, Nature Conservation and Environmental Protection sectors
4. present professional issues in writing</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">During the implementation of 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 to perform professional Urban Forestry, Nature Conservation and Environmental Protection 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 Urban Forestry, Nature Conservation and Environmental Protection sectors. 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.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☒ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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></td><td></td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>Written report</td><td>YES</td><td></td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><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>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>2</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Perform entrusted professional tasks during the implementation of professional practice. Prepare a written report at the end of the professional practice.</td></tr>
<tr><td rowspan="2">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Handbook for conducting professional practice in Urban forestry, Nature Conservation and Environmental Protection</td><td colspan="3"></td><td colspan="2">YES</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9"></td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)		1.7. Number of ECTS credits	8
1.2. Course title	Bachelor thesis	1.8. Number of hours in semester (L+E+F+e-learning)	
1.3. Course code	226131	1.9. Expected enrolment in the course	30
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION			
2.1. Course objectives	The bachelor thesisis an independent professional work of an experimental nature or a professional work in which the student, under the guidance and with the help of a mentor, deals with the chosen topic. The topic of the bachelor thesis may be related to interdisciplinary knowledge, if it corresponds to the title and objectives of the bachelor thesis. The preparation of a bachelor thesis of an experimental nature means the student's independent work based on a small-scale research or part of it that the student conducts independently and analyzes, describes and presents the results himself. The bachelor thesis should not contain original views and results. The review bachelor thesis has cognitive value because it gives a complete overview of a problem/topic based on already published papers and studies and requires the study and analysis of relevant literature.		
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 apply aproach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyse data and conclude individually based on analysed data A2 use relevance in maintaining, area and possibilities of basic technical components A3 apply skills in solving practical side of buisness, either by control measuring, calculations or testing verification D1 continue perfection on university graduate studies on Forestry section on Faculty of Forestry		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. be able to apply existing knowledge to solve professional problems for the selected topic of bachelor thesis 2. create a term work plan in accordance with the set deadlines for the preparation of the bachelor thesis by components 3. devise a methodology for writing a professional or review paper 4. apply the methodology of writing a professional or review paper 5. present your bachelor thesis in written and oral form		
2.5. Course content (syllabus)	The bachelor thesis is an individual written work based on professional research. It is written in a professional form and implies the time load of students with research work that is equivalent to the value of 8 ECTS. The bachelor thesis is usually prepared during the 6th semester of undergraduate study, and ends with a defense (presentation and answering questions).		
2.6. Format of instruction	☐ lectures	☒ independent	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☒ field work</td><td colspan="3">assignments
☐ multimedia and the internet
☒ laboratory
☒ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="6">2.8. Monitoring student work</td><td>Class attendance</td><td></td><td>NO</td><td>Research</td><td>YES</td><td></td><td>Oral exam</td><td>YES</td><td></td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><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>Project</td><td>YES</td><td></td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>8</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Choose the topic and mentor of the bachelor thesis, prepare the bachelor thesis and submit it to the mentor of the bachelor thesis, report the defense of the bachelor thesisand defend the bachelor thesis.</td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Ordinance on the preparation and defense of the bachelor thesis</td><td colspan="2"></td><td colspan="2">website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td colspan="4">Form ZR-1 Request for approval of the topic and mentor of the bachelor thesis</td><td colspan="2"></td><td colspan="2">website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td colspan="4">Instructions on the layout and content of the diploma thesis</td><td colspan="2"></td><td colspan="2">website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9"></td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Danko Diminić, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Forest Mushrooms	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	33833	1.9. Expected enrolment in the course	10
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Students acquire basic knowledge of the most important species of fungi in our forest ecosystems and their characteristics and role (mycorrhizal, saprotrophic and parasitic species). Students acquire knowledge about the methods of recognizing certain species and their value with gastronomic points of view, the degree of their toxicity.
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 recognise and determine the most important types of xylophages bacteria, insects and funghi on trees species and detect wood defects incurred due to their activity
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Describe fungi as eukaryotic organisms. Explain and explain the role and systematics of fungi. Expose and interpret mycorrhizae (ecto- and endomycorrhiza). Survive and connect fungal habitats and substrates. 2. Describe, enumerate and distinguish the characteristics of fungal fruiting bodies important for identification. Describe and identify the characteristics of mushroom caps and hymenophores. Describe and recognize the characteristics of the stalk and the sheath and their origins. Explain the significance of the color of the spores in the mass for identification. Describe and recognize the characteristics of hymen and spores in ascomycetes and basidiomycetes. Describe, recognize and expose the importance of sterile elements of hymen in basidiomycetes. Explain, describe and list the anatomical and histological features of the ovary. Explain and explain other characteristics and chemical reactions in fungi and their importance in identification. 3. State the chemical composition of the fungus. Describe and list the medicinal properties of mushrooms. Expose and interpret toxins in fungi, their harmful effects on human health, or the symptoms they can cause, and possible methods of treatment.
2.5. Course content (syllabus)	Lectures: 1. Fungi as eukaryotic organisms; the role of fungi; classification (systematics) of fungi; mycorrhiza (ecto- and endomycorrhiza); habitat and substrate of fungi. 2. Characteristics of fungal fruiting bodies important for identification. Chemical reactions in fungal identification; other features used in the identification of fungi; analysis of samples in fungal identification. 3. Chemical composition of fungi; medicinal properties of mushrooms; fungal toxins: cellular toxins; neurotoxins; digestive intoxications; conditional poisoning.

<table>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td>2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td></td><td colspan="5">Usčuplić, M., 2004: Svijet gljiva. Akademija nauka i umjetnosti Bosne i Hercegovine, Sarajevo, 243 pp</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="5">Božac, R., 1989: Gljive naših krajeva. Grafički zavod Hrvatske, Zagreb, 399 pp.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="5">Garnweidner, E., 1990: Gljive - džepni gljivarski vodič. Cankarjeva založba, Ljubljana - Zagreb, 255 str.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="5">Glavaš, M., 1999: Gljivične bolesti šumskoga drveća. Sveučilište u Zagrebu, Šumarski fakultet, 281 pp.</td><td colspan="2">YES</td><td colspan="2">2nd level of application of e-learning</td></tr>
<tr><td></td><td colspan="5">Diminić, D., 2016: Forest mushrooms (presentation of lectures in PDF)</td><td colspan="2">YES</td><td colspan="2">2nd level of application of e-learning</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Tortić, M., 1966: O rasprostranjenosti gljiva u Gorskom kotaru. Acta Botanica Croatica, 25, 21–33.
Tortić, M., 1966: Makromiceti Gorskoga kotara I. Acta Botanica Croatica, 25, 35–50.
Glavaš, M. & Diminić, D., 2001: Mikološki kompleks obične jele. U: Prpić, B. (ed.) 2001: Obična jela (Abies alba Mill.) u Hrvatskoj. Akademija šumarskih znanosti, Zagreb, 606–625.
Glavaš, M. & D. Diminić, 2011: Bolesti šumskoga drveća. U: Matić, S. (ed.): Šume hrvatskoga sredozemlja. Akademija šumarskih znanosti, Zagreb, 533-555.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Mario Božić, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Tree measurement	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	33834	1.9. Expected enrolment in the course	10
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Students get to know principles of mensuration and most important elements in measurement of tree parts, trees and forest stands: diameters, heights, volume and area covered by individual trees.
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. apply approach to experimental observing and mathematical modelling, mathematically solving research and practical problems, statistically process, present and analyze data and conclude individually based on analyzed data 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 C4. conduct monitoring of the environment D1. continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Specify measurement variables, terms precision and accuracy for measurement and ways to display measured dana Interpret measurement of diameter, circumference and tree height. (instruments and errors). Interpret definition and calculation of voulume (volume of cut and standing trees, tree sectioning method, single entry and two entry volume tables).
2.5. Course content (syllabus)	1. Introduction. Measures and systems of measurement 2. Measurement errors (precision, accuracy, bias, significant digits). Presenting measured data. 3. Tree measurements: diameter, breast height diameter, circumference, tree crown dimensions. Errors of measurement. 4. Tree height and trunk length. Errors in height measurement 5. Instruments for measuring tree height. 6. Defining growing space of a tree. Shading of area due to tree size. 7. Measurement of diameters – field work (Maksimir park). 8. Measurement of tree crown – field work (Maksimir park). . 9. Measurement of tree height – field work (Maksimir park). 10. Volume of logs. 11. Tree volume. 12. Two-entry volume tables.

<table>
<tr><td></td><td colspan="9">13. Measurements on area level – sample plots
14. Height curves.
15. Single-entry volume tables. Calculation of volume on a stand (sample) level.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td>YES</td><td></td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Pranjić, A., Lukić, N., 1997: Forest inventory / Izmjera šuma. Šumarski fakultet Sveučilišta u Zagrebu, 410 pp, Zagreb</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td colspan="4">Božić, M: Lecture handouts</td><td colspan="2"></td><td colspan="3">Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Van Laar, A., Akça, A., 2007: Forest Mensuration. Springer, 383 pp.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Daniel Krstonošić, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Floriculture	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	73814	1.9. Expected enrolment in the course	25
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Knowing the great variety of ornamental cut flowers and potted plants and their biological and ecological features. Understanding the factors that influence the growth and development of ornamental cut flowers and potted plants.
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	B4. participate in the realization of programs for the management of protected natural areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To explain the ways ornamental plants propagation and the factors that affect their growth and flowering. 2. To present the most important taxa of cut flowers and their characteristics (geophytes, flowering species, foliage species, species for outdoor cultivation) and recommend and select a suitable type of cut flower according to habitat conditions. 3. Show the most important taxa of potted plants and their characteristics (flowering potted plants, foliage potted plants, succulents) and recommend and select suitable types of potted plants with regard to habitat conditions.
2.5. Course content (syllabus)	Lectures 1. The use of ornamental plants through the past and the characteristics of flower production in Croatia and in the world. 2. General characteristics of plants in floriculture (life form, ecological characteristics, cultivation, uses in space, special forms of cultivation). 3. External and internal factors affecting the growth and flowering of cut flowers. 4. External and internal factors affecting the growth and flowering of potted plants. 5. Propagation methods. Generative. Vegetative. 6. Taxonomic status and systematic classification of cut flowers. 7. Introduction the most important species of cut flowers - geophytes. 8. Introduction the most important species of cut flowers – flowering species. 9. Introduction the most important species of cut flowers – foliage species. 10. Introduction the most important species of cut flowers – species for outdoor cultivation. 11. Taxonomic status and systematic classification of potted plants.

<table>
<tr><td></td><td colspan="9">12 Introduction the most important species of potted plants – flowering potted plants.
13. Introduction the most important species of potted plants – foliage species.
14. Introduction the most important species of potted plants – succulents.
15. Interior landscaping with ornamental plants (pantscaping).</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and fieldwork, preparation and presentation of seminars. Passing preliminary exams, exams.</td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Krstonošić, D., Škvorc, Ž., Franjić, J. 2017: Parkovno perensko i jednogodišnje bilje. Interna skripta. Šumarski fakultet, Zagreb.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td colspan="4">Karlović, K., Pagliarini, N., Vrdoljak, A.Vršek, I., 1999: Sobno i balkonsko cvijeće, Gospodarski list, Zagreb, 1999.</td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td colspan="4">Maree, J., Wyk, B., 2010: Cut Flowers of the World. Timber Press, London, 2010.</td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Dole, M. J., Wilkins, H. F., 1999: Floriculture, Principles and Species, Prentice Hall, New Jersey.
McHoy, P., 2000: Kućne biljke. Leo commerce, Rijeka.
Parađiković, N., 2014: Osnove florikulture – interna skripta, Poljoprivredni fakultet Osijek
Vincelj, M.,1995: Cvjećarstvo, Agronomski fakultet Zagreb.
Vinceljak-Toplak, M. 1989: Cvjećarstvo, interna skripta, Agronomski fakultet, Zagreb.
Vinceljak-Toplak, M.: Lončanice, interna skripta, Agronomski fakultet, Zagreb</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marilena Idžojtić, PhD. Assist. Prof. Igor Poljak, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Exotic Woody Plants	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	73815	1.9. Expected enrolment in the course	60
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION			
2.1. Course objectives	Students acquire basic knowledge about economically important exotic woody plants. Theoretical knowledge encompasses morphological characteristics, economic importance and distribution. Particularly emphasized is the use of certain plant parts.		
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 perform biological and technical works in maintenance of parks and green areas		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	To learn botanical and common names and distribution of exotic fruits, nuts and citrus species, species used for spices, beverages and syrups, species important for wood production, use of bark, plant fibers, resins, gum and oil; To identify and describe exotic fruits, nuts and citrus species; To describe which plant parts of exotic woody species are used for spices, beverages and syrups;		
2.5. Course content (syllabus)	Lectures: 1. *Aceraceae*, *Agavaceae*, *Anacardiaceae*, *Apocynaceae*. 2. *Araliaceae*, *Araucariaceae*, *Arecaceae*, *Asparagacea*. 3. *Asteraceae*, *Betulaceae*, *Bombaceae*, *Buddlejaceae*. 4. *Burseraceae*, *Buxaceae*, *Caesalpiniaceae*, *Capparaceae*. 5. *Caprifoliaceae*, *Caricaceae*, *Celastraceae*, *Cornaceae*. 6. *Cupressaceae*, *Cycadaceae*, *Ebenaceae*, *Elaeagnaceae*. 7. *Ericaceae*, *Euphorbiaceae*, *Fabaceae*, *Fagaceae*. 8. *Ginkgoaceae*, *Grossulariaceae*, *Hamamelidaceae*, *Juglandaceae*. 9. *Lamiaceae*, *Lauraceae*, *Meliaceae*, *Mimosaceae*. 10. *Moraceae*, *Musaceae*, *Myrtaceae*, *Oleaceae*. 11. *Pinaceae*, *Poaceae*, *Punicaceae*, *Rhamnaceae*. 12. *Rhizophoraceae*, *Rosaceae*, *Rubiaceae*, *Ruscaceae*. 13. *Rutaceae*, *Salicaceae*, *Santalaceae*, *Simaroubaceae*. 14. *Smilacaceae*, *Sterculiaceae*, *Styracaceae*, *Taxaceae*. 15. *Thymelaeaceae*, *Ulmaceae*, *Verbenaceae*.		
2.6. Format of instruction	☒ lectures	☐ independent	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance at lectures. Passing final exam.</td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Idžojtić, M., 2009: Dendrologija – List. Šumarski fakultet Sveučilišta u Zagrebu. 904 pp.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Idžojtić, M., 2013: Dendrologija – Cvijet, češer, plod, sjeme. Šumarski fakultet Sveučilišta u Zagrebu. 672 pp.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Šumarska enciklopedija Vol. I-III, 1980-1987. JLZ Miroslav Krleža, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Duarte, O., Paull, R.E., 2015. Exotic fruits and nuts of the New World. CABI, Wallingford.
2. Farjon, A., 2010. A handbook of the world's conifers. Vol. I-II. Brill, Leiden.
3. Fitschen, J., 2007: Gehölzflora. Quelle und Meyer Verlag, Wiebelsheim.
4. Hu, S., 2005. Food plants of China. The Chinese University Press, Hong Kong.
5. Janick, J., Paull, R.E., 2008. The encyclopedia of fruits and nuts. CABI International, London.
6. Krüssmann, G., 1972: Handbuch der Nadelgehölze. Verlag Paul Parey, Berlin und Hamburg.
7. Krüssmann, G., 1976: Handbuch der Laubgehölze. Band I-III. Verlag Paul Parey, Berlin und Hamburg.
8. Louppe, D., Oteng-Amoako, A.A., Brink, M. (Eds.), 2008. Plant resources of tropical Africa 7(1). Timbers 1. PROTA Foundation, Wageningen, Backhuys Publishers, Leiden, CTA, Wageningen.
9. Lyle, S., 2007. Discovering fruit and nuts. David Bateman Ltd., Auckland.
10. Morton, J., 1987: Fruits of warm climates. Florida Flair Books.
11. Roloff, A., Bärtels, A., 2008: Flora der Gehölze. Bestimmung, Eigenschaften und Verwendung. Eugen Ulmer KG, Stuttgart.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Anka Ozana Čavlović, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Applied technical graphics	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	73816	1.9. Expected enrolment in the course	20
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Students acquire basic knowledge of orthogonal and 3D projection. This course offers all elements of technical drawing and geometrical basics needed for the use of the AutoCAD drawing computer program.
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	A3. apply skills in solving practical side of business, either by control measuring, calculations or testing verification
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Explain the basics of drawing AutoCAD (item drawings, layers of drawings, basic drawing tools for orthogonal drawing, modifying, writing and printing). Explain the elements of interior design drawing and the situation draft drawing.
2.5. Course content (syllabus)	Lectures 1. Introduction to AutoCAD. 2. Basics of program AutoCAD - the program interface, drawing tools and modifying tools. 3. Basics of drawing in AutoCAD. Adjustment of dynamic input, polar tracking and object tracking. 4. Drawing of objects. Selection of objects. 5. Editing of draw. Making a Layers. 6. Text and text style. Dimensioning and dimension style. 7. Making a template for drawing with layers and text style. 8. Editing of dimensioning style in drawing layout. 9. Making a template for technical drawing. 10. Making blocks and its application. 11.Drawing hatch and colors. 12. Drawing sketches with zoning boundaries on the cadastral base, zoning and print in M 1:1000. 13. Drawing of landscape planning solution and print in M 1:1000. 14. Drawing of landscape planning solution and print in M 1:200. 15. Drawing of orthogonal projection elements of exterior design and print in M 1:20.

<table>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ computer classroom</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>Computer drawing</td><td></td><td>NO</td></tr>
<tr><td>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Čavlović, A.O.: Uvod u AutoCAD 2018 [Introduction in AutoCAD 2018], internal script, 2019.</td><td colspan="2">NO</td><td colspan="3">https:// moodle.srce.hr</td></tr>
<tr><td colspan="4">Risović, S., Čavlović, A.O.: Primijenjena tehnička grafika [Applied technical graphics], revised teaching material, 2012.</td><td colspan="2">NO</td><td colspan="3">https:// moodle.srce.hr</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9"></td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assist. Prof. Martina Temunović, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Conservation biology	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226133	1.9. Expected enrolment in the course	5-10
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	To introduce Conservation biology discipline which investigates biodiversity patterns and aims to preserve biodiversity on Earth. To get familiar with the major threats to biodiversity and to understand various causes and processes of biodiversity loss. To understand the importance of biodiversity preservation and to get familiar with different kind of actions and strategies that can be undertaken to preserve it. To get familiar with and to apply monitoring of conservation status of species under relevant EU Directives.
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 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 organise integrated management of the environment C2 plan and organise professional works in realization of programs for the management of protected natural areas C3 apply actual legislation in management of protected natural areas C4 conduct monitoring of the environment D1 continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1.To understand and explain basic terminology and concepts in Conservation biology and to define its major goals 2.To explain patterns of biodiversity and to calculate basic measures of biodiversity 3.To explain and compare in situ and ex situ conservation strategies 4.To identify major threats to biodiversity and causes of biodiversity loss, to associate them with consequences and to suggest appropriate measures for their mitigation 5.To critically address and discuss conservation strategies, to develop and present monitoring schemes for conservation status of species
2.5. Course content (syllabus)	1. Introduction to Conservation biology (concepts, aims, basic terminology, historical overview) 2. Patterns of biodiversity, biodiversity across spatial scales 3. Threats to biodiversity - habitat fragmentation (biotic effects of habitat fragmentation, corridors, source-sink model, stepping stone habitat) 4. Threats to biodiversity – Invasive species 5. Threats to biodiversity – Climate change 6. Species concept in Conservation biology (Keystone, Indicator, Umbrella, Priority,

<table>
<tr><td></td><td colspan="9">Flagship, Ecosystem engineers)
7. In situ conservation
8. Ex situ conservation (what is ex situ conservation and when is it necessary, examples, reintroduction, translocation)
9. Conservation genetics (basic concepts, terminology and aims in conservation genetics, importance of genetic diversity, genetic conservation of species - conservation units)
10. The paradigm and problems of small populations (extinctions, extinction vortex)
11. Endemic species (types of endemism, cryptic species, ecological isolation, conservation of endemic species)
12. Measuring biodiversity (Species richness, Shannon index H, Evenness, Abundance, EDGE)
13. Biodiversity conservation in urban landscapes (Green corridors, Brownfields, conservation measures in urban landscapes, Citizen science)
14. Legislation and policy in Conservation biology (species action plans, monitoring of conservation status and reporting under the EU Habitats and Birds Directives, communication with stakeholders)
15. National monitoring schemes for assessing the conservation status of species (parameters used to assess the conservation status and trends – range, population, habitat for the species, future prospects)</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☐ exercises
☐ online in entirety
☒ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular attendance and activity during the lectures. Written exam.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Sodhi, N.S., Ehrlich P.R. (2010) Conservation Biology for All. Oxford University Press. (pdf)</td><td colspan="2"></td><td colspan="3">Availabile on-line</td></tr>
<tr><td colspan="4">Pullin, A.S. (2013) Conservation Biology. Cambridge University Press.</td><td colspan="2"></td><td colspan="3">Availabile as pdf at course lecturer</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Van Dyke, F. (2008) Conservation Biology: Foundations, Concepts, Applications. 2nd. edition. Springer, 478 pp
Frankham, R., Ballou, J. D., & Briscoe, D. A. (2002) Introduction to Conservation Genetics. Cambridge University Press. Cambridge, UK, 617.
Primack RB (2010): Essentials of Conservation Biology, 5th ed. Sinauer Associates, 601 str.
Relevant scientific papers, Legislation acts and web pages.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Željko Škvorc, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Allergenic herbaceous plants	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226134	1.9. Expected enrolment in the course	20
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION			
2.1. Course objectives	Know the herbaceous plant species that grow in Croatia and whose pollen causes allergic reactions in humans. Know ways to reduce their impact on human health.		
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	B4. participate in the realization of programs for the management of protected natural areas B9. collaborate in preparation of ecological impact studies and spatial plans		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define and explain the characteristics of herbaceous plants that cause allergic reactions in humans (their systematic affiliation, biological and morphological characteristics, ecological requirements and distribution in Croatia). 2. Know the negative impact and symptoms of allergic reactions caused by certain representatives of the group of allergenic plants. 3. Know the phenology of allergenic species and take timely action to prevent the negative impact of allergenic plants on human health.		
2.5. Course content (syllabus)	1. The concept of allergies and the causes of allergic reactions. Division of allergenic plants. 2. Pollen. Types of allergic reactions. 3. Division and representatives of the group of allergenic plants that cause contact allergies. 4. Division and representatives of the group of allergenic plants that cause pollen allergies. 5. Characteristics of allergenic herbaceous species that cause contact allergies. 6. Characteristics of allergenic grass species that cause pollen allergies. 7. Characteristics of allergenic weed species that cause pollen allergies. 8. Preventive measures to combat the negative impact of allergenic plants and measures to control allergenic plants. 9. Selection of planting material in urban areas to reduce the negative impact of allergenic species.		
2.6. Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ *online in entirety* ☒ partial e-learning	☐ independent assignments ☐ multimedia and the internet ☐ laboratory	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☐ field work</td><td colspan="3">☐ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="5">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td>YES</td><td></td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Regular class attendance.</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Petrić, P., Tomašević, M., 2003: Biljne vrste uzročnice peludnih alergija. Spin Valis, Požega.</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="5">Franjić, J., Škvorc, Ž., 2014: Šumsko zeljasto bilje Hrvatske. Sveučilište u Zagrebu - Šumarski fakultet. Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Igić, R. ed., 2012: Alergijske biljke. Univerzitet u Novom Sadu, Prirodno-matematički fakultet, Departman za biologiju i ekologiju, "Vrelo", Novi Sad.</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Bogoslav Šefc, PhD. Prof. Jelena Trajković, PhD. Assist. Prof. Iva Ištok, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Wood structure properties of park tree species	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226135	1.9. Expected enrolment in the course	15
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Acquiring knowledge about structural properties of wood in general, and especially about wood of indigenous and non-indigenous species. Distinguishing wood of the mentioned species by applying identification keys. Introduction to international legislation on endangered wood species and its 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	B1 identify tree species based on morphological characteristics, identify parts and tree shapes and apply theoretical and practical knowledge of commercially indigenous and foreign tree species and shrubs B5 perform biological and technical works in maintenance of parks and green areas
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Recognize and describe the macroscopic and microscopic structure of wood 2. Distinguish species of park trees based on their wood 3. Apply modern computer programs (keys) for microscopic and macroscopic wood identification
2.5. Course content (syllabus)	1. Macroscopic structure of wood. Main sections and directions in wood. Texture, grain, rings, wood pores, sapwood and heartwood. 2. Wood formation in trees. Primary and secondary growth. Tissues. 3. Wood cells: morphology, dimensions and functions. 4. Microscopic and macroscopic characteristics of softwood, ring porous wood and diffuse porous wood. 5. Diagnostic features in wood identification. 6. Application of modern computer programs (keys) for microscopic and macroscopic identification of wood species, limit possibilities of key application, examples. 7. CITES and IUCN RED LIST - international conventions on trade in endangered species of wild animals and plants. Application. Examples. The subject matter covers the selected genera of park trees from the families: *Aquifoliaceae*, *Araucariaceae*, *Buxaceae*, *Cupressaceae*, *Fagaceae*, *Hippocastanaceae*, *Juglandaceae*, *Oleaceae*, *Pinaceae*, *Platanaceae*, *Rosaceae*, *Salicaceae*, *Sapindaceae*,

<table>
<tr><td></td><td colspan="9">Taxaceae, Taxodiaceae, Caesalpinioideae, Dipterocarpaceae , Ebanaceae, Fabaceae, Meliaceae, Moraceae, Sapotaceae.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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>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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="5">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Strukturna svojstva drva,: Predavanja iz predmeta strukturna svojstva drva (skripta, autori: Jelena Trajković i Bogoslav Šefc, pdf dokument oko 3 MB) i Atlas slika uz predavanja (Ilustracije uz predavanja, sabrali: Jelena Trajković i Bogoslav Šefc, pdf dokument oko 39 MB</td><td colspan="2">YES</td><td colspan="2">Library of Wood science department</td></tr>
<tr><td colspan="5">Špoljarić, Z., 1978: Anatomija drva, skripta za slušače Šumarskog odjela Šumarskog fakulteta u Zagrebu, Zagreb, 266 str.</td><td colspan="2">YES</td><td colspan="2">Library of Wood science department</td></tr>
<tr><td colspan="5">Gérard, J.; Guibal, D.; Paradis, S.. Cerre, J.C., 2017: Tropical Timber Atlas, Technological characteristics and uses, Éditions Quae RD10, 78026 Versalies.</td><td colspan="2"></td><td colspan="2">Library of Wood science department</td></tr>
<tr><td colspan="5">Wagenführ, R.; Scheiber, C., 2006: HOLZATLAS, VEB Fachbuchverlag, Leipzig,</td><td colspan="2"></td><td colspan="2">Library of Wood science department</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">H. G. Richter and M. J. Dallwitz 2000: 'Commercial timbers: descriptions, illustrations, identification, and information retrieval.' In English, French, German, and Spanish. Version: 25th June 2009. https://www.delta-intkey.com/wood/index.htm. https://www.wood-database.com/wood-articles/restricted-and-endangered-wood-species/</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Damir Ugarković, PhD. Prof. Ivica Tikvić, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Bioclimatology of forest and urban ecosystem	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226136	1.9. Expected enrolment in the course	15
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Introduce students to the impact of climate and weather, and climate change on living organisms in forest and urban 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	B9. cooperate in the development of environmental studies and spatial plans C4. conduct environmental monitoring
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	Show and interpret different climate analyzes (related to B9.) Explain the interaction of climate and organisms (related to C4.) Analyze and explain the consequences of climate extremes and climate change (related to C4.)
2.5. Course content (syllabus)	Lectures: 1 Introduction to bioclimatology and climate classification - genetic and effective climate classification 2 Climatic elements - air and soil temperature, precipitation, relative humidity, wind, snow, insolation 3 Climatic phenomena - clouds, fog, frost 4 Climate indices - rain factors, climate continentality indices, aridity indices, pluviothermal quotient, ombrothermal index 5 Thornthwaite and Köppen classification of climate 6 Climate analysis, Walter diagram, Godard diagram, Emberger diagram 7 Interactions between climate and forest ecosystems 8 Urban climate, urban thermal island, comparison of climatic elements in urban and rural areas 9 Microclimate of urban ecosystem, microclimate of forest park, park and tree line 10 Microclimate of forest ecosystems 11 Urban ecosystem and global climate change 12 The impact of climate change on the phenology of forest trees 13 Impact of climate change in the process of tree extinction

<table>
<tr><td></td><td colspan="9">14 Impact of climate change on forest calamities
15 Influence of climate and weather on soil microorganisms and macrofauna</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☐ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Classes will be conducted in the form of lectures, and students will be given the task to write a seminar paper from one thematic unit.</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><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>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>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Šegota, T., A. Filipčić, 1996: Klimatologija za geografe. Školska knjiga, Zagreb, str. 465</td><td colspan="2">YES</td><td colspan="2">YES</td></tr>
<tr><td colspan="5">Šimunić, I., 2013: Uređenje voda. Hrvatska sveučilišna naklada, Zagreb, str. 260</td><td colspan="2">YES</td><td colspan="2">YES</td></tr>
<tr><td colspan="5">Oke, T.R., G. Mills, A. Christen, J.A. Voogt, 2017: Urban Climates. Cambridge University Press, UK, p. 520</td><td colspan="2">NO</td><td colspan="2">YES</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Penzar, B., I. Penzar, M. Orlić, 2001: Vrijeme i klima hrvatskog Jadrana. Nakladna kuća Dr. Feletar, Zagreb, str. 257 Lalić, B., J. Eitzinger, A.D. Marta, S. Orlandini, A.F. Sremac, B. Pacher, 2018: Agricultural Meteorology and Climatology. Firenze University Press, Firenze, p. 351 Jug, D., B. Stipešević, I. Jug, M. Mesić, 2011: Agroklimatološki pojmovnik. Poljoprivredni fakultet, Osijek, str. 118</td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Marijana Zovko Končić, PhD.	1.7. Number of ECTS credits	1
1.2. Course title	Medicinal Plants	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226138	1.9. Expected enrolment in the course	15
1.4. Study programme	University undergraduate 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	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION			
2.1. Course objectives	Knowledge of basic groups of medicinal plant matabolites and their pharmacological effects. Identification of medicinal plant species, especially those pertaining to Croatian flora, and their application in medical treatment.		
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	B4 participate in the realization of programs for the management of protected natural areas B9 collaborate in preparation of ecological impact studies and spatial plans		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Evaluate the application of plants in treatment in the past and today 2. Analyze the differences between the plant, herbal raw material, medicinal preparation and herbal drugs 3. Group selected plant species according to their structure, composition and medicinal effect		
2.5. Course content (syllabus)	1. Treatment with medicinal plants: Herbal drugs, phytochemical components, medicinal plants preparations 2. Collection and cultivation of medicinal plants, control of its identity and quality 3.-15. Medicinal plants according to the phytochemical groups: identification, phytotherapeutic application, potential toxic effects 3-4. Medicinal plants with flavonoid and coumarin components 5. Medicinal plants with tannins and simple phenols 6. Medicinal plants with antracene derivatives 7. Medicinal plants with saponins 8. Medicinal plants with iridoids 9. Medicinal plants with sulfur-containing phytochemicals 10-11. Medicinal plants with alkaloids 12-13. Medicinal plants with essential oils 14-15. Medicinal plants with therapeutic carbohydrates		
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☐ exercises ☐ *online in entirety*	☐ independent assignments ☐ multimedia and the internet	2.7. Comments:

<table>
<tr><td></td><td colspan="3">☒ partial e-learning
☐ field work</td><td colspan="3">☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3"></td></tr>
<tr><td rowspan="6">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>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>Essay</td><td></td><td>NO</td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td>YES</td><td></td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9"></td></tr>
<tr><td rowspan="4">2.11. Required literature (available in the library and/or via other media)</td><td colspan="4">Title</td><td colspan="2">Availability in the library</td><td colspan="3">Availability via other media</td></tr>
<tr><td colspan="4">Presentations with the lectures</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td colspan="4">Kuštrak, D. 2005: Farmakognozija fitofarmacija. Golden marketing - Tehnička knjiga, Zagreb.</td><td colspan="2">YES</td><td colspan="3"></td></tr>
<tr><td colspan="4">Schaffner, W., 1999: Ljekovito bilje - kompendij. Leo – comerce, Rijeka.</td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9"></td></tr>
</table>

COURSE DECRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Sanda Gitt, prof.	1.7. Number of ECTS credits	1
1.2. Course title	Foreign Language-English	1.8. Number of hours in semester (L+E+F+e-learning)	15+0+0
1.3. Course code	226053	1.9. Expected enrolment in the course	55
1.4. Study programme	University undergraduate 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	English
1.6. Year of the study	3	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	- to enable the learner to communicate effectively and appropriately in real life situation, including digital environment - to use English effectively for study purpose across the curriculum - to develop interest in and appreciation of further development - to develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking and Writing - to revise and reinforce structure already learnt
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	D1 continue perfection on university graduate studies on Forestry section on Faculty of Forestry
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	• Students will heighten their awareness of correct usage of English grammar in writing and speaking • Students will improve their speaking ability in English both in terms of fluency and comprehensibility • Students will give oral presentations and receive feedback on their performance • Students will increase their reading speed and comprehension of academic articles • Students will strengthen their ability to write academic papers, essays and summaries using the process approach. • Students will read university texts and expand their vocabulary • Students will read for intensive information retrieval and interpretation required by university studies • Students will paraphrase information from outside sources effectively and accurately • Students will summarize information from academic sources, distinguishing between main ideas and details
2.5. Course content (syllabus)	Lectures: 1. Introduction to the course (ppt) 2. Unit 1 – No Place Like Home Reading: An inspirational story 3. Revision Language review: Describing trends

<table>
<tr><td></td><td colspan="9">Dealing with tenses
4. Cultures
Listening: Cultural differences
Idioms
5. Reading: Culture shock
Language review: Advice, obligation and necessity
6.Vocabulary
Climate Change
7. Reading: Amazon Forest
8. Environment Vocabulary
Listening: Helping environmental research
9. Unit 5: An Eye to the Future
10. Deforestation (Forestry Journals)
Vocabulary-Right or wrong
11. Species, Planst, Animals, Trees
12. Grammar: Narrative tenses
National Parks (Exchanging Information)
13. Unit 11: The ends of the Earth
Gheographical Expressions
14.Sustainable Forest Management
15. Presentation, Course Review</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☐ field work</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:</td></tr>
<tr><td rowspan="6">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></td><td>NO</td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td>YES</td><td></td><td>(other)</td><td></td><td></td></tr>
<tr><td>Essay</td><td>YES</td><td></td><td>Seminar paper</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Preliminary exam</td><td></td><td>NO</td><td>Practical work</td><td></td><td>NO</td><td>(other)</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td>NO</td><td>Written exam</td><td></td><td>NO</td><td>ECTS credits (total)</td><td>1</td><td></td></tr>
<tr><td></td><td colspan="9"></td></tr>
<tr><td>2.9. Assessment methods and criteria</td><td colspan="9">Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.</td></tr>
<tr><td>2.10. Student responsibilities</td><td colspan="9">Select topic and present on foreign language</td></tr>
<tr><td rowspan="3">2.11. Required literature (available in the library and/or via other media)</td><td colspan="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Headway, Upper Intermediate&Advanced</td><td colspan="2"></td><td colspan="2">YES</td></tr>
<tr><td colspan="5">Forestry Journals_ selected scientific Articles</td><td colspan="2"></td><td colspan="2">YES</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9"></td></tr>
</table>