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

Undergraduate Study Wood Technology

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
Mathematics	Asst. Prof. Maja Moro, PhD	45	45			7	Compulsory
Physics	Asst. Prof. Kristijan Radmanović, PhD	30	30			5	Compulsory
Wood chemistry	Assoc. prof. Alan Antonović, PhD	45	45			7	Compulsory
Wood anatomy	Asst. Prof. Iva Ištok, PhD Prof. Jelena Trajković, PhD	45	60			8	Compulsory
Basics of design drawing	Assoc. prof. Danijela Domljan, PhD	15	30			2	Compulsory
Physical and health education 1	Davor Pavlović M.Ed., professor of kinesiology		30			1	Compulsory
In total						30	

Year of study: I							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / Elective
Engineering mechanics	Asst. Prof. Branimir Šafran, PhD	30	30			5	Compulsory
The basics of dendrology	Prof. Marilena Idžojtić, PhD Asst. Prof. Igor Poljak, PhD	15	30			3	Compulsory
Applied technical graphics	Prof. Anka Ozana Čavlović, PhD	15	45			5	Compulsory
Wood industry mechanical engineering	Asst. Prof. Branimir Šafran, PhD	30	30			5	Compulsory
Fundamentals of electrotechnics	Asst. Prof. Kristijan Radmanović, PhD	30	30			4	Compulsory
Technical properties of wood I	Prof. Tomislav Sinković, PhD Asst. Prof. Tomislav Sedlar, PhD	45	60			7	Compulsory
Physical and health education 2	Davor Pavlović M.Ed., professor of kinesiology		30			1	Compulsory
In total						30	

Year of study: II							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / Elective
Woodworking machinery I	Assoc. prof. Igor Đukić, PhD	45	45	2		6	Compulsory
Technical properties of wood II	Asst. Prof. Tomislav Sedlar, PhD Prof. Tomislav Sinković, PhD	30	30	2		5	Compulsory
Pathology and wood protection	Assoc. prof. Marin Hasan, PhD	45	45	2		7	Compulsory
Sawmilling technology	Assoc. prof. Josip Ištvanić, PhD	30	45	1		6	Compulsory
Transport equipment in wood industry	Prof. Ružica Beljo Lučić, PhD	30	45	2		5	Compulsory
Physical and health education 3	Davor Pavlović M.Ed., professor of kinesiology		30			1	Compulsory
In total						30	

Year of study: II							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / Elective
Wood constructions	Prof. Silvana Prekrat, PhD	45	45			7	Compulsory
Wood drying technology	Prof. Stjepan Pervan, PhD Asst. Prof. Miljenko Klarić, PhD	30	45	1		5	Compulsory
Vener and veneer plywood	Prof. Mladen Brezović, PhD	30	45			5	Compulsory
Glues and wood glueing	Assoc. Prof. Goran Mihulja, PhD Asst. Prof. Josip Miklečić, PhD	30	30	1		4	Compulsory
Panels from disintegrated wood	Prof. Vladimir Jambreković, PhD	30	45	1		5	Compulsory
Practical work 1			75			3	Compulsory
Physical and health education 4	Davor Pavlović M.Ed., professor of kinesiology		30			1	Compulsory
In total						30	

Year of study: III							
Semester: Winter							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / Elective
Production organisation	Assoc. Prof. Krešimir Greger, PhD Asst. Prof. Kristina Klarić, PhD	45	45	1		7	Compulsory
Final wood processing	Assoc. Prof. Goran Mihulja, PhD	45	45	2		6	Compulsory
Basic statistics	Prof. Anamarija Jazbec, PhD	30	30			4	Compulsory
Wood in construction	Prof. Hrvoje Turkulin, PhD Assoc. Prof. Vjekoslav Živković, PhD	30	30	1		4	Compulsory
Marketing of wood products	Assoc. Prof. Andreja Pirc Barčić, PhD Prof. Darko Motik, PhD	30	30	1		4	Compulsory
Practical work 2			90			3	Compulsory
Business communication in a foreign language			30			2	Compulsory
In total						30	

Year of study: III							
Semester: Summer							
COURSE	COURSE TEACHER	L	E	F	e-learning	ECTS	Compulsory / Elective
Production planning and calculation	Prof. Darko Motik, PhD Assoc. Prof. Andreja Pirc Barčić, PhD	30	45	1		5	Compulsory
Wood finishing	Prof. Vlatka Jirouš-Rajković, PhD Asst. Prof. Josip Miklečić, PhD	30	45	1		5	Compulsory
Practice				10		3	Compulsory
Operations management	Asst. Prof. Ivana Perić, PhD	30	30	1		3	Elective
Technological properties of wood	Asst. Prof. Tomislav Sedlar, PhD	30	30	1		3	Elective
Woodworking machinery II	Assoc. Prof. Igor Đukić, PhD	30	30	2		3	Elective
Furniture constructions	Assoc. Prof. Zoran Vlaović, PhD	30	30	2		3	Elective
Upholstered furniture	Assoc. Prof. Zoran Vlaović, PhD	30	30	2		3	Elective
Furniture design	Assoc. Prof. Danijela Domljan, PhD	30	30	2		3	Elective
Bachelor thesis						8	Compulsory
In total						30	

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - I. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Maja Moro, PhD	1.7. Number of ECTS credits	7
1.2. Course title	Mathematics	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+0
1.3. Course code	33556	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 content is adapted for students of wood technology studies. Efforts are made to preserve the overall material relating to the function, differential and integral calculus, such that the approach to all the most important concepts is maximally simplified. The emphasis is placed on mastering the skills of steps in mathematical models, the development of abstract thinking and analytical thinking, the precision of expression, and noticing the substantially.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A3 - Competently maintain, work with and use the possibilities of basic technical components; E1 - Continue specialisation in University graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define and implement the tasks in terms of mathematical logic, sets, sets of numbers and mathematical induction 2. Define, analyse and relate the concepts and properties of applied functions of a real variable, as well as terms related to sequences (limit of a sequence, limit of a function) 3. Define and apply the concepts of tasks derivatives, indefinite and definite integrals 4. Define, analyse and apply the tasks in terms of functions of two variables 5. Define the term and solve differential equations using a method of separation of variables 6. Define and apply the tasks from introductory elementary algebra (vectors and matrices)
2.5. Course content (syllabus)	1. Sets of numbers and points. Real numbers. Infimum and supremum expensive. 2. Inequalities (linear, quadratic, exponential, trigonometric, etc.). 3. Functions (algebraic and transcendent). 4. Limes function. Continuity of a function. 5. The notion of derivation. Derivation of elementary functions. 6. Differential calculus. 7. Analysis of algebraic functions using differential calculus. 8. Analysis of transcendent functions using differential calculus. 9. Functions of two variables. 10. Indefinite integral. Some methods of integration. 11. Certain integral-surface problems. 12. Application of integral calculus (area, volumes, moments, centre of gravity).

	13. Differential equations 14. Vectors in plane and space. Vector operations. 15. Matrices and matrix calculus.								
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☐ fieldwork			☒ 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		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)	7	
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	Writing homework, participating in classes during lectures and exercises, taking colloquia, taking the oral exam.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Bradić, T. i sur. 1998: Matematika za tehnološke fakultete, Element, Zagreb				NO				
2.12. Optional literature	Moro, M.: Zbirka ispitnih zadataka (radni materijal)								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Kristijan Radmanović, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Physics	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33557	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	The course gives the fundamentals laws of physics and practical applications needed to make the students understand other domains in their specialities. Moreover, the physics course develops facilities in critical (exactly) thinking, reasoned argumentation, evaluation of evidence, mathematical modelling, and ethical values.		

2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A2 - Apply basic laws of physics that present the basis of wood technology, understand Newton's axioms and apply them to solve technical problems, explain phenomena in the field of electrical engineering, and make accurate and optimal use of electric energy A3 - Competently maintain, work with and use the possibilities of basic technical components; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Identify the vector and scalar quantities. 2. Explain the physical quantities that describe the translational motion 3. Different types of translational motion and performing kinematic expressions of translational motions. 4. Analyse the graphic description of the translational motion. 5. Explain and perform expressions describing a uniform circular motion. Describe the effects of centripetal and centrifugal forces. 6. Analyse the horizontal, vertical and piece shot 7. Explain Newton's laws of motion. Explain Newton's general law of gravitation. 8. Distinguish the fundamental forces in nature. Sketch and analyse the action of more force on the body. Find out the expressions for the force impulse and the amount of motion. 9. Derive expressions for the impulse force and momentum. 10. Analyse the graphical description of the isothermal, arsenic and isobaric changes in the state of ideal gases. 11. Interpret the concept of work in the isobaric, isothermal and adiabatic change of state of an ideal gas 12. Explain and analyse Carnot's circular process. 13. Handle Mollier's h-x diagram.		
2.5. Course content (syllabus)	The methods of physics research. Physical quantities, units and dimensions. Errors in the measurements. Motions. Kinematics: Rectilinear motion (uniform motion, non-uniform motion, uniformly accelerated, free fall), Circular motion, Motion of bodies in a gravitational field. Dynamics: Force, Lows of dynamics (Newton's first law, Newton's second law, impulse of the force, momentum, Newton's third law, law of conservation of impulse and momentum). The density of a substance. Tables for density of various substances and species of wood. Force of gravity (weight). Friction forces, Resistance of the medium. Work, Energy, and Power. Dynamics of rotation: Centripetal force, Moment of a force, Newton's second law for rotational motion, Moment of inertia, Angular momentum. Mechanical oscillations and waves: Harmonics motion, Mathematical and physical pendulum, Free and forced oscillations, Resonance, Waves, Sound, the intensity of sound, ultrasound. Mechanics of liquids and gases: Pressure, Statics (Pascal's law, hydro-and aerostatics, Archimedes principle), Dynamics (ideal fluid, viscous fluid, motion of an ideal fluid, Bernoulli's equation, motion of a viscous fluid). Internal friction. The surface tension of liquids. Capillarity. Heat: Measurement of temperature, Thermal expansion of solids and liquids, Quantity of heat, Heat capacities, First law of thermodynamics, Ideal gas laws, Mixtures of ideal gases, Basic thermodynamic processes, Power cycles, Transmitted of heat, Phase changes, Water vapour (steam), Humid air (basic concepts, quantities, h-x diagram), Heat of combustion of fuels.		
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☐ fieldwork	☐ independent assignments ☒ multimedia and the internet ☐ laboratory ☐ work with mentor	2.7. Comments:

				☐ (other)					
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)	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	Regular attendance and active participation in lectures and exercises. Taking colloquia and exams.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Petar Kulišić i dr., „Mehanika i toplina“, Školska knjiga Zagreb, 2005.	YES	
	Nedjeljka Petric, Ivo Vojnović, Vanja Martinac, „Tehnička termodinamika“, KTF Split, 2007.	NO	Online edition
	Petar Kulišić i dr. „Riješeni zadaci iz mehanike i topline“, Školska knjiga Zagreb, 2007.	NO	
	E. Babić, R. Krsnik, M. Očko „Zbirka riješenih zadataka iz fizike“, Školska knjiga Zagreb, 1988	YES	

2.12. Optional literature	1. Antonije Dulčić „Mehanika“, PMF Zagreb, 2019. (online izdanje) 2. Charles Kittel and all „Mehanika“, Tehnička knjiga Zagreb, 1982. 3. F. Bošnjaković, „Nauka o toplini I i II, Tehnička knjiga Zagreb, 1976. i 1978. 4. Jakov Labor „Fizika 1“, Alfa d.d., 2019. 5. Nada Brković „Zbirka zafataka iz fizike“ LUK d.o.o., 2001.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Alan Antonović, PhD	1.7. Number of ECTS credits	7
1.2. Course title	Wood chemistry	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+0
1.3. Course code	228982	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	YES
2. COURSE DESCRIPTION			

2.1. Course objectives	Knowledge seen to be gained by the "Wood chemistry" programme enables students of wood technology studies to connect it with that gained in programmes of main expert subjects.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications; B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery; E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Use the knowledge acquired in different wood technology areas and solve technological and qualitative tasks and problems in the wood industry. 2. Explain the chemical composition and properties of wood and apply the same during the basic working and processing of wood 3. Analyse and isolate all chemical components, whether analytically or instrumentally, related to determining different properties or for further working and processing of wood.
2.5. Course content (syllabus)	Wood structure, the density of wood, water content, the chemical composition of wood, analysis of elements in wood, analysis of wood age, inorganic substances in wood, content and role of inorganic substances, wood ash, chemical reaction of wood, fundamentals of carbohydrate chemistry, monosaccharides, oligosaccharides, polysaccharides, cellulose, molecular and supramolecular properties, nature and classification of polyose, xylans, mannans, glucans, galactans, pectins, fundamentals of aromatic compounds, phenols, precursors of lignin, synthesis and role of lignin, structure and properties of lignin, instrumental and chemical methods analyses of cellulose and lignin, extractives, extractives of softwood, extractives of hardwood, extractives from foliage, buds and fruits, the acidity of wood, measuring the pH of wood, the chemical composition of bark, cellulose, polyose, lignin, polyphenols, suberin, extractives, combustion and pyrolysis of wood, degradation of wood.
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☐ fieldwork ☒ independent assignments ☒ multimedia and the internet ☒ laboratory ☐ work with mentor ☐ (other)
2.7. Comments:	

2.8. Monitoring student work									
	Class attendance	YES		Research	YES		Oral exam	YES	
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project	YES		Written exam	YES		ECTS credits (total)	7	

2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises. Taking exam.

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	A. Antonović (2018): Kemija drva (interna skripta). Šumarski fakultet, Zagreb	NO	YES
	D. Fengel, G. Wegener (1989): Wood – chemistry, ultrastructure, reactions. Walter de Gruyter, Berlin-New York.	NO	YES
	T. Higuchi (1997): Biochemistry and molecular biology of wood. Springer-Verlag, Berlin Heidelberg.	NO	YES
2.12. Optional literature	1. E. Sjostrom, R. Alen (1999): Analytical methods in wood chemistry, pulping and papermaking, Springer Verlag, 2. T. D. N.-S. Hon, N. Shiraishi (2001): Wood and cellulosic chemistry. Marcel Dekker, Inc., 3. E. Sjostrom (1993): Wood chemistry – Fundamentals and applications. Academic Press, Inc. 4. T. Higuchi (1985): Biosyinthesis and biodegradation of wood components. Academic Press, Inc.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Iva Ištok, PhD Prof. Jelena Trajković, PhD Assoc. Prof. Bogoslav Šefc, PhD	1.7. Number of ECTS credits	8
1.2. Course title	Wood anatomy	1.8. Number of hours in a semester (L+E+F+e-learning)	45+60+0
1.3. Course code	228983	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	One of the aims is to learn to recognise the xylem anatomy of woody plants as a prerequisite for understanding the basic properties of wood. The second aim is to attain professionalism in identifying important commercial wood species.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning	1. Explain the main terms of macroscopic, microscopic and submicroscopic characteristics of wood structure helpful in identifying and technical wood properties. 2. Differentiate native commercial wood species based on their microscopic and macroscopic characteristics with the help of wood identification keys.		

<table>
<tr><td>outcomes)</td><td colspan="9">3. Explain variations in wood anatomy structure within the tree, between trees of each species and explain the influence of variations in wood structure on technical properties of wood and its use.
4. Explain the origin of natural wood "defects", recognise them and explain their influence on selected technical properties.
5. Explain the influence of wood anatomy structure on its technical properties</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction: The aims of wood anatomy. The origin of wood in the plant kingdom. Commercial utilisation. Methods in wood anatomy. Coarse structure of wood. Structure of vascular plants: basic parts of a vascular plant, primary and secondary growth. The origin and development of wood cells. Tissues. Cambium. Cell and cell wall: dimensions, forms, parts, divisions, development of cell wall. Composition and distribution of cell wall components in wood cells. Submicroscopic structure and organisation of cell wall. Sculptures of the cell wall: pits, perforations of vessel members, spiral thickenings and dentations, warty structures and warty pits. The macroscopic and microscopic structure of conifer wood: types of cells and tissues, their distribution and shape, helpful features in identifying conifer wood, comparative anatomy of different kinds of conifer woods. The macroscopic and microscopic structure of hardwoods: types of cells and tissues, their distribution and shape, helpful features in identifying hardwoods. Comparative anatomy of different kinds of hardwoods. Guide through the hand-lens key for identifying selected wood species. Wood identification: methods, limiting conditions, wood identification keys. Wood structure variations within the species and the tree. Physical nature of wood, moisture content, dimensional changes, specific weight and density, porosity, permeability. The influence of wood structure on shrinking, density, permeability and final utilisation of wood. Irregularities of wood structure.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ fieldwork</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></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>8</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. 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="5">Title</td><td colspan="2">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="5">Predavanja iz predmeta Anatomija 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">NO</td><td colspan="2">YES</td></tr>
</table>

	Anatomija drva e-kolegij na sustavu za udaljeno učenje.		YES, Merlin
	Z. Špoljarić 1978: Anatomija drva, Šumarski fakultet, Zagreb.	YES	NO
2.12. Optional literature	1. Panshin, A. J.; de Zeew, 1980: Textbook of wood technology, McGraw-Hill, Inc. 722 str. 2. Schweingruber, F.H., 1990: Anatomy of European woods, Paul Haupt Berne and Stuttgart Publishers, 800 str. 3. Špoljarić, Z.; Petrić, B.; Šćukanec, V., 1969: Višejezični rječnik stručnih izraza u anatomiji drva, Poslovno udruženje šumskoprivrednih organizacija, Zagreb, 85 str. 4. Šumarska enciklopedija, HLZ Miroslav Krleža, Zagreb 5. Pojmovnik hrvatskoga drvnotehnološkog nazivlja (2018) 6. 2019: Vrste drva s naslovnica časopisa Drvna industrija (2019), Šumarski fakultet Sveučilišta u Zagrebu, str. 212.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Danijela Domljan, PhD	1.7. Number of ECTS credits	2
1.2. Course title	Basics of design drawing	1.8. Number of hours in a semester (L+E+F+e-learning)	15+30+0
1.3. Course code	228984	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	Developing basic drawing skills, artistic perception and visual thinking and expression through mastering basic drawing skills. Master the skills of observation, viewing, observation and spatial sketching and drawing, and methods and techniques of transferring three-dimensional to the two-dimensional surface of the paper with clarity of representation of the observed. The aim is to enable students to express their ideas in later years of study creatively and to create a foundation for monitoring the process of design and construction and overall product development.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD; E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Master the methods, techniques and materials of freelance design drawing 2. Master the perception, proportion, composition and observation and analysis of products and spaces and their transfer to paper 3. Analyse and draw the observed object in proportion using different drawing techniques, in spatial dawn (perspective) and orthogonal projection 4. Draw an object according to visual memory with the application of the principle of aesthetic order		

	5. Master critical thinking and visual expression on given examples
2.5. Course content (syllabus)	Introduction to design drawing. Types of graphics and drawing techniques. What is a design drawing? Examples of product development and the role of design drawing. Kroki, functional drawing, conceptual drawing, technical drawing, presentation drawing. Techniques in design drawing. Introduction to the principles of aesthetic order and basic design. Application of methods and motives. Drawing on a given topic. Development of drawing and visual ability, perception, proportions and composition. Drawing on visual memory. Linear display and tonal modulation, graphics, texture, colours. Displaying projection and volume on a surface. Orthogonal projection of objects and spatial representation (perspective). Display of objects of everyday use. Visual interpretation of a given message. Measures and relationships. The relationship between man, object (furniture) and interior (space).
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☐ partial e-learning ☐ fieldwork ☒ independent assignments ☐ multimedia and the internet ☐ laboratory ☐ work with mentor ☒ some of the tasks are performed in a DTO practicum/workshop
2.7. Comments:	

2.8. Monitoring student work									
	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	Mapa radova (crteža)	YES	
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam		NO	ECTS credits (total)	2	

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	Mandatory attendance at lectures and exercises, delivery of materials and accessories and execution of assigned tasks within the set deadline.

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Apah, (2004): Elements and Principles of Design	NO	YES, Merlin
	Arnheim, R. (1974): Art and Visual Perception	NO	YES, Merlin
	Richards, J. Freehand Drawing and Discovery: Urban Sketching and Concept Drawing for Designers	NO	YES, Merlin
	Grey, J., Ardley, S. i sur. (2001): Dizajn stanovanja; Znanje, Zagreb, 2001.	YES	
	Neufert, E. (2000): Elementi arhitektonskog projektiranja, Golden marketing, Zagreb	YES	

2.12. Optional literature	Riley, N. /ed/ (2003): The Elements of Design Panero, J. i Zelnik, M. (1987): Antropološke mere i interijer, Zbirka preporuka za standarde u projektiranju, IRO ''Građevinska knjiga'', Beograd Damjanov, J., (1991) Vizalni jezik i likovna umjetnost" Zagreb, Školska knjiga Bačić, M. i Mirenić Bačić J., (1994) Uvod u likovno mišljenje, Zagreb, Školska knjiga Kraigher Hozo, M.(2008): Metode slikanja i materijali" Sarajevo, Kult-B

	Itten. J.(1973) Umetnost boje, priručnik, Beograd, Umetnička akademija u Beogradu Bogdanović, K.(1986) Uvod u vizuelnu kulturu, Beograd, Zavod za udžbenike i nastavna sredstva Lefteri C. (2014). Materials for Design, UK: Laurence King Publishing, Ltd Ashby, M., Johnson, K.(2002). Materials and Design, The Art and Science of Matreial Selection in Product Design. Oxford, UK: Elsevier Butterworth-Heinemann How to Draw drawing and sketching objects and environments from your imagination: https://www.pdfdrive.com/how-to-draw-drawing-and-sketching-objects-and-environments-from-your-imagination-e158148887.html Open University: Art – Using sketching effectively in design: Drawing, sketching and designing: https://www.youtube.com/watch?v=aqKdUXtJTHg&ab_channel=OpenLearnfromTheOpen University One Day Video: https://www.youtube.com/watch?v=ACoMMj1C94o&ab_channel=OneDayVideo

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović M.Ed., professor of kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 1	1.8. Number of hours in a semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226038	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 Physical and Health Culture aims to acquire theoretical and practical kinesiological knowledge to train students for independent physical exercise and adopt healthy living habits. Through various forms of physical activity, the goal is to meet the daily needs for movement and improve the student population's motor, functional, and cognitive abilities. By attending classes, students are educated about the importance of daily physical exercise and all the good things 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 competencies required for the course	Health status.		
2.3. Learning outcomes at the level of the programme to which the course contributes	E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.		
2.4. Expected learning	1. Describe the structure of the physical exercise class. 2. Explanation of the impact of physical exercise on health.		

<table>
<tr><td>outcomes at the level of the course (3 to 10 learning outcomes)</td><td colspan="9">3. Choose fitness exercises designed to strengthen individual muscle groups.
4. Demonstrate specific exercises concerning kinesiologic activity.
5. Organise 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.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">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 down a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads, relay running, hurdles running different height.
Martial arts
Basic judo techniques - falls, hand throws, belt throws, leg throws, choking techniques, levers;
Basic techniques of karate - kicks, punches, defence.
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 movement, ball technique, cooperation of two and three players, shots on goal from the run, shot on goal after the ball is added, volley, headshots, stopping the ball;
Volleyball - passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, playing technique in attack, playing technique in defence;
Handball - guiding the ball in a straight line and with a change of direction. Passes in place, pass in motion, crosses, passes for counterattacks, cooperation of two and three players, shot on goal after the lead, shot on goal on the added ball.
Racket sports
Badminton - forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand kick under the arm, high serve, backhand serve, short serve, field moves, single play, pair play;
Shooting - classification of shooting disciplines and equipment, weapons maintenance, breathing techniques, air rifle 10 m.
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 to reduce subcutaneous fat, exercises to increase muscle endurance, exercises to increase muscle mass, exercises stretching.
Hiking tours - hiking on flat terrain, hiking tours, interval hiking methods.
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
☐ fieldwork</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></td><td>NO</td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>Mapa radova (crteža)</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>
</table>

	Project		NO	Written exam		NO	ECTS credits (total)	1	
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 exercises.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	1. D. Pavlović (2010): Skripta za studente Šumarskog fakulteta kolegij Tjelesna i zdravstvena kultura				NO		YES, Merlin		
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								

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - II. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Branimir Šafran, PhD Marko Rastija, mag. ing. mech.	1.7. Number of ECTS credits	5
1.2. Course title	Engineering mechanics	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33627	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	The course's main objective is the correct understanding of Newton's three fundamental laws of mechanics and their application to the solution of engineering problems. The students get the ability to analyse any problem logically and straightforwardly. They become able to design mechanical structures, e.g. to determine such cross-sectional and material properties that the structures, subjected to given loading, can perform without failure.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme	A2 - Apply basic laws of physics that present the basis of wood technology, understand Newton's axioms and apply them to solve technical problems, explain phenomena in the field of electrical engineering, and make accurate and optimal use of electric energy;		

to which the course contributes	A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Determine the resultant force of the system of forces acting on a body 2. Calculate the moment of the force around an axis 3. Model the contact forces at the body contact points with the other body and environment 4. Write conditions/equations for the equilibrium of forces acting on a body 5. Calculate reactive forces to keep the body in equilibrium 6. Calculate the force of friction 7. Determine the forces of belt friction 8. Determine axial forces and draw an axial forces diagram for axially loaded rods 9. Determine shear forces and bending moments and draw diagrams of shear forces and bending moments on a beam 10. Calculate twisting moments of torsionally - loaded shaft and draw diagrams of twisting moments 11. Determine stress and deformation of the axially loaded rod 12. Determine shear stress 13. Calculate the stress and deformation of a shaft subjected to torsion 14. Determine bending stress 15. Determine dimensions of cross-sections of structural members based on material strength criteria 16. Examine the stability of columns
2.5. Course content (syllabus)	The course covers the statics of rigid bodies and the strength of the material. The first part contains the fundamental knowledge of statics as follows: the representation of the force and the moment of a force, the reduction of a system of forces, the equilibrium conditions for rigid bodies, free-body diagrams, dry friction, the Coulomb law as a limit case for impending motion, belt friction, internal forces in beams and normal force, shear force and bending moment diagrams. The second part begins with the difference between rigid and deformable bodies and the definition of stress. The stresses in point depend on the orientation of the surface on which they are computed. The stress-strain relationship (Hooke law), the ultimate strength, the allowable stress, the engineering stress, and the safety factor are derived from the material testing. The following lectures are devoted to the analysis of the stresses and of the corresponding deformations in various structural members, considering successively axial loading, torsion and bending. Each analysis is based on the conditions of equilibrium of the forces exerted on the member, the Hooke law, and the member's loading. A large number of examples complements the study of each type of loading. Statically indeterminate problems are solved using the method, which combines the analysis of deformations with conventional analysis of forces used in statics. Finally, the basic concepts of the stability of columns (buckling) are given.
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☐ fieldwork ☐ 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		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits	5	

							(total)			

2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.		
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises. Taking colloquia and exams.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Damić V.: Statika, Hrvatska sveučilišna naklada, Zagreb 2000.		
	Matejiček F., Semenski D., Vnučec Z.: Uvod u statiku sa zbirkom zadataka, Golden marketing, Zagreb 1991.		
	Alfirević I.: Nauka o čvrstoći, Tehnička knjiga, Zagreb 1989.		
2.12. Optional literature	1. Beer F., Johnston R.: Vector Mechanics for Engineers, Statics, McGraw-Hill, New York 1988. 2. Beer F., Johnston R.: Mechanics for Materials, McGraw-Hill, New York 1992.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	1. Prof. Marilena Idžojtić, PhD 2. Asst. Prof. Igor Poljak, PhD 3. Antonio Vidaković mag. ing. silv.	1.7. Number of ECTS credits	3
1.2. Course title	The basics of dendrology	1.8. Number of hours in a semester (L+E+F+e-learning)	15+30+0
1.3. Course code	33628	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 students acquire theoretical and practical knowledge about economically most important autochthonous and allochthonous tree species. The theoretical knowledge includes biological features, morphological characteristics, intra-species variability, natural range, special characteristics, as well as the economic and ecological importance of species. Practically, the students acquire the ability to recognise tree species based on different morphological characteristics: habit, bark, leaves, twigs of deciduous species in winter, flowers, fruits and seeds.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course	B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and		

<table>
<tr><td>contributes</td><td colspan="9">practical knowledge of commercially important indigenous and foreign species of wood and shrubbery.</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. To define and explain biological features and morphological characteristics of the selected genera of autochthonous and allochthonous gymnosperms and angiosperms;
2. To identify and describe economically important autochthonous and allochthonous gymnosperm and angiosperm tree species according to bark, twigs and buds in winter, leaves, cones, fruits and seeds;
3. To use determination keys;
4. To group autochthonous and allochthonous gymnosperm and angiosperm tree species according to biological features, morphological characteristics, distribution and economic importance;</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Basic botanical and dendrological definitions essential for understanding the subject.
Biological features, morphological characteristics, number of species and the natural range of some of the genera of gymnosperms and angiosperms. Morphological characteristics, natural range, special characteristics and economic and ecological importance of individual species among these genera. The genera belong to the following families: Pinaceae, Taxodiaceae, Taxaceae, Platanaceae, Ulmaceae, Moraceae, Juglandaceae, Fagaceae, Betulaceae, Tiliaceae, Salicaceae, Rosaceae, Fabaceae, Myrtaceae, Hippocastanaceae, Aceraceae, Simaroubaceae and Oleaceae.
The subject covers the economically most important autochthonous and allochthonous tree species, and the topics of the lectures follow a systematic order.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</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>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></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 responsibilities</td><td colspan="9">Regular attendance at lectures and exercises. Making and submitting exercises. Collection, production and delivery of herbariums. Making and taking homework. Taking 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., 2005: Listopadno drveće i grmlje u zimskom razdoblju. Šumarski fakultet Sveučilišta u Zagrebu. 256 pp.</td><td colspan="2">YES</td><td colspan="2"></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>
</table>

2.12. Optional literature	1. Anić, M., 1946: Dendrologija. Šumarski priručnik I, Zagreb. 475-582 pp. 2. Bean, WJ, 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.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Anka Ozana Čavlović, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Applied technical graphics	1.8. Number of hours in a semester (L+E+F+e-learning)	15+45+0
1.3. Course code	228985	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	1.10. Level of application of e-learning (level 1, 2, 3)	2
1.5. Course type	Compulsory	1.11. Language of instruction	Croatian
1.6. Year of the study	1	1.12. Possibility of instruction in English	NO

2. COURSE DESCRIPTION	
2.1. Course objectives	Students acquire basic knowledge of orthogonal and 3D projection. This course offers all elements of technical drawing and geometrical basics needed for using the AutoCAD drawing computer program. Through drawing, students practice technical perception and proportional transfer of seen or imagined objects.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD; E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Apply the technical standards of orthogonal projection drawing (T, N, B, T1, N1, B1) (type of lines, technical letter, paper format, scale, dimensioning) according to the given 3D sketch or model measurement; 2. Apply the technical standards for drawing the cross-sections; 3. Apply basics of drawing program AutoCAD (templates, drawing tools and modify tools, text writing and dimensioning, print); 4. Construction model sketch in isometric, oblique dimetric projection;

<table>
<tr><td></td><td colspan="9">5. Construction perspective projection of model and room with one or two points of view.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction to AutoCAD computer drawing program. Introduction to drawing domain, selection line and tools, dialogue frames. Measure standard. Choice of drawing units. Paper area placement, drawing limits and measure units. Line type and layer properties orders. Introduction to x,y coordinates systems of AutoCAD – WCS and UCS. Absolute and relative coordinate system. Orthogonal drawing and tools. Movement, selection, and modification of drawing orders. The point, line, construction line and ray drawing. Cutting, copying and moving of object orders. Trimming, stretching and extending of object orders. Text creation, text style, one or two-line text writing. Polygons and curves drawing with AutoCAD. Dimension lines, layout and print order. Orthogonal projection, sections A-A, B-B, C-C. 3D projection. Introduction to x,y,z coordinates system for isometric, dimetric and oblique projection. 3D projection of basic geometry objects determined by orthogonal projection. Isometric drawing of basic and complex geometry objects with AutoCAD. Central projection. Perspective construction of a point. Perspective construction of basic geometry objects. Perspective construction of a room determined by orthogonal sections</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ computer classroom</td><td colspan="3">2.7. Comments:
The lecture on a specific topic must precede the exercise in which the lecture's content is applied.</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></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 within the set deadline. Taking exam.</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="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Čavlović, A.O.: Uvod u AutoCAD 2018, interna skripta, 2019.</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="4">A.O.: Primijenjena tehnička grafika, revidirani nastavni materijal, 2012.</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="4">Prekrat, S., Čavlović, A.O.: Osnove 3D modeliranja dijelova i sklopova namještaja i drvnih proizvoda, nastavni materijal, 2021.</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">Kljajin, M., Opalić, M. (2012) Inženjerska grafika. Osijek: Strojarski fakultetu Slavonskom brodu i Grafika d.o.o.
Kljajin, M., Karakašić M. (2012) Modeliranje primjenom računala. Osijek: Strojarski fakultetu Slavonskom brodu i Grafika d.o.o.</td></tr>
</table>

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Branimir Šafran, PhD Marko Rastija, mag. ing. mech.	1.7. Number of ECTS credits	5
1.2. Course title	Wood industry mechanical engineering	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33630	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	It is specific for this course that it involves parts of technical knowledge aimed at acquiring proficiency in procedures and processes of the woodworking industry - means of work means for handling supplies, gaining competence in their maintenance, getting familiar with ways of accreditation/certification, scope and possibilities of the basic components of technology and mechanisation as comprehensive means of work and woodworking production. Within the programme framework, the skill in mastering the practical side of this activity will also be developed by use of control measurements, calculations, testing, etc.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A3 - Competently maintain, work with and use the possibilities of basic technical components; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define mechanical properties and testing 2. Compare effects of heat and chemical-heat treatment of steel on a dynamic load of machine elements 3. Analyse the use of tool steels and new materials in production phases of mechanical processing 4. Identification of connecting elements, power and motion transmission elements 5. Calculate load magnitude at non-separable and separable joints 6. Check main quantities in work with rotation motion elements, peripheral and angular velocity, speed frequency, torque 7. Calculate power transfer elements by friction and engagement 8. Construct machine elements and define their application 9. Apply basic technical criteria for designing and dimensioning machine elements (factor of safety) 10. Analysis of piping, stop, safety and regulating organs from the point of pressure loss 11. Compare fusion and force (friction) welding methods in WI plants and calculation of stress in welded joints 12. Check and compare working features of turbopumps on Q - H, Q – η, Q – P diagrams 13. Differ types and characteristics of turbine plants in WI plants 14. Analyse the operation of the internal combustion engine from the standpoint of energy consumption considering the travelled distance 15. Describe existing energy problems in WI and make plans for the application of renewable energy sources (forest biomass)

<table>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Classification of mechanical engineering and machines. SI units in WI mechanical engineering. Properties of metal materials and the ways of testing mechanical properties. Metal materials for the building of wood industry tools and products. Classification of engineering iron: steel, cast iron. The most common steels in the building of WI-tools and products. Heat treatment and chemical and heat treatment of steels. Light and non-ferrous metals and their properties. Application in the building of WI-products. Engineering ceramics, hard metals, composite materials, metal foams, polymers – properties and application. Friction and lubrication of WI-devices. Lubricants. The quality of lubricants. Devices for oil and grease lubrication. Tolerances and joint tolerances. Tolerances of shape and position. Properties and the quality of the treated surface. Connecting elements. Separable and non-separable joints. Rotary motion elements. Axles and shafts and their design. Journals. Sliding and rolling bearings. Couplings. Flat belt, V-belt and time belt drives. Chain drive. Friction drives. Gears. Types of gears, their shapes, transmissions, efficiency, lubrication, and materials used to manufacture gears. Worm drives. Piping. Flow regulation elements and pressure regulation elements. Mechanical engineering technologies in WI. Processes of welding and allied processes. Soldering. Sticking to metals. Machining metals and special facing methods. Fundamental laws of fluid mechanics. Fluid machinery in WI. Suction pump. Performances of turbine pumps. Hydraulic motors. Radial and axial ventilators. Air (pneumatic) motor drives. Compressors: features and types of compressors in WI. Internal combustion engines. Steam generators in WI. Heat pumps. Potential application in WI. Types and properties of turbine plants in WI plants. Application. Overview of power issues in the wood industry.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</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>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 and exercises, preparation and submission of exercises within the set deadline. Taking 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">Perše, S. 2000: Osnove strojarstva, Sveučilište u Zagrebu, Fakultet prometnih znanosti, Zagreb.</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="5">Karl-Heinz Decker, 1987: Elementi strojeva, Tehnička knjiga Zagreb.</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="5">Ražnjević, K. (ured.) 1997: Krautov strojarski priručnik, Axiom, Zagreb</td><td colspan="2"></td><td colspan="2"></td></tr>
</table>

	Alfirević, I., Modlić, B. (ured. biblioteke): IP 1 –... Inženjerski priručnik, ŠK, Zagreb, izabrana poglavlja		
2.12. Optional literature	1. Dubbel Taschenbuch für den Maschinenbau, Springer. 2. Filetin, T., Kovačiček, F., Indof, J. 2002: Svojstva i primjena materijala, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje. 3. Franz, M. 1998: Mehanička svojstva materijala, FSB. 4. Kralj, S., Andrić, Š. 1992: Osnove zavarivačkih i srodnih postupaka, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje. 5. *** Izabrana poglavlja iz TE, LZ "Miroslav Krleža", Zagreb, sv. 1-12.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Kristijan Radmanović, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Fundamentals of electrotechnics	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33631	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	The basis of power-generating energy of woodworking machinery and illumination is electrical energy. Reasonable management requests optimally make use of electrical energy. This calls for knowledge of the fundamental laws of electrical engineering.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A2 - Apply basic laws of physics that present the basis of wood technology, understand Newton's axioms and apply them to solve technical problems, explain phenomena in the field of electrical engineering, and make accurate and optimal use of electric energy; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; B4 - Apply technical knowledge to master wood industry procedures and processes, means of work and material handling methods; B5 - Organise transport of wood and wooden materials, calculate and adjust the capacities of means of transport with technological procedures, calculate and analyse energy consumption, and recommend solutions for less complex wood and wooden material transport projects.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define Coulomb's law and explain the meaning of the constants in the expression for the Coulomb force. 2. Name and describe the physical quantity which describes the electric field. 3. Apply the Gaussian law, for example, to determine the electric field of charged metal spheres, plates and capacitors.		

<table>
<tr><td></td><td colspan="9">4. Analyse the serial and parallel condenser connections.
5. Explain the capacity of the capacitor and the role of the dielectric at the capacitor.
6. Describe direct current sources. Demonstrate Kirchoff's rules on an arbitrary example.
7. Analyse complex current circuits of direct current. Explain the occurrence of magnetism and electromagnetic induction.
8. Use the right-hand rule to determine the direction of Amper and Lorentz's force.
9. Appoint and describe the physical size of the alternating current with appropriate current and effective values.
10. Analyse the RLC titre circle and explain the role of each element in the circle
11. Distinguish the alternating current's active, reactive, and apparent power.
12. Explain the principle of electric motor and generator operation. Analyse the three-phase system. Interpret electrical measurements in woodworking plants.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction. Electrical units. Electrostatic field. Work and voltage. Capacitance. Conductors, insulators and semi-conductors. Effects of el. current. Electric circuit. Ohm's law. Connection of resistors and sources. Work and Power of an electric current. Kirchoff's laws. Electrochemical cells. Electromagnetism. Magnetic field; Magnetic fields of currents, Magnetic properties of a substance; Move in the magnetic field. Electromagnetic induction; Self-induction. Alternating current: Generation and effective value; Alternating-current circuit (ohmic resistance, inductive and capacitive reactances); Electric oscillations (resonances); High-frequency generator; Power, power factor, reactive energy. Three-phase systems. Electric machines: Direct-current generators and motors; Protections; Transformers; Synchronous machines; Induction machines; Polyphase induction motors; Single-phase induction motors. Illumination: Luminous intensity; Electric lamps (bulbs, fluorescent lamps); Quality and quantity of illumination. Electronic converters. Electric measurements of electrical quantities in Wood industrial plants.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</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>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. Taking colloquia and 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="3">Availability via other media</td></tr>
<tr><td></td><td colspan="4">M. Essert, J. Grilec, „Elektricitet i magnetizam“ FSB Zagreb 2009</td><td colspan="2">NO</td><td colspan="3">Online edition</td></tr>
<tr><td></td><td colspan="4">Ivan Mandić, Veselko Tomljenović, Milica Pužar, „Sinkroni i asinkroni električni strojevi“, TVZ Zagreb 2012.</td><td colspan="2">NO</td><td colspan="3">Online edition</td></tr>
</table>

	Ivan Felja, Danira Koračin „Zbirka zadataka i riješenih primjera iz osnova elektrotehnike“ (1. i 2. dio), Školska knjiga Zagreb, 1992.	YES	
2.12. Optional literature	1.Borislav Kuzmanovič „Osnove elektrotehnike“, Element 2000. 2.Eugen Stanić „Osnove elektrotehnike“, Školska knjiga Zagreb 2007. 3. R. Stojanović: ''Zbirka zadataka iz osnova elektrotehnike'', Školska knjiga, Zagreb, 2005.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Tomislav Sinković, PhD Asst. Prof. Tomislav Sedlar, PhD Branimir Jambreković mag. ing. techn. lign.	1.7. Number of ECTS credits	7
1.2. Course title	Technical properties of wood I	1.8. Number of hours in a semester (L+E+F+e-learning)	45+60+0
1.3. Course code	Prof. dr. sc. Tomislav Sinković Doc. dr. sc. Tomislav Sedlar Branimir Jambreković mag. ing. techn. lign.	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 aims to acquire basic knowledge about commercial types of wood. Parts and shapes of the tree. Macroscopic and physical properties of wood. Arrangement of macroscopic and physical properties of wood within trees and trees. Basic knowledge is required as prior knowledge for basic wood technology processes of wood processing.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Determine parameters essential for the identification of commercial wood species, tree parts and tree modifications; 2. Defining the structure of wood as a factor in the properties of wood; 3. Wood cross-sectional properties; 4. Defining and determining the physical properties of wood; 5. Defining and determining the most significant factors that affect the physical properties of wood; 6. Defining the distribution of physical properties of wood in the radial direction.		
2.5. Course content (syllabus)	Introduction to commercial tree species. Segments and shape of the tree. Factors, types and modifications of the tree. Elemental composition of wood and their influence on wood properties. The wood structure as a feature of wood properties. Properties of wood sections. Sapwood and heartwood. Classification. Process of heartwood forming. Earlywood and		

<table>
<tr><td></td><td colspan="9">latewood and participation of latewood. The closeness of grain. The colour and lustre of the wood. The odour of wood. Wood texture. The density of wood matter. Wood density. Procedures for determining wood density. Wood density factors. Density distribution in timber and wood. Binding water to wood. Free and bound water in the wood. Methods for determining the moisture content in wood. Wood moisture conditions. Distribution of moisture content in wood and wood products. The gradient of moisture content in wood. Adsorption and desorption. Hygroscopic balance. Fibre saturation point. Maximum moisture content in wood. Shrinkage and swelling of the wood. Anisotropy of shrinkage and swelling. Specific heat of wood. Heat conductivity in wood. Electrical conductivity of wood. Dielectric and piezoelectric properties of wood. Speed and sound resistance in wood. Attenuation and resonance of sound in wood. Arrangement of physical properties in wood. Diversity of physical properties between trees of the same type of wood. Comparison of physical properties of wood for domestic and foreign commercial types of wood.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</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>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></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 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 at classes and exercises and preparation and submission of exercises within the set deadline. Taking 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">Horvat, I.: Tehnologija drva I, skripta, Zagreb, 1976, str. 1-680.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">Horvat, I. i drugi: Osnove nauke o drvu, Zagreb, 1985, str. 28-66.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">Karahasanović, A.:Nauka o drvetu, Sarajevo 1988, str. 1-426.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td colspan="4">Ugrenović,A.; Horvat,I.: Tehnologija drveta, Zagreb, 1950, str. 1-502.</td><td colspan="3">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Giordano, G.: Tecnologia del legno, Volume I, Torino, 1971, str. 1-1086.
2. Giordano, G.: Tecnologia del legno, Volume 111, Torino, 1976, str. 1-1351.
3. Kollmann F. R., Cote, W A Jr Principles of Wood Science and Technology I solid Wood, New York, 1968, str. 1-592.
4. Tsoumis, G.: Science and Technology of Wood, New York,1991, str. 1-233.</td></tr>
</table>

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović M.Ed., professor of kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 2	1.8. Number of hours in a semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226042	1.9. Expected enrolment in the course	70
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 Physical and Health Culture aims to acquire theoretical and practical kinesiological knowledge to train students for independent physical exercise and adopt healthy living habits. Through various forms of physical activity, the goal is to meet the daily needs for movement and improve the student population's motor, functional, and cognitive abilities. By attending classes, students are educated about the importance of daily physical exercise and all the good things 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 competencies required for the course	Health status.
2.3. Learning outcomes at the level of the programme to which the course contributes	E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
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. Explanation of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises concerning kinesiologic activity. 5. Organise 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)	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 down a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads, relay running, hurdles running different height. Martial arts Basic judo techniques - falls, hand throws, belt throws, leg throws, choking techniques, levers; Basic techniques of karate - kicks, punches, defence.

<table>
<tr><td></td><td colspan="9">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 movement, ball technique, cooperation of two and three players, shots on goal from the run, shot on goal after the ball is added, volley, headshots, stopping the ball;
Volleyball - passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, playing technique in attack, playing technique in defence;
Handball - guiding the ball in a straight line and with a change of direction. Passes in place, pass in motion, crosses, passes for counterattacks, cooperation of two and three players, shot on goal after the lead, shot on goal on the added ball.
Racket sports
Badminton - forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand kick under the arm, high serve, backhand serve, short serve, field moves, single play, pair play;
Shooting - classification of shooting disciplines and equipment, weapons maintenance, breathing techniques, air rifle 10 m.
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 to reduce subcutaneous fat, exercises to increase muscle endurance, exercises to increase muscle mass, exercises stretching.
Hiking tours - hiking on flat terrain, hiking tours, interval hiking methods.
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
☐ fieldwork</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>Mapa radova (crteža)</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 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 exercises.</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">1. D. Pavlović (2010): Skripta za studente Šumarskog fakulteta kolegij Tjelesna i zdravstvena kultura</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">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)</td></tr>
</table>

	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

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - III. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Igor Đukić, PhD Juraj Jovanović mag. ing. techn. lign.	1.7. Number of ECTS credits	6
1.2. Course title	Woodworking machinery I	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+16
1.3. Course code	239450	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 the knowledge for selecting, optimal usage and maintenance of tools and machinery for wood processing. Acquiring the basics required for assigning project tasks to the manufacturers of special equipment for wood processing.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	C1 - Analyse the wood cutting process, select, optimally use and maintain primary process machinery, select machinery working regimes and tools for final wood processing, and recommend project assignments to special equipment manufacturers.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Distinguish characteristic types of woodworking machines and tools with and without forming wood shavings (saw blades, circular saw blades, planers, mills, drills, lathes). 2. Explain the term elementary blade and sketch the basic geometrical cutting edge elements. 3. Explain the difference between elemental and real blades. 4. Identify the basic forms of tool-tip blunting and distinguish the causes of wear that cause some form of blunting. 5. Differentiate the basic materials for making tool blades (tool steel, high-speed steel, hard alloy, hard metals, artificial diamonds) and the basic properties essential for woodworking (strength, hardness, temperature stability). 6. Group influential variables on a tool-tip lifetime in different processing conditions and analyse their mutual relationship. 7. Sketch and analyse forces on the tool-tip. 8. Explain the role of individual cutting edge elements during cutting. 9. Identify wood properties and tool-tip characteristics that affect the cutting process. 10. Identify the basic types of wood shavings in mechanical woodworking and identify the causes of the formation of a particular type of shaving.		

<table>
<tr><td></td><td colspan="9">11. List the influential parameters and calculate the specific cutting resistance in processing conditions.
12. Calculate the technological parameters for basic types of woodworking machines
13. Calculate the cutting forces in basic types of woodworking machines
14. Calculate the cutting power and electric motor power required for basic types of woodworking machines
15. Calculate the capacity of basic types of woodworking machines
16. Sketch the basic woodworking tools (saw blades, circular saw blades, milling cutter, drill bit) with all the essential elements (tool diameter, tool blade angles, etc.).</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Basic terms. Elements and angles of a cutting tool. Real cutting edge. Tool life. Tool wear and tool wear types. Methods for increasing tool life. The influence of the tool wear on the crucial cutting parameters. Materials for woodworking tools. The cutting of wood. The properties of wood influence the cutting process. Models of wood cutting. Cutting forces. Work done, cutting power, specific cutting energy and cutting resistance. The influencing parameters on specific cutting resistance. Basic kinematics relations during sawing. Band saws. The band saw blade. Sawing quality. Frame saw. Kinematics. Frame saw blade. Saw blade lateral stability and cutting quality. Circular saw. Circular saw blade. Machine for planing and moulding, turning machines, machines for boring and mortising, sanding machines – tools, kinematics cutting quality and efficiencies. Presses.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>(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="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. Taking colloquia, exams.</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">Goglia V. (1994) STROJEVI I ALATI ZA OBRADU DRVA – I dio, Šumarski fakultet Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Zupčević R. (1988) MAŠINE ZA OBRADU DRVETA I dio, TEORIJA REZANJA, Mašinski fakultet Sarajevo</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Ettelt, B.; Gittel, H (2004): Sägen, Fräsen, Hobeln, Bohren - Die Spanung von Holz und ihre Werkzeuge, DRW-Verlag</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Lisičan J. (1996) TEORIJA A TECHNIKA SPRACOVANIA DREVA, MAT-CENTRUM, Zvolen</td></tr>
</table>

	2. Williston E. M. (1978) SAWS – design, selection, operation, maintenance, Miller Freeman, S.Francisco 3. Šavar Š. (1990) OBRADA METALA ODVAJANJEM ČESTICA Svezak 1, Školska knjiga Zagreb 4. Šavar Š. (1990) OBRADA METALA ODVAJANJEM ČESTICA Svezak 2, Školska knjiga Zagreb

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Tomislav Sedlar, PhD Prof. Tomislav Sinković, PhD Branimir Jambreković mag. ing. techn. lign.	1.7. Number of ECTS credits	5
1.2. Course title	Technical properties of wood II	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+16
1.3. Course code	239398	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 course aims to acquire basic knowledge about the mechanical properties of wood, the distribution of mechanical properties of wood within the stem and within trees, wood defects and the impact of defects on the mechanical properties of wood. Basic knowledge is required as prior knowledge for the technology of wood processing.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Introduction to measuring instruments for determining the mechanical properties of wood 2. Determination of mechanical properties of wood 3. Evaluation of wood species based on mechanical properties of wood 4. Defining the radial distribution of mechanical properties of wood and their impact on further processing and use of wood 5. Defining wood defects on trees and round wood 6. Practical recognition and valorisation of wood defects on trees and round wood		
2.5. Course content (syllabus)	Mechanical properties of wood. Introduction to measuring instruments and devices for determining the mechanical properties of wood. Tensile strength of wood. The compressive strength of wood. Bending strength of wood. The twisting strength of wood. Wood splitting		

<table>
<tr><td></td><td colspan="9">strength. Impact strength of wood. The hardness of wood. Wear resistance of wood. Wood elasticity. Determination of wear resistance of wood in domestic and foreign commercial wood species. Factors affecting the mechanical properties of wood. Arrangement of mechanical properties in stem and trees. Comparison of mechanical properties of domestic and foreign commercial wood species. Rheological properties of wood. Wood defects. Classification. Wood defects caused by weather conditions. Wood defects caused by irregularities in the shape of the tree and the anatomical structure of the wood. Wood defects caused by physical and mechanical influences, changes in colour and consistency of wood. Effect of wood defects on mechanical properties of wood.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>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></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 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. Doing exercises and taking colloquia and exams.</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">Horvat, I.: Tehnologija drva I, skripta, Zagreb, 1976, str. 1-680.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Horvat,I. i drugi: Osnove nauke o drvu, Zagreb, 1985, str. 28-66</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Karahasanović, A.:Nauka o drvetu, Sarajevo 1988, str. 1-426.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Ugrenović,A.; Horvat,I.: Tehnologija drveta, Zagreb, 1950, str. 1-502</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1.Giordano, G.: Tecnologia del legno, Volume I, Torino, 1971, str. 1-1086.
2.Giordano, G.: Tecnologia del legno, Volume 111, Torino, 1976, str. 1-1351.
3.Kollmann F. R., Cote, W A Jr Principles of Wood Science and Technology I solid Wood, New York, 1968, str. 1-592.
4.Tsoumis, G.: Science and Technology of Wood, New York,1991, str. 1-233.
5. Walter, F.: Pruftechnikin der Holzindustrie, Leipzig, 1977, str. 1-318.</td></tr>
</table>

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Marin Hasan, PhD	1.7. Number of ECTS credits	7
1.2. Course title	Pathology and wood protection	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+16
1.3. Course code	239400	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 skills in identifying the most important wood pests and wood decay fungi and recognising all damages produced by mentioned organisms. The establishing of knowledge about the basic principles of wood protection (the purpose of the wood protection and preservation, application of preventive and repressive methods and preservatives, and the influence of physical, chemical and anatomycal properties of wood on the wood preservation).
2.2. Enrolment requirements and/or entry competencies 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 xylophagous bacteria, insects, fungi and marine borers, and determine flaws on wood incurred due to their activity; learn the basic principles of wood protection based on physical, chemical and structural properties of wood, and apply basic procedures and methods for wood protection
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Explain which chemical components of the wood structure and how they affect the wood's natural resistance. 2. Distinguish the natural resistance from the natural durability of wood and define them. 3. Analyse and describe the degree of degradation of wood by abiotic factors. 4. Differentiate and explain defects in wood's structure and physical properties resulting from the degradation of abiotic factors from defects caused by biodegradation of wood. 5. Differentiate and explain the bacterial degradation of wood from fungal degradation. 6. Differentiate and explain the defects in wood's structure and physical properties resulting from the degradation of wood by certain groups (types, species) of wood-decaying fungi. 7. Identify and distinguish insects from other arthropods. 8. Identify and distinguish between commercially the most important species of xylophagous insects based on morphological images of adult insects. 9. Differentiate and describe defects in the structure of wood caused by degradation of certain groups, genera and/or insect species. 10. Differentiate and describe defects in the structure of wood caused by the degradation of individual groups, genera and/or species of marine pests. 11. Analyse and describe the degree of degradation of wood caused by xylophagous organisms and assess the risk of using such wood in the manufacture of wooden products. 12. Predict the mechanism of degradation of wood in certain use classes. 13. Recommend an appropriate wood protection procedure under the given conditions. 14. Independently write a report and present it before a group of people.
2.5. Course content (syllabus)	Introduction to the history of wood protection and character and role of other fundamental courses involved in the wood protection. The role of natural wood durability in wood protection. Degradation and biodegradation of wood, generally. Biological causes;

<table>
<tr><td></td><td colspan="9">morphology, anatomy, physiology, ecology, divisions and most significant representatives. Wood decay and succession: bacteria, rotting wood fungi (moulds, blue stain, soft rot fungi, basidiomycetes – decay fungi). Wood pests; primary, secondary, tertiary and quarternary insects (Coleoptera – wood-boring insects and Isoptera – termites). Marine borers. The use of physical and structural characteristics of wood in the wood preservation (porosity, permeability, diffusion, sapwood, heartwood). The fundamentals about the division and use of wood protection methods (preventive and repressive methods, surface and deep protection). Traditional preservation methods without pressure (brushing, spraying, dipping, hot-and-cold open tank processes, diffusion, penetration, absorption, adsorption), and Pressure treatment methods (full-cell method, empty-cell method, double vacuum process, penetration, max. & min. absorption & retention). Wood preservatives (traditional and new inorganic and organic preservatives, fumigant gases), the properties of wood preservatives (water repellency, vapour permeability, adhesion and its use (wood in interior and exterior, wood in the ground and above ground contact, hazard classes, penetration classes, retention classes).</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>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>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">Regular attendance and active participation in lectures and exercises. Taking colloquia and 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">Hasan, M., Despot, R. 2018: Zaštita drva I, Abiološki čimbenici, lignikolne bakterije i gljive, ksilofagni kukci i morski štetnici – skripta za studente drvne tehnologije iz predmeta Zaštita drva I i Patologija drva. Sveučilište u Zagrebu, Šumarski fakultet, Zagreb, 2018.</td><td colspan="2">YES</td><td colspan="2">YES, Merlin</td></tr>
<tr><td></td><td colspan="5">Špoljarić, Z. 1973: ZAŠTITA DRVA (Impregnacija), skripta za slušače DT odsjeka VII stupnja nastave Šumarski fakultet Zagreb, 1973.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="5">Glavaš, M. 1999: GLJIVIČNE BOLESTI ŠUMSKOG DRVEĆA. Sveučilište u Zagrebu, Šumarski fakultet, Zagreb, 1999. (odabrana poglavlja).</td><td colspan="2">YES</td><td colspan="2"></td></tr>
</table>

2.12. Optional literature	Vasić, K. 1971: ZAŠTITA DRVETA 1: KSILOFAGNI INSEKTI, Naučna knjiga, Beograd, 1971 (odabrana poglavlja). Petrović, M. 1980: ZAŠTITA DRVETA 2: TRULEŽ I OBOJENOST DRVETA, Naučna knjiga Beograd, 1980. (odabrana poglavlja). Zbornici radova s međunarodnih savjetovanja WOOD IN THE CONSTRUCTION INDUSTRY,(Despot, R. i Jambreković, V. Editors); (2000, 2001, 2002, 2003 i 2004), Zagreb: Šumarski fakultet. Eaton, R.A., Hale, M.D.C.1994: WOOD, DECAY, PESTS AND PROTECTION, Chapman & Hall, 1994. United Kingdom. Bravery, A.F., Berry, R.W., Carey, J.K., Cooper, D.E.1992: RECOGNISING WOOD ROT AND INSECT DAMAGE IN BUILDINGS, BRE Bookshop, Seconfd edition, 1992. Garston, Watford, United Kingdom.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Josip Ištvanić, PhD	1.7. Number of ECTS credits	6
1.2. Course title	Sawmilling technology	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+8
1.3. Course code	236171	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	Sawmilling products, knowledge of sawmilling raw materials and practical abilities for their gradings and measurements. Knowledge and use of sawmilling machines, sawmilling technologies, sawing logs and sawn wood methods. Knowledge of sawmilling technology efficiency criteria.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C1 - Analyse the wood cutting process, select, optimally use and maintain primary process machinery, select machinery working regimes and tools for final wood processing, and recommend project assignments to special equipment manufacturers; C2 - Recognise and assess sawmilling raw material and products, conduct the categorisation and measurements of sawmilling raw material and products, apply basic skills of wood sawmilling technology and techniques of log and board sawing, and identify factors of successful sawmilling wood processes; D1 - Plan and organise the time study, work rationalisation, and perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate basic business KPIs, write basic financial reports, recognise types of expenses.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning	1. Distinguish the type and quality of oak, beech, fir and spruce sawmilling raw material 2. Distinguish the type and quality of oak, beech, fir and spruce sawmilling products 3. Measure the dimensions of the round wood (diameter and length)

<table>
<tr><td>outcomes)</td><td colspan="9">4. Calculate individual volumes of round wood shavings based on the measurement of their dimensions (diameter and length)
5. Estimate (calculate) the volume of the stack, or the volume of the round wood in the stack
6. Calculate individual volumes of sawmilling products by measuring their dimensions (thickness, width and length)
7. Estimate the (computed) volume of the stack, or the volume of sawmilling products in the stack
8. Calculation of oversizes on sawmilling products
9. Distinguish types and application of log band saws and resaws
10. Distinguish the types and application of the frame saws
11. Distinguish types and application of circular saws
12. Distinguish types and applications of secondary sawing circular saws specializing in cross-cut sawing
13. Different types and applications of secondary sawing circular saws specializing in rip sawing
14. Link different types of sawing machines to sawmilling technology,
15. Calculate the success of sawing of certain wood species according to the criteria of the quantitative yield of round and sawn wood,
16. Calculate the success of sawing of certain wood species according to the criteria of value yield of round and sawn wood
17. Use the basic methods of sawing logs
18. Use the basic methods of sawing the planks
19. Plan and organize day-to-day sawmilling production.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction to sawmilling production. Short overview of a sawmilling history. Importance of the sawmilling industry. Sawmilling raw materials. Variety of sawmilling raw materials. Measurement of round wood. Quality and characteristic defects of our most important wood species. Standard rules for sawmilling logs. Sawmilling products and residues. Main characteristics of sawn wood. Defects of sawn wood. Measurement of sawn wood. Oversizes of sawn wood. Sawmilling plant. Main parts of the sawmilling plant. Other parts of sawmilling parts. The shape of the sawmilling plant. Location of the sawmilling plant. Size of the sawmilling plant. Sawmill capacity. Major sawmill machinery. Vertical log band saws and resaws. Other types of log band saws. Frame saws. Circular saws. Log chipping machines. Selection and working conditions of sawmill machines. Criteria for selection of sawmill machines. Significance of sawmill machines for the quantity and quality yield of logs. The capacity of major sawmill saws. Production and technological process in a sawmill. Production flow and technical charts processing fir and spruce logs and hardwood logs. Log conversation methods. Conversation of logs by chipping methods. Other methods of log conversation. Sawn wood conversation methods. Methods of sawing of more important wood species. Recovery of the saw logs. Factors affecting log yield.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</td><td colspan="3">☒ independent assignments
☒ multimedia and the internet
☐ laboratory
☐ work with mentor
☐ (other)</td><td colspan="3">2.7. Comments:
Presentations, parts of the literature, exercise templates, instructions, task examples, links and other materials are available on the Merlin e-learning system.</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></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</td><td>6</td><td></td></tr>
</table>

							(total)			

2.9. Assessment methods and criteria	Assessment is conducted in accordance with Assessment methods and criteria for the current academic year.		
2.10. Student responsibilities	Regular attendance and active participation in lectures and exercises. Taking colloquia and exams.		
2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Brežnjak, M. 1997: Pilanska tehnologija drva, I dio, Udžbenik, Sveučilište u Zagrebu, Šumarski fakultet (odabrana poglavlja).	NO	YES, Merlin
	Brežnjak, M. 2000: Pilanska tehnologija drva, II dio, Udžbenik, Sveučilište u Zagrebu, Šumarski fakultet (odabrana poglavlja).	YES	YES, Merlin
	Dević, I.; Ištvanić, J., 2003: Alati i strojevi u obradbi drva 1, Element, Zagreb. (odabrana poglavlja)	YES	
	Goglia, V. 1994: Strojevi i alati za obradu drva I dio, Sveučilište u Zagrebu, Šumarski fakultet. (odabrana poglavlja)	NO	
2.12. Optional literature	1.Merzelj, F. 1996: Žagarstvo: Udžbenik, Kmečki glas, Ljubljana. 2.Gornik Bučar, D.; Merzelj, F. 1998: Žagarski praktikum, Univerza v Ljubljani, Biotehniška fakulteta, Oddelek za lesarstvo. 3.Nikolić, M. 2004: Prerada drveta na pilanama, udžbenik, Univerzitet u Beogradu, Šumarski fakultet, Beograd		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Ružica Beljo Lučić, PhD Asst. Prof. Matija Jug, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Transport equipment in wood industry	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+16
1.3. Course code	239685	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	This course aims to acquire basic technical and technological knowledge related to monitoring and control of the work of transport equipment in the wood industry, as well as to assess and adapt the capacity of means of transport and their coordination with technological procedures. The course provides primary ground for solving less complex tasks and issues related to the transport of wood and wooden materials.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		

2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications; B4 - Apply technical knowledge to master wood industry procedures and processes, means of work and material handling methods; B5 - Organise transport of wood and wooden materials, calculate and adjust the capacities of means of transport with technological procedures, calculate and analyse energy consumption, and recommend solutions for less complex wood and wooden material transport projects.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Calculate the basic characteristics of transported materials in the wood industry that are important for transport and storage: volume, mass, density, bulk density, bulk angle, and granulation. 2. Analyze influential factors on the basic characteristics of transported materials. 3. Calculate the required capacity of transport equipment in the woodworking and processing industry: conveyors capacity (belt conveyors, scraper conveyors, elevators, roller conveyors, chain conveyors), cranes and industrial vehicles depending on the parameters of the technical processing of wood. 4. Evaluate the transport losses expressed in percentage relative to the transported weight. 5. Calculate the required driving power of the transport equipment in the woodworking process. 6. Calculate the dimensions (diameter, cross-sectional area) and select the steel rope and chain components according to the appropriate standards depending on the load weight, rope and chain strength, and load mode. 7. Control the operation of the air conveyor system – determine static pressure drop in the system, dynamic pressure, and airflow rate, and calculate the fan's utility and system utility. 8. Select the ventilator for the air conveyor system depending on the system parameters.
2.5. Course content (syllabus)	Purpose and task of transport. Historical development of transport. Basic forms of transport and transport equipment. Maximum load and capacity of means of transport of periodical and continuous supply. Measures of assessment of transport activities. Equivalent resistance coefficient. Characteristics of transported materials in the wood industry. Types of loads of transport constructions. Components of transport equipment. Driving mechanism of the means of transport in the wood industry. Means of transport in the wood industry. Means of periodical supply. Winches. Lifts. Cranes. Industrial vehicles. Hand-operated industrial vehicles. Motor-operated industrial vehicles. Road vehicles. Manipulators, industrial robots. Means of continuous supply. Conveyors. Mechanical conveyors with a hauling element (belt conveyors, track conveyors, chain conveyors, elevators). Mechanical conveyors without a hauling element (roller, vibrating, worm, and gravity conveyors). Air conveyors. Components of air conveyors. Control of an exhaust system. A mean of transport in the function of the technological production process. Transport systems in a sawmill, in production plants of particle boards, in production plants of veneer and plywood and production plants of furniture. Characteristics of transport equipment are essential in terms of choice and efficient application. Storage facilities in the wood industry

2.6. Format of instruction				2.7. Comments:
	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork		☒ independent assignments ☐ multimedia and the internet ☒ laboratory ☐ work with mentor ☐ (other)	

2.8. Monitoring student work									
	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		

	Preliminary exam	YES		Practical work	YES		(other)		
	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	Regular attendance and active participation in lectures and exercises. Independent preparation of exercises and taking exams.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Sever, S. 1988: Transport u drvnoj industriji, autorizirani rukopis, Zagreb, 1 – 26, 50 – 231.				NO		YES, Merlin		
	Hamm, Đ. 1987: Transportni uređaji, Šumarska enciklopedija, svezak 3, JLZ "Miroslav Krleža", Zagreb, 521-529.				YES		YES, Merlin		
	Oluić, Č. 1991: Transport u industriji, Rukovanje materijalom I. dio, Sveučilišna naklada, Zagreb, 1 – 278.				YES				
	Beljo Lučić, R.: Transportna tehnika u drvnoj industriji, prezentacije u Power Pointu, 2020.						YES, Merlin		
2.12. Optional literature	1. Biljan, M.: Dizalice, Šumarska enciklopedija, svezak 1, JLZ, Zagreb, 1980, str. 346-357. 2. Madjarević, B.: Rukovanje materijalom, Tehnička knjiga, Zagreb, 1972, str. 1-476. 3. Šćap, D.: Prenosila i dizala (Odabrana poglavlja), Uvodne osnove, Sveučilište u Zagrebu, Fakultet strojarstva i brodogradnje, Zagreb, 1993.: Physiological Plant Ecology. Springer. Berlin.								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović M.Ed., professor of kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 3	1.8. Number of hours in a semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226043	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 course Physical and Health Culture aims to acquire theoretical and practical kinesiological knowledge to train students for independent physical exercise and adopt healthy living habits. Through various forms of physical activity, the goal is to meet the daily needs for movement and improve the student population's motor, functional, and cognitive abilities. By attending classes, students are educated about the importance of daily physical exercise and all the good things 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 competencies required for the course	Health status.		
2.3. Learning outcomes at the level of the programme to which the course contributes	E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.		
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. Explanation of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises concerning kinesiologic activity. 5. Organise 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)	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 down a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads, relay running, hurdles running different height. Martial arts Basic judo techniques - falls, hand throws, belt throws, leg throws, choking techniques, levers; Basic techniques of karate - kicks, punches, defence. 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 movement, ball technique, cooperation of two and three players, shots on goal from the run, shot on goal after the ball is added, volley, headshots, stopping the ball; Volleyball - passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, playing technique in attack, playing technique in defence; Handball - guiding the ball in a straight line and with a change of direction. Passes in place, pass in motion, crosses, passes for counterattacks, cooperation of two and three players, shot on goal after the lead, shot on goal on the added ball. Racket sports Badminton - forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand kick under the arm, high serve, backhand serve, short serve, field moves, single play, pair play; Shooting - classification of shooting disciplines and equipment, weapons maintenance, breathing techniques, air rifle 10 m. 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 to reduce subcutaneous fat, exercises to increase muscle endurance, exercises to increase muscle mass, exercises stretching. Hiking tours - hiking on flat terrain, hiking tours, interval hiking methods. Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa.		
2.6. Format of instruction	☐ lectures	☐ independent	2.7. Comments:

	☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☐ partial e-learning ☐ fieldwork			assignments ☐ multimedia and the internet ☐ laboratory ☐ work with mentor ☐ (other)					
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam		NO
	Experimental work		NO	Report		NO	Mapa radova (crteža)		NO
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work		NO	(other)		
	Project		NO	Written exam		NO	ECTS credits (total)	1	
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 exercises.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	1. D. Pavlović (2010): Skripta za studente Šumarskog fakulteta kolegij Tjelesna i zdravstvena kultura	NO	YES, Merlin
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		

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - IV. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Silvana Prekrat, PhD Assoc. Prof. Vjekoslav Živković, PhD	1.7. Number of ECTS credits	7
1.2. Course title	Wood constructions	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+0
1.3. Course code	235953	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	Mastering the advanced 2D modelling with AutoCAD. Learning about CAD systems in the wood industry. Tasks of the constructor. Mastering the construction systems and preconditions for products construction. Basic construction documentation and systematic approach to its development.		
2.2. Enrolment requirements and/or entry competencies required for the course	Computer classroom equipped with graphic workstations and general CAD computer programs for 2D drawing and parametric 3D modelling. Passed exam in the course Applied Technical Graphics. Mastering the basics of 2D drawing in exact and sketching in a parametric CAD program.		
2.3. Learning outcomes at the level of the programme to which the course contributes	C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Recognition of different wood species and types of wooden and non-wooden materials in the construction of furniture and furnishing. 2. Make a technical drawing of the element and the assembly in terms of and cross-section according to norms 3. Use technological labels, adhesive joints, mechanical and surface treatments 4. Apply tolerances - tolerances on wood products. 5. Calculate the percentages on wood assemblies 6. Choose characteristic views and cross-sections by determining the plane position 7. Apply simple calculations for dimensioning construction elements. 8. Make a technical description of the product. 9. Describe and recognize the constructional forms of the assembly system on the products. 10. Sketching and technical drawing in orthogonal and axonometric projections showing different forms of construction of wooden structures. 11. Separate joints and assemblies and use fitting and joining elements in wooden structures. 12. Design longitudinal assemblies, width and angle assembly and edge and corner assembly 13. Create basic structural documentation of furniture and wood products using AutoCad. 14. Apply appropriate hardware on products of wood		
2.5. Course content (syllabus)	Construction venue and tasks. Wood, wooden and non-wooden materials as furniture and equipment construction materials. Technical drawing of wooden products. Technical drawing according to the standards. Deviations from measures, tolerances and fits. Technological markings for the mechanical finish, connecting with glue, surface finish, upholstery. Control of drawings. Selection of characteristic views and cuts by determining the position of the cut plane, demonstration of parts, product assemblies and details views and cuts. System of constructional forms for joining wooden constructions. Longitudinal, latitudinal, plain and mitre joints of the elements of solid wood and wood-based panels. Corner joints of wooden elements. Computerized construction. Advanced mastering of AutoCad in 2D projection. Products designing for information processing. CAD/CAM system and its importance, designing equipment and computerized construction. Functional description of a CAD system. Assembling and connecting elements. Construction principles for wooden products.		
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork	☒ independent assignments ☐ multimedia and the internet ☐ laboratory ☐ work with mentor ☐ (other)	2.7. Comments: Exercises are performed in a computer classroom. Therefore, students must have computers with the current version of the CAD computer program for 2D drawing and 3D modelling downloaded.

2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam	YES		Practical work	YES		(other)		
	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	Regular attendance and active participation in classes. Independent learning, solving exercises and learning outside of regular classes. Regular lectures on deadlines.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Tkalec, S. Prekrat, S (2000): Konstrukcije proizvoda od drva - osnove drvnih konstrukcija, Sveučilišni udžbenik Šumarski fakultet i Znanje, Zagreb, str. 1-308	YES	YES, Merlin
	Prekrat, S., Čavlović, A.O. (2021): Osnove 3D modeliranja dijelova i sklopova namještaja i drvnih proizvoda, priručnik, str. 1-135	NO	YES, Merlin

2.12. Optional literature	1. Noll, T.: (2002.): Joint book, Quatro Publishing, London, str. 1-187 2. Nutsch, W. (2017.): Handbuch technisches Zeichnen und Entwerfen, DRW verlag, str. 1-304 3. Nutsch, W. (2018.): Handbuch der Konstruktion: Möbel und Einbauschränke, DRW, str. 1-432 4. Rogowski, G.: (2002.) Joinery, The Taunton Press, str. 1-390 5. Antonović, A i ostali (2018) : Pojmovnik hrvatskog drvnotehnološkog nazivlja, riječnik, Sveučilište u Zagrebu, Šumarski fakultet ; Institut za hrvatski jezik i jezikoslovlje, str.1-424 6. Autodesk Inventor For Beginners (2020): Tutorials, Kishore

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Stjepan Pervan, PhD Asst. Prof. Miljenko Klarić, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Wood drying technology	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+8
1.3. Course code	235955	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	The course aims to qualify an expert for self-governing monitoring and control of a drying process of solid wood, veneer and chipped wood.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C3 - Monitor and control processes of massive wood, veneer and wood particle drying, other special drying processes, and wood steaming.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define the basics of wood chemistry and its impact on the drying process 2. Define the basics of wood technology and the impact of technological properties on the drying process 3. Define the anatomical basics of wood and their influence on the drying process 4. Explain the theoretical basics of the drying process, the relationship between water and wood 5. Describe the hygroscopicity of wood concerning the surrounding climate, the negative phenomena of shape change (shrinkage and swelling) while drying the most commonly used commercial wood species in Croatia 6. Identify the impact of process errors on wood and finished products quality 7. Provide methods for measuring water content during the wood drying process and explain their industrial application 8. Describe the natural drying - basics, storage yard of raw and dried material 9. Describe ways of organizing the storage yard by the type of transport means 10. Describe the basics of technical drying of massive wood 11. Categorize the types of technical drying of the massive wood according to the technical criteria 12. Categorize and apply types of wood drying regimes 13. Distinguishing wood drying kilns according to the type of process and the level of equipment 14. Describe and use of kiln control systems in industrial conditions 15. Group and identify wood faults in the drying process to reduce the share of wood defects. Choose the most economical wood drying method without defects (natural drying, technical drying or a combination of both types) 16. Explain the processes and techniques of technical drying of chopped wood 17. Explain the processes and techniques of veneer technical drying 18. Group and identify veneer drying defects
2.5. Course content (syllabus)	The theoretical basics of the wood drying process, wood - moisture relations, hygroscopic properties of wood, shrinkage and swelling in the drying process, wood moisture content measuring and controlling in the wood drying process, air drying – basics, green and dry lumber stockyard, basics and means of technical drying of solid wood, types and use of kiln drying schedules, kiln dryers: types and equipment, drying control systems – basics usage, wood defects in the drying process, diminishing of wood drying defects, processes and schedules for chipped wood drying, processes and schedules for veneer drying.

2.6. Format of instruction			2.7. Comments:
	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork	☐ independent assignments ☒ multimedia and the internet ☐ laboratory ☒ work with mentor ☐ (other)	

2.8. Monitoring student work									
	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar		NO	(other)		

				paper					
	Preliminary exam	YES		Practical work		NO	(other)		
	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	Regular attendance and active participation in lectures and exercises. Taking colloquia and exams.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Pervan, S. (2000): Priručnik za tehničko sušenje drva. 272. str. SAND.	YES	
	Simpson W.T. (1991): Dry kilns operator manual. 274 str. USDA, Madison, Wisconsin	NO	Internet
	Conners, T. (2010): Hardwood dry kiln operation: A manual for operators of small dry kilns. University of Kentucky, Kentucky USA. 114 str.	NO	Internet
	Simpson W.T. (1991): Dry kilns operator manual. 274 str. USDA, Madison, Wisconsin, 274 p.	NO	Internet
2.12. Optional literature	Ross, R. J. (2010): Wood handbook-Wood as an engineering material. USDA, FPL, Madison, Wisconsin, 508 p.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Mladen Brezović, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Vener and veneer plywood	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+0
1.3. Course code	33644	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	A course objective is to acquire knowledge of a manufacturing process in the industry of veneer and veneer plywood and use that knowledge for independent supervision and production control in veneer and veneer plywood plants.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course	C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties.		

<table>
<tr><td>contributes</td><td colspan="9"></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. Identification, describe and distinguish veneers according to the type of wood from which they are made
2. Identify and describe the technological phases, machines, devices and equipment used to manufacture veneers and veneer plywood.
3. Choose optimum methods and parameters for making a veneer of more excellent qualitative and quantitative yield.
4. Distinguish the malfunction that arises in the particular technological stages of veneer production and identify the causes of these defects.
5. Choose, explain adhesive properties and compare synthetic resins used in the production of veneer plywood.
6. Identify different types of veneer plywood and explain their properties.
7. Apply the rules for stacking veneer plywood construction and determine the optimum construction of the veneer plywood.
8. Calculate and choose the appropriate parameters for pressing veneer plywood.
9. Differentiate the methods and reasons for the optimization of veneer plywood.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Veneers. Wood as a raw material. Plant log storage yard. Log protection in the storage yard. The mechanical process of veneer logs. Defects of veneer logs due to a mechanical process. Veneer logs heating with hot water or steam. Heating process and defects of veneer logs. Veneer slicing. Veneer slicing machine. Defects due to veneer slicing. Veneer peeling. Veneer peeling machine. Veneer peeling - centric. Centring a log. Veneer peeling - eccentric (cutting). Defects due to veneer peeling. The final process of veneer. Veneer jointing. Veneer classification. Veneer storing. Other types of veneer. Coloured veneers. Micro-veneers. Fine line veneers. Sawn veneers. Veneer plywood. Manufacture line of veneer plywood. Adhesives for veneer plywood. Adhesive spreading. Adhesive mixtures. Defects due to adhesive spreading. Pressing of veneer plywood. Presses. Pre-pressing. Parameters of pre-pressing and pressing of veneer plywood. The final process of veneer plywood. Defects due to the final process of veneer plywood. The utilisation of raw material in the manufacturing of peeling veneer and veneer plywood. Veneer plywood for specific use. Moulded plywood. Veneer plywood with a non-standard construction. Overlaid plywood. Chemically treated veneer plywood. Optimisation of plywood properties.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☐ fieldwork</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>Brief test</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>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">Regular attendance and active participation in lectures and exercises. Taking brief tests and colloquia (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="3">Availability via other media</td></tr>
</table>

	Mešić, N.,1998.: Furniri, furnirske i stolarske ploče. Grafika Šaran, Sarajevo	YES	
	Furniri i furnirske ploče e-kolegij na sustavu za udaljeno učenje: https://moodle.srce.hr/2020-2021/course/view.php?id=75377	NO	YES, Merlin
2.12. Optional literature	Drvna industrija. Znanstveni časopis za pitanja drvne tehnologije.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Goran Mihulja, PhD Asst. Prof. Josip Miklečić, PhD Tomislav Gržan, mag. ing. techn. lign.	1.7. Number of ECTS credits	4
1.2. Course title	Glues and wood glueing	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+8
1.3. Course code	33642	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 course aims to acquire knowledge about the technology of wood glueing. Preparation of surfaces prior to glueing. Choice of glues for individual processes of glueing. Preparation of glues. Process of glueing. Parameters that affect the toughness and durability of joins.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C6 - Use wood glueing technology, select materials with optimal properties important for final processing, and apply simpler technological methods in final wood processing.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Explain the basic theory of adhesion present in wood glueing; 2. Distinguish and categorize glue according to the source of raw material, hardening method (thermosetting and thermoplastic adhesive groups), and usage (constructive and nonconstructive purposes); 3. Repeat the measurement of the basic adhesive properties such as viscosity, density and solid content and explain their significance for the bonding process; 4. To know, check and control glue factors, substrates, and bond formation processes; 5. Suggest the type of adhesive for each material and application of the adhesive assembly; 6. Explain the anatomy of the bonded joint, distinguish the factors of strength and durability and formulate their impact on product quality; 7. Evaluate the quality of adhesives according to EN and ISO test methods; 8. Identify, check and recommend basic adhesion parameters (glue application, application uniformity, pressure and compression temperature) and adhesive technology (type of press, adhesive application machines, machines for intensification of curing, etc.).

<table>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">About adhesion and soaking the surface of the wood with glue in general. Types of glue for final products. Glueing structures of final products. Measuring the density of the glue. Measuring the viscosity of the glue. Measuring dry matter in the glue. Measuring the pH value of the glue. Measuring inner stresses in joins. Measuring resistance to high and low temperatures. Production of tests for analyzing toughness. Testing toughness to shear. Testing toughness to bending. Testing joins on glued sponges.
Stresses in a join. Trends and attributes of glued joins. Quality of joins. The durability of joins. Exposure and mechanical testing. Attributes of joins at different humidity, and temperature, because of stresses and time.
Formation of glued join and basic parameters of glueing. Anatomy of joins. Glueing bent and layered elements. Formation of joins using different methods. Glueing final products. Joint geometry.
Properties of joins. Attributes of joins depending on the adherent. Attributes of joins depending on the adhesive. Attributes of joins concerning processes of glueing. Attributes of joins depending on conditions during usage.
Procedures of gluing final products. Lengthwise glueing of wood. Widthwise glueing of wood. Thickwise glueing of wood. Chair glueing. Corpus glueing. Lipping surfaces and edges with veneer, foil or laminates. Glueing framework and hexagonal constructions. Glueing in the production of padded furniture. Glueing of bent and layered elements.
Recording the process of glueing solid wood. Recording the process of veneering. Recording the process of assembly glueing. Recording the process of glueing bent and layered elements. Recording the process of glueing in the production of padded furniture.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>(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">Regular attendance and active participation in lectures and exercises. Taking colloquia and exams.</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">Ljuljka, B.,: Lijepljenje u tehnologiji finalnih proizvoda, Zagreb, 1978, str. 1-219.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Obućina, M.: Lijepljenje drveta, Sarajevo, 2014, str. 1-142.</td><td colspan="2">NO</td><td colspan="2"></td></tr>
<tr><td colspan="5">Backović, M.: Lijepljnje u tehnologijama prerade drveta, Sarajevo, 1997, str. 1-394.</td><td colspan="2">NO</td><td colspan="2"></td></tr>
<tr><td colspan="5">Mezger, G.T.: Applied Rheology (edition 6th). Anton Paar GmbH, Austria, 2019, odabrana poglavlja.</td><td colspan="2">NO</td><td colspan="2"></td></tr>
</table>

2.12. Optional literature	1. Bandel, A.: Gluing wood, CATAS, Udine, 1995.: Physiological Plant Ecology. Springer. Berlin. 2. COST Action E34: Bonding of Timber, University of Natural Resources and Applied Life Sciences Resources, Vienna, 2008

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Vladimir Jambreković, PhD Asst. Prof. Nikola Španić, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Panels from disintegrated wood	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+8
1.3. Course code	33643	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 this course is gaining of knowledge about the processes of industrial production of panels made from disintegrated wood, together with the application of obtained knowledge for autonomous supervision and control of production processes in factories for the production of panels made from disintegrated wood. The aim is also to learn about the properties of panels made from disintegrated wood to achieve the capability of choosing and applying panels of optimal characteristics.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To explain the significance of fragmented wood panels 2. To anticipate the guidelines of panel development 3. To interpret the geographic distribution of production areas and panel consumption in the global contexts 4. To identify the basic board types 5. To identify the basic raw materials for panel manufacturing 6. To describe the characteristics and evaluate the quality of lignocellulosic raw materials 7. To select the chemical components for panel manufacturing 8. To describe the properties of formaldehyde resins (UF, MF, FF) and other types of binders 9. To evaluate the resins for panel manufacturing (formaldehyde, polyurethane, tannin and lignosulfonate based resins) 10. To explain the free formaldehyde emission 11. To choose an adhesive for the production of a particular board type 12. To use primary and auxiliary raw materials for panel manufacturing 13. To list and explain the specificity of properties and application of mineral binders 14. To show primary phases and equipment in particleboard production		

<table>
<tr><td></td><td colspan="9">15. To explain the procedures for obtaining particleboards and fibreboards
16. To explain the basics of the fragmented wood panels production
17. To analyse the basic technological parameters in panel production
18. To identify surface coating materials
19. To describe the properties and application of fragmented wood panels
20. To show the significance of panels with horizontally oriented particles
21. To recognize the specificity of the production and characteristics of the panels with the vertically oriented particles (extrusion panels)
22. To explain the structure specificity panels made from macroparticles (OSB)
23. To identify special types of panels and trusses for construction made of fragmented wood
24. To recommend the use of panels coated with natural veneer and decorative synthetic materials (HPL, DPL, CPL, 3D coating foils, ABS foils)</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction to: the importance of panel development, basic panel types, raw materials for panel production, the basics of panel production, materials for panel overlaying, properties and use of panels from disintegrated wood. In that course the following panel types will be reconsidered: panels with horizontally oriented particles; panels with vertically oriented particles (extrusion panels); one layered, threelayer, multi layer and panels with gradual transition of section structure; light weight, medium-heavy, and heavy boards; working panels and frontal panels; postforming variation; compact medium layered, and middle layer with holes, the panels with macroparticles (OSB); stone-wood panels; lightweight construction panels bounded with plaster; cardboard panels bounded with plaster, lightweight construction panels bounded with cement, concrete particleboard; particleboard bounded with cement, magnesite or plaster; particleboard reinforced with synthetic or mineral fibres; Triboard, Woodmat, Spaceboard, Lignoplast mouldings, Werzalit mouldings, Collipress mouldings; LSL, LFL; hard boards (HB), medium boards, medium boards of low density (MBL), medium boards of high density (MBH), porous boards (SB); dry process (MDF, HDF MDF; lightweight MDF, ultra-lightweight MDF, isolation boards, tarred fibreboard, fibreboard bounded with cement, fibreboard bounded with plaster. The topics will also be the boards coated with veneer, synthetic material, HPL, DPL or CPL decorative laminate, decorative paper impregnated with synthetic resins, varnishes and enamel, overlays for 3D overlaying, PVC overlays, ABS.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>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">Regular attendance and active participation in lectures, exercises and fieldwork. Taking a colloquium (3 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
	Jambreković, V.: Drvne ploče i emisija formaldehida, Sveučilišni udžbenik, Šumarski fakultet, Zagreb, 2004.	YES	YES
	Bruči, V., Jambreković. V.: Ploče iverice i vlaknatice. Sveučilišni udžbenik, Šumarski fakultet, Zagreb, 1996.	YES	YES
2.12. Optional literature	1. Ćehić, M.; Omer, S.E.: Pločasti materijali na bazi drveta. Univerzitet u Bihaću, Bihać, 2018. 2. Wood Handbook: Wood as an Engineering Material. Forest Products Society, Madison, 2011.		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	-	1.7. Number of ECTS credits	3
1.2. Course title	Practical work 1	1.8. Number of hours in a semester (L+E+F+e-learning)	15+75 independent work in the workshop
1.3. Course code	235956	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	1.10. Level of application of e-learning (level 1, 2, 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	Application of acquired knowledge and skills on a real example of a product, material or less demanding manufacturing process. Preparation and organization of essential documentation for project development. Making models, mock-ups or wood products. Project report.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods; C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties; C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Apply the acquired knowledge and skills to a realistic model of wood products or wood technology process 2. Solve the given problem under defined conditions and deadlines 3. To form a sense of personal responsibility for the execution of assigned tasks on more minor demanding projects		

	4. Prepare and organize essential documentation for project development 5. Make a model, model or product from wood according to the prepared documentation 6. Develop three-dimensional dawn on made models, models or wood products 7. Prepare a report on the professional project or presentation of the product, material or procedure
2.5. Course content (syllabus)	Preparation and organization of essential documentation for project development. Making models, mock-ups or wood products. Preparation of a report on the developed project.
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☐ partial e-learning ☐ fieldwork ☒ independent assignments ☐ multimedia and the internet ☒ laboratory ☒ work with mentor ☐ (other) 2.7. Comments:

2.8. Monitoring student work									
	Class attendance		NO	Research	YES		Oral exam		NO
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	Practical work	YES		(other)		
	Project	YES		Written exam		NO	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	Mandatory execution of assigned tasks within the set deadline.

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Priručnik za stručnu praksu	NO	YES, Merlin
	Priručnik za rad na siguran način	NO	YES, Merlin
2.12. Optional literature	-		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Davor Pavlović M.Ed., professor of kinesiology	1.7. Number of ECTS credits	1
1.2. Course title	Physical and health education 4	1.8. Number of hours in a semester (L+E+F+e-learning)	0+30+0
1.3. Course code	226045	1.9. Expected enrolment in the course	35
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 course Physical and Health Culture aims to acquire theoretical and practical kinesiological knowledge to train students for independent physical exercise and adopt healthy living habits. Through various forms of physical activity, the goal is to meet the daily needs for movement and improve the student population's motor, functional, and cognitive abilities. By attending classes, students are educated about the importance of daily physical exercise and all the good things 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 competencies required for the course	Health status.
2.3. Learning outcomes at the level of the programme to which the course contributes	E1 - Continue specialisation in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
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. Explanation of the impact of physical exercise on health. 3. Choose fitness exercises designed to strengthen individual muscle groups. 4. Demonstrate specific exercises concerning kinesiologic activity. 5. Organise 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)	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 down a slope, interval cyclic movements, differences in running long, medium and short distances, running with loads, relay running, hurdles running different height. Martial arts Basic judo techniques - falls, hand throws, belt throws, leg throws, choking techniques, levers; Basic techniques of karate - kicks, punches, defence. 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 movement, ball technique, cooperation of two and three players, shots on goal from the run, shot on goal after the ball is added, volley, headshots, stopping the ball; Volleyball - passing with two hands above the head, passing with the forearms, service, passing behind the head, receiving service, blocks, playing technique in attack, playing technique in defence; Handball - guiding the ball in a straight line and with a change of direction. Passes in place, pass in motion, crosses, passes for counterattacks, cooperation of two and three players, shot on goal after the lead, shot on goal on the added ball. Racket sports Badminton - forehand punch under the arm, forehand punches above the head, forehand lob above the head, backhand kick under the arm, high serve, backhand serve, short serve, field moves, single play, pair play;

<table>
<tr><td></td><td colspan="9">Shooting - classification of shooting disciplines and equipment, weapons maintenance, breathing techniques, air rifle 10 m.
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 to reduce subcutaneous fat, exercises to increase muscle endurance, exercises to increase muscle mass, exercises stretching.
Hiking tours - hiking on flat terrain, hiking tours, interval hiking methods.
Dance structures - English waltz, Viennese waltz, disco fox, jive, salsa.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☐ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☐ partial e-learning
☐ fieldwork</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></td><td>NO</td></tr>
<tr><td>Experimental work</td><td></td><td>NO</td><td>Report</td><td></td><td>NO</td><td>Mapa radova (crteža)</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 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 exercises.</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">1. D. Pavlović (2010): Skripta za studente Šumarskog fakulteta kolegij Tjelesna i zdravstvena kultura</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">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</td></tr>
</table>

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - V. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Krešimir Greger, PhD Asst. Prof. Kristina Klarić, PhD	1.7. Number of ECTS credits	7
1.2. Course title	Production organisation	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+8
1.3. Course code	33645	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 gain general and specialist knowledge in the following fields: work-study, work rationalisation, quality control in technological processes and final products, supply organisation and stock optimisation, and logistic support.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 - Plan and organise the time study, work rationalisation, perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate basic business KPIs, and write basic financial reports, recognise types of expenses.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define the concepts of an organization as a science and profession. 2. Identify organizational and technological specifics of production in wood processing and furniture manufacturing. 3. Plan and analyse the time study. 4. Review and recommend the work rationalization. 5. Distinguish the characteristic production processes in wood processing. 6. Distinguish the processes in research and development and suggest the development of new products. 7. Distinguish processes in procurement, storage and logistics, plan procurement, recommend a procurement model, and lead procurement and storage. 8. Evaluate the capacities of technological processes. 9. Use the principles of designing technology systems in industrial wood processing. 10. Prepare production and manage production processes. 11. Conceive quality control in the technological process and for finished products. 12. Distinguish processes in maintaining devices and plants in the wood processing industry and organize the maintenance of devices and plants. 13. Analyze the production program, conduct the sales process and manage the distribution of finished products. 14. Evaluate accounting processes.		
2.5. Course content (syllabus)	An organisation as science and profession; Development of organisation sciences; Organisation as a part of wood technology; Specific features of organisation and technology in wood processing and furniture manufacture.		

<table>
<tr><td></td><td colspan="9">Basics of modern concepts in the functioning of industrial firms for wood processing and furniture manufacture; Business and production logistics; Systematic approach to management process in industrial firms for wood processing and furniture manufacture; Process-oriented organisation of structures of wood-processing business systems.
Processes in marketing, sales and distribution; Products and services; Analysis of production programmes; Management of sales processes; Logistic management of final product distribution; Processes in research and development; Development of new products; Development of production and business; Development of wood technology.
Processes in supply, storage and logistics; Supply preparation; Management of supply processes; Logistics of supply and storage; Specific features of materials in industrial wood processing
Basics of production theory; Principles of planning technological systems in industrial wood processing; Planning capacities of technological processes.
Characteristic production processes in wood processing; Preparations and management of wood processing production; Characteristic production processes; Work study; Processes in the maintenance of devices and machines in industrial wood processing; Concept and model applied in industrial wood processing.
Processes in quality insurance and control of products, production and business; Quality control systems; Methods of quality control in wood processing and furniture manufacture; Bookkeeping processes as preconditions of realistic and objective financial reporting as applied to specific conditions of production and production programmes in wood processing and furniture manufacture.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☒ laboratory
☐ work with mentor
☒ exercises in computer practicum</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>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>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 exercises, preparation and presentation of seminar work. Taking colloquia and 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">Figurić, M. 2000: Proizvodni i poslovni procesi u preradi drva i proizvodnji namještaja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td></td><td colspan="4">Greger, K. 2000: Proizvodni i poslovni procesi u preradi drva i proizvodnji namještaja (zbirka zadataka), Sveučilište u Zagrebu, Šumarski fakultet, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
</table>

2.12. Optional literature	1. Sikavica, P., 2011: Organizacija, Školska knjiga d.d., Zagreb. 2. Inženjerski priručnik IP4, Proizvodno strojarstvo, Organizacija proizvodnje, Školska knjiga 2002. 3. Taboršak D.: Studij rada, Orgadata, Zagreb 1994 4. Daft, R. L.: Organizational Theory and Design; 13th edition; Cengage Learning, 2020.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Goran Mihulja, PhD Tomislav Gržan, mag. ing. techn. lign.	1.7. Number of ECTS credits	6
1.2. Course title	Final wood processing	1.8. Number of hours in a semester (L+E+F+e-learning)	45+45+16
1.3. Course code	33646	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 course aims to acquire knowledge about technological processes in final wood production and the properties of materials important in final production. Students will acquire the knowledge and skills needed for managing the technological processes in final wood production.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C6 - Use wood glueing technology, select materials with optimal properties important for final processing, and apply simpler technological methods in final wood processing.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Explain the basic concepts about the technological processes of final wood processing 2. Distinguish and categorize primary final products (e.g. chair, bed, table, wardrobe etc.); 3. Evaluate, draw up a budget and recommend the quantity of wood and non-woven materials needed for the production of certain final products or elements of final products; 4. Identify, describe and choose the most technologically acceptable (optimal) formatting (cutting) of wood elements in the production of final products; 5. Design the order of joining assemblies and assemblies and the order of assembling elements into a finished product; 6. Use essential measuring equipment, e.g. measuring strip, calliper, micrometre, comparator and line, to measure dimensions and processing accuracy. To acquire knowledge of the working principle of modern measuring instruments such as 3D scanners; 7. Identify and distinguish factors that have the most significant impact on the quality of a particular wood processing; 8. Evaluate the possibilities of applying new technologies and technological processes concerning the production program and existing manufacturing technology of the company;

<table>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction: basic terms of technological processes, primary and final wood processing, equipment and space for final processing, classification of final products, final wood processing at home and abroad.
Material: material used in final products and its technological and exploiting properties - lumber and wood material, synthetic-wood material, soft synthetic sponge material, solid synthetic material of the porous and solid structure, springs and springy cores, mounts, textile material, leather and other.
Shaping wood and other materials: massive wood, boards, fabric, sponges. Processing of parts for assembly. Assembling.
Process precision: technological base, shaping and dimensioning, factors affecting process precision, substituting, tolerances, hardness of different joints, measuring equipment.
Analysis of the cutting and shaping processes: saw shaping, routing, lathing, drilling, bending and pressing.
Edge banding: edges veneering, "post-forming", "soft forming", membrane pressing.
Upholstering the final products: shaping and joining parts, assembling parts, covering.
Production processes: cabinet furniture, solid wood furniture, chairs and other products.
The technology of final products. Technological task. Complex solutions in developing the technological processes. Technological systems.
Technology transfer. Development of technology and technological forecasting. Relationship between material technology - and equipment. Flexible technology. Perspective, technological processes, future equipment. Technology development from an ecological standpoint.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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></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">Regular attendance and active participation in lectures and exercises, doing exercises. Taking colloquia and exams.</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">Ljuljka, B.: Tehnologija proizvodnje namještaja, Zagreb, 1980, str. 1-257.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Skakić, D. i Krdžović, A.: Finalna prerada drveta. Šumarski fakultet, Beograd, 2002, str. 1-403.</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="5">Backović, M.: Lijepljnje u tehnologijama prerade drveta, Sarajevo, 1997, str. 173-286.</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Ljuljka, B.: Namještaj, Šumarska enciklopedija II, JLZ, Zagreb, 1983, str. 436-490.</td></tr>
</table>

	2. Ljuljka, B., Bogner, A., Turkulin, H., Grbac, I., 1986.: Ispitivanje mogućnosti primjene VF struje za plastifikaciju i savijanje masivnog drva. (znanstvena studija), str. 1-63, Šumarski fakultet, Zagreb. 3. Sandberg, D., Kitek Kuzman, M., Gaff, M.: Engineered Wood Products I. Wood as an engineering and architectual material. Czech University of Life Sciences Prague, 2018., str. 1-181.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Anamarija Jazbec, PhD Asst. Prof. Maja Moro, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Basic statistics	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+0
1.3. Course code	33636	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 objective of this course is to teach students to compile independently, statistically analyze, present and analyze compiled data, as well as discuss and make conclusions based on already analyzed data.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Identify and distinguish numeric and categorical variables types (continuous, discrete, dichotomous, nominal, ordinal). Choose the appropriate graphs. Create a frequency table. Calculate the central tendency measures and analyze them. Calculate variability measures and analyze them. Calculate median and quartiles and analyze them. 2. Apply the basics of probability. Calculate probabilities. 3. Differentiate, sketch, and apply theoretical distribution: normal, T, and binomial. 4. Apply different sampling methods: a random, stratified, systematic sample. Know the main essence of the central boundary theorem and the standard error. 5. Estimate (point estimate) the arithmetic mean, the standard deviation and the proportions of the population 6. Calculate and interpret the interval estimate of the arithmetic mean, standard deviation, and population proportions. 7. Calculate, draw and interpret individual index numbers. 8. Interpret and draw the linear trend equation. Calculate the prediction using a linear trend equation.		
2.5. Course content (syllabus)	Types of Variables. Scales of Measurement. Graphic Presentations. Frequency tables and distributions. Measures of Central Tendency and Dispersion. Measures of Relative Standing. Empirical distribution. A Survey of Probability Concepts. Discrete Random and Continuous Random Variables. Binomial, Normal and T Probability Distribuitions. Sampling Methods.		

	Sampling Distribution. Point and interval estimations. Interval estimation of population means, proportion and standard deviation. Statistical Quality Control. Quality Control charts.								
2.6. Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork			☒ 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		NO	(other)		
	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 and exercises. Independent learning solving exercises outside of regular classes. Taking colloquia and exams if necessary.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Jazbec, A (2009) OSNOVE STATISTIKE, drugo izdanje, Šumarski fakultet, Zagreb. (sveučilišni udžbenik)				YES		YES, Merlin		
2.12. Optional literature	1. Bahovec V, Erjavec N. et al. (2018) STATISTIKA, Element, Zagreb.								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Hrvoje Turkulin, PhD Assoc. Prof. Vjekoslav Živković, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Wood in construction	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+8
1.3. Course code	33647	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	Learning about the specific conditions of using specific wood species in building applications. Learning about the functional requirements, classes and technical details of the main groups of products: windows, doors, floors, and overview of other types of wood building products. Designing simple constructions and construction products.		

2.2. Enrolment requirements and/or entry competencies 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 xylophagous bacteria, insects, fungi and marine borers, and determine flaws on wood incurred due to their activity; learn the basic principles of wood protection based on physical, chemical and structural properties of wood, and apply basic procedures and methods for wood protection; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; C6 - Use wood glueing technology, select materials with optimal properties important for final processing, apply simpler technological methods in final wood processing; C7 - Define the specifics of wood usage in construction, recommend adequate applications of a particular type of wood for building purposes, recommend the basic shape, physical and construction solutions, explain and ensure functional requirements, types and construction solutions for main product groups; C8 - Recommend materials and procedures applied in the wood finishing process in the interior and the exterior, and operate the wood finishing process starting from base preparation to the hardening of the material.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Identify the prominent families of wood construction products and connect their end-use requirements with design and construction types and material properties. 2. To appoint and explain the ecological features of wood as a building material, the importance of maintaining its durability and the possibilities of wood recycling. 3. To explain the dimensional and structural limitations of wood and propose and evaluate their improvement methods (laminating, structural and engineering connections). 4. To distinguish, group, and argument the technical properties of wood essential for construction, explain and evaluate the aesthetic, economic and traditional values of wood for construction. 5. To identify, explain and group factors of durability and risk classes to the durability of construction products and wood buildings and suggest and design the measures to overcome these risks. 6. To adapt or design a set of details and measures of integral (physical, structural, surface and biological) protection of a simple wood building or wood construction product. 7. Connect the type of window and door with basic functional requirements, connect the details into a functional unit, and design and illustrate the final product. 8. To describe types of wood floor coverings and connect the product type with the basic technical properties and functional requirements.		
2.5. Course content (syllabus)	Significance of wood building components in Croatia and Europe. Specific requirements for exterior application of wood: synergistic actions of light, climatic and biological degradative factors. Risk classes and technical solutions for their elimination in buildings and wood construction products. Technical properties of importance for building applications, availability of the species: wood properties and durability. Principles of the technical design of wood products for their durability: physical protection, technical detailing, surfacing and finishing, maintenance and renovation of weathered products. Dimensional and structural limitations of wood and methods of improving wood products: lamination, structural and engineering connections. Windows and doors: function and design, forms and types, general functional requirements. Wood flooring – types, technical and functional properties. Overview of other types of wood building products: houses, laminated beams, wooden structures, bridges, noise barriers, cladding and facades etc.		
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:

	☒ fieldwork			☐ work with mentor ☐ (other)					
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper		NO	(other)		
	Preliminary exam		NO	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 and exercises, making exercises. Taking exam.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Turkulin, H.; Ljuljka, B. 1988. Lamelirana građevna stolarija, 182 p. Šumarski fakultet Zagreb		
	Turkulin i dr. 2002: Postojanost drva na pročeljima. Drvna ind. 53(1):33-48 i 53(3): 44-54.		
	Tomašević, J. (1996): Drvo u podnim konstrukcijama. Zagreb: naklada autora.		
	*** 2020: Zbirka članaka o postojanosti i površinskoj obradi građevnog drva. Šumarski fakultet		
	*** 2001. Tehnologija drvenih građevina. Zagreb: Mozaik knjiga		
2.12. Optional literature	1. Liesse, B. (2002): Holzbauteile. Leinfelden-Echterdingen: DRW-Verlag 2. Erler, K. (2002): Holz im im Aussenbereich. Basel-Boston-Berlin: Birkhäuser Verlag 3. *** (2002): Wood as an engineering material. Madison, WI: USDA For. Ser., Forest Products Lab		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Andreja Pirc Barčić, PhD Prof. Darko Motik, PhD	1.7. Number of ECTS credits	4
1.2. Course title	Marketing of wood products	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+8
1.3. Course code	33648	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 subject is the education of students in order to get all the needed knowledge and skills from the wood and wood products trade. It means that they should be able to work not only as purchasing and sales agents but also in the field of products processing plans, presentation, marketing research, etc.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	D2 - Perform wood industry-specific calculations, define and analyse expenses, organise and conduct distribution, promotion and market research, plan products and product programmes, form product cost and selling prices, organise and conduct sales of wood and wooden products.		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To carry out a market research process using the customer survey methodology and to evaluate the demand for wood products based on the derived consumption method 2. To decide about marketing strategies in woodworking and furniture manufacturing companies and design strategic product planning processes 3. To establish a business portfolio of business attractiveness business and business power of companies and to create a multifactor portfolio matrix 4. To plan the life span of the best-selling products in the production program 5. To create a product marketing strategy at each stage of the product life cycle 6. To analyze wood products customers' behaviour based on information in the recent years 7. To develop a market prediction of furniture sales and to plan furniture consumption based on the determined quantity of products sold in the past period 8. To design wood products and furniture distribution channels and to recommend the application of the appropriate distribution channels 9. To suggest cost allocation concerning stages in the product development process and form the price of a particular product based on price and competitiveness 10. To develop a promotional plan for a wood industry company 11. To assess the most common business, merchandise and financial risks in industry company and to suggest transportation documentation for wood products		
2.5. Course content (syllabus)	Notion, meaning and trade function. Trade division. The ways of selling wood and wood products. Wood market. Retail trade and wholesale. Wood products classification. Supply and demand for wood products. Trade usages and incoterms. Complete processing of inland and foreign trade documentation. Trade operations risks and risks insurance. Customs duty and other restrictions. Products transportation to customers. Forwarding. The marketing meaning and role in the enterprises for manufacture and sale of wood and wood products. The enterprise orientation to the market. The management of products and production programmes in the furniture industry. Products or production programmes plan strategy. The analysis of marketing possibilities. The characteristics of wood products necessary for the sale. Agreements about products brand, branding processing. Favours to a customer. The development of wood products. Products life cycle in the furniture industry. The structure of production programmes in the enterprises for the manufacture and sale of wood products. Establishing prices of wood products. Distributional channels in the wood trade. Distributional channels agents. Presentation of furniture and other wood products. Market research of enterprises for manufacture and sale of wood products. Market research plan. Data resources. The usage of marketing information in the trade of wood and wood products. The analysis of customers` behaviour. The factors that affect behaviour in the process of buying. The process of buying wood products. Business marketing strategies. Direct and online marketing management in furniture and other wood products sale. Marketing plan and supervision.		
2.6. Format of instruction	☒ lectures	☒ independent	2.7. Comments:

	☒ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork			assignments ☐ multimedia and the internet ☐ laboratory ☐ work with mentor ☐ (other)					
2.8. Monitoring student work	Class attendance	YES		Research		NO	Oral exam	YES	
	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)	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 and exercises, preparation and submission of exercises within the set deadline. Preparation of seminars on specific thematic units and participation in fieldwork. Taking colloquia and exams.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	Kotler, P., Wong, V., Saunders, J., Armstrong, G. (2006). Osnove marketinga. Mate, 4th ed.,		Online edition
	Schiffman, L.G., Kanuk, L.L. (2004): Ponašanje potrošača. Mate.		Online edition
	Renko, N. (2010): Marketing malih i srednjih poduzeća. Ljevak		Online edition
	Pirc, A., D, Motik, M. Moro, S. Posavec, A. Kopljar, 2010: Analiza pokazatelja stanja na tržištu drvnih proizvoda Republike Hrvatske, Drvna industrija, 61(4): 229-238.		Online edition

2.12. Optional literature	1. Hansen, E., Ranwar, R., Vlosky, R. (2014): The Global Forest Sector. CRC Press. 2. Pirc Barčić, A., Motik, D., Paluš, H., Klarić, K., Liker, K., Oblak, L. (2016): Analysis of furniture selling place in Croatia, Slovenia and Slovakia. Drvna industrija. 67 (3): 257-262. 3. Kaputa, Vladislav; Barčić Pirc, A.; Mat'ova, H, Motik, D.; (2018): Consumer Preferences for Wooden Furniture in Croatia and Slovakia. Bioresources. 13(3): 6280-6299.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	-	1.7. Number of ECTS credits	3
1.2. Course title	Practical work 2	1.8. Number of hours in a semester (L+E+F+e-learning)	90 independent work in the workshop
1.3. Course code	236194	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	1.10. Level of application of e-learning (level 1, 2, 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	Application of acquired knowledge and skills on a real example of wood products or wood technology process. Solving technical and technological problems. Developing the ability to recognize wood and non-wood materials and technological processes based on defined criteria. Preparation and organization of primary documentation for the development and presentation of the project. Product design and project report, product processor innovation presentation.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods; C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties; C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD; C6 - Use wood glueing technology, select materials with optimal properties important for final processing, apply simpler technological methods in final wood processing; C8 - Recommend materials and procedures that are applied in the wood finishing process in the interior and the exterior, operate the wood finishing process starting from base preparation to the hardening of the material.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Apply the acquired knowledge and skills to a realistic model of wood products or wood technology process 2. Solve design and technological problems independently or as a team 3. Develop the ability to recognize variants of wood and non-wood materials and technological processes 4. Define variants of materials, product construction and technological conditions and processes based on defined criteria 5. Prepare and organize the primary documentation for the development and presentation of the project 6. Prepare a product and a report on the professional project; prepare a presentation of a product, material or process; present a product, process or innovation at a conference or exhibition
2.5. Course content (syllabus)	Solving technical and technological problems. Developing the ability to recognize wood and non-wood materials and technological processes based on defined criteria. Preparation and organization of primary documentation for the development and presentation of the project. Product design and project report, product process or innovation presentation.

2.6. Format of instruction			2.7. Comments:
	☐ lectures ☒ seminars and workshops ☒ exercises ☐ *online in entirety* ☐ partial e-learning ☐ fieldwork	☒ independent assignments ☐ multimedia and the internet ☒ laboratory ☒ work with mentor ☐ (other)	

2.8. Monitoring student work									
	Class attendance		NO	Research		NO	Oral exam		NO
	Experimental work	YES		Report		NO	(other)		
	Essay		NO	Seminar		NO	(other)		

				paper					
	Preliminary exam		NO	Practical work	YES		(other)		
	Project		NO	Written exam		NO	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	Mandatory execution of assigned tasks within the set deadline.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	Priručnik za stručnu praksu				NO		YES, Merlin		
	Priručnik za rad na siguran način				NO		YES, Merlin		
2.12. Optional literature	-								

UNDERGRADUATE STUDIES OF WOOD TECHNOLOGY - VI. SEMESTER

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Darko Motik, PhD Assoc. Prof. Andreja Pirc Barčić, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Production planning and calculation	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+8
1.3. Course code	33649	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 target of the course subject is to qualify students for solving problems in planning and production calculation. Students obtain general and specialist knowledge in production planning, calculation of basic indicators of successful business, making basic financial reports, recognising cost types, and producing specific calculations in the wood industry.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 - Plan and organise the time study, work rationalisation, and perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate primary business KPIs, write basic financial reports, recognise types of expenses;		

<table>
<tr><td></td><td colspan="9">D2 - Perform wood industry-specific calculations, define and analyse expenses, organise and conduct distribution, promotion and market research, plan products and product programmes, form product cost and selling prices, organise and conduct sales of wood and wooden products.</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. To analyze and select the profile of the company's wood processing and furniture manufacturing business for possible business collaboration based on calculated and analyzed performance and safety performance indicators
2. To analyze fundamental principles of financial accounting (Balance Sheet, Profit and Loss Account, Cash Flow Statement)
3. To recommend the type of calculation and to calculate a cost price per unit in wood processing
4. To recommend the type of calculation and to calculate a cost price per unit in furniture manufacturing
5. To create a cost price per one unit of wood product and furniture by applying calculation incomplete costs calculation method
6. To suggest a method of calculating depreciation as a specific expense of fixed assets
7. To calculate productivity cost (contribution margin) of selected wood products in wood processing and furniture manufacturing companies
8. To plan production costs classification in relation to changes in the scope of production activities (fixed costs, variable costs, mixed costs, discretionary costs)
9. To plan production costs classification according to their natural characteristics (staff costs, material costs, depreciation, service costs, non-material / other costs, financing costs)
10. To create a relationship model of costs, revenue and change in business activity
11. To analyze the company's cost structure and determine cost-related priorities and evaluate the type of calculations that the company applies in the formation of the product's cost and decide which type of calculation would be most applicable to the company being monitored.
12. To select loan repayment models in wood processing and furniture manufacturing companies.</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">The analysis of the wood-technology processes system. Basic knowledge of cost management. System connections of financial bookkeeping with management cost bookkeeping. Special features of wood article production. Raw materials and stocks. Semi-products on the stock. Finished products on stock. Indicators of business success. Planning concept. Purpose and tasks of production planning. Contents and structure of business plan and production. Use and control of the plan. Basic guidelines of financial bookkeeping. Balance. Profit and loss calculation. Money flow. Cost management. Approach to cost management. Costs in business decision. Traditional, aimed, static and active concepts of management costs. Models of production management costs in wood processing and furniture manufacture. Costs. Conceptual determination of costs. Cost division.
Specific costs in wood processing and furniture manufacture. Case study. Calculations of products and services. Calculation division in individual production types in wood processing and furniture manufacture. Oppositions of concepts. Absorptive approach to costs vs marginal approach; Gross profit vs contribution margin with a case study in wood processing and furniture manufacture. The integral management model of production management is specific to wood processing and furniture manufacture, emphasising planning, launching, and production cost calculation. Cost calculation per processes and work orders. Covering and recording work/material costs in calculation per processes and work orders. Calculation of actual prime costs. Concept and phases of making production 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
☒ fieldwork</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>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>
</table>

	Experimental work		NO	Report		NO	(other)		
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work		NO	(other)		
	Project		NO	Written exam	YES		ECTS credits (total)	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	Regular attendance and active participation in lectures and exercises, preparation and submission of exercises within the set deadline. Preparation of seminars on specific thematic units and participation in fieldwork. Taking colloquia and exams.								

2.11. Required literature (available in the library and/or via other media)	Title	Availability in the library	Availability via other media
	1.Figurić, M. (2003): Menadžment troškova u drvno tehnološkim procesima. Šumarski fakultet Sveučilišta u Zagrebu. Zagreb.		
	2.Motik, D. (2002): Zbirka zadataka ekonomika proizvodnje. Šumarski fakultet Sveučilišta u Zagrebu.Zagreb. Polimeni, R.S.		
	3.Polimeni, R.S., Handy, S.A., Cashin, J.A. (1999): Troškovno računovodstvo. Faber & Zgombić Plus. Zagreb.		
2.12. Optional literature	1. Samuelson, P. A., Nordhaus, W. D. (2011): Ekonomija. Mate. Zagreb. 2. Liker, K., Pirc Barčić, A., Motik, D. 2015: Proizvodni troškovi kao osnovni čimbenik konkurentnosti pilanske prerade četinjača (Production Costs as a Basic Factor of Competitiveness of Softwood Sawmilling). Drvna industrija, 66(4): 289-296		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Prof. Vlatka Jirouš-Rajković, PhD Asst. Prof. Josip Miklečić, PhD	1.7. Number of ECTS credits	5
1.2. Course title	Wood finishing	1.8. Number of hours in a semester (L+E+F+e-learning)	30+45+8
1.3. Course code	33650	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 student gains knowledge about materials and processes in exterior and interior wood finishing. He becomes acquainted with the whole wood finishing process from surface preparation, application, and curing finishes.		

2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications; B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods; C8 - Recommend materials and procedures that are applied in the wood finishing process in the interior and the exterior, operate the wood finishing process starting from base preparation to the hardening of the material; E1 - Continue specialization in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Differentiate the sanding materials for various types of wood, wood materials, wood finishes according to the backing, abrasive grain and grain's hardness and toughness, grit size and amount of grains. 2. Differentiate the properties and composition of wood staining materials (water-based stains,alcohol-based stains, oil stains, reactive stains and wood bleaching materials. 3. Compare the properties of wood coatings based on natural resins, oils and waxes with coatings based on synthetic resins. 4. Identify the advantages and disadvantages of specific methods of applying varnishes (manual application, applying by spraying, curtain coating, dipping, roller coating, flow coating, vacuum coating). 5. Measure the viscosity of the wood coating material, density, dry solid, film thickness, and application rate. 6. To compare the methods of curing (drying) coatings on wood (convection drying, infrared radiation, microwaves, UV radiation, electron beam irradiation). 7. Calculate the consumption of wood finishing materials 8. To evaluate the safety and health risks in the finishing room (explosiveness, flammability, health hazard, danger to the environment). 9. Write a professional paper on a given topic in wood finishing.
2.5. Course content (syllabus)	History of wood finishing. Trends of development. Wood and wood-bases substrates for finishing. Materials for sanding, filling, and degreasing, materials for resins removal, and glues removal. Materials for colouring of wood -stains. Materials for bleaching of wood. Organic solvent preservatives, wood primers, stains. The composition and properties of the film-forming wood finishes. Natural-resin based materials, cellulose-based coatings, alkyds coatings, polyesters coatings, acid-cured coatings, polyurethane-coatings, water-borne coatings, epoxy coatings, silicone coatings, thermoplastics-based coatings. Solvents and thinners. Additives. Methods of applying finishes: manual applying, air-assisted spraying, airless spraying, air mix spraying, hot-spraying, two - components materials spraying. Spray equipment, automatic spraying machines, and robots. Electrostatic spraying. Roller coating, curtain coating, flow coating, dipping. Drying and curing techniques of coatings. Convection drying, Cold drying, infrared drying, UV curing for the furniture and joinery industry. Microwave drying, Electron Beam (EB) curing.
2.6. Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *online in entirety* ☒ partial e-learning ☒ fieldwork ☒ 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		NO	Report		NO	(other)		

	work								
	Essay		NO	Seminar paper	YES		(other)		
	Preliminary exam	YES		Practical work	YES		(other)		
	Project	YES		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	Regular attendance and active participation in lectures and exercises, preparation and submission of exercises within the set deadline. Taking colloquia and exams.								
2.11. Required literature (available in the library and/or via other media)	Title				Availability in the library		Availability via other media		
	1. Ljuljka, B.: POVRŠINSKA OBRADA DRVA. Sveučilište u Zagrebu. Šumarski fakultet, Zagreb 1990.				YES				
	2. Ljuljka, Boris; Jirouš-Rajković, Vlatka OSNOVE POVRŠINSKE OBRADE DRVA Zagreb: Sand, d.o.o., 2006				YES				
2.12. Optional literature	Bulian F, Jon G (2009) Wood coatings: theory and practice. Elsevier Science, New York.								

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	-	1.7. Number of ECTS credits	3
1.2. Course title	Practice	1.8. Number of hours in a semester (L+E+F+e-learning)	80
1.3. Course code	236196	1.9. Expected enrolment in the course	30
1.4. Study programme	University Undergraduate Studies of Wood Technology	1.10. Level of application of e-learning (level 1, 2, 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	Application of acquired knowledge and skills gained during studies in specific situations in wood production. Recording and commenting on work procedures, wood product production and company operations. Comparison of the success of the wood-technology output according to given criteria. Preparation of a written report on the developed professional practice.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications; B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods;		

<table>
<tr><td></td><td colspan="9">B5 - Organise transport of wood and wooden materials, calculate and adjust the capacities of means of transport with technological procedures, calculate and analyse energy consumption, and recommend solutions for less complex wood and wooden material transport projects;
C1 - Analyse the wood cutting process, select, optimally use and maintain primary process machinery, select machinery working regimes and tools for final wood processing, and recommend project assignments to special equipment manufacturers;
C2 - Recognise and assess sawmilling raw material and products, conduct the categorisation and measurements of sawmilling raw material and products, apply basic skills of wood sawmilling technology and techniques of log and board sawing, and identify factors of successful sawmilling wood processes;
C3 - Monitor and control processes of massive wood, veneer and wood particle drying, other special drying processes, and wood steaming;
C4 Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties;
C8 - Recommend materials and procedures that are applied in the wood finishing process in the interior and the exterior, operate the wood finishing process starting from base preparation to the hardening of the material;
D2 - Perform wood industry-specific calculations, define and analyse expenses, organise and conduct distribution, promotion and market research, plan products and product programmes, form product cost and selling prices, organise and conduct sales of wood and wooden products.</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. Apply the acquired knowledge and skills gained during the study in specific situations
2. Apply communication skills in a new work environment
3. Record and comment on characteristics of working procedures, wood product production and business
4. Compare the success of wood production according to the given criteria
5. To form a sense of responsibility and motivation for the execution of assigned tasks
6. Prepare a written report on professional practice</td></tr>
<tr><td>2.5. Course content (syllabus)</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
☒ fieldwork</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></td><td>NO</td><td>Research</td><td>YES</td><td></td><td>Oral exam</td><td></td><td>NO</td></tr>
<tr><td>Experimental work</td><td>YES</td><td></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>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>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>3</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">Mandatory execution of assigned tasks within the set deadline.</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
	Priručnik za stručnu praksu	NO	YES, Merlin
	Priručnik za rad na siguran način	NO	YES, Merlin
2.12. Optional literature	-		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Ivana Perić, PhD Karla Kremenjaš, mag. ing. techn. lign.	1.7. Number of ECTS credits	3
1.2. Course title	Operations management	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+8
1.3. Course code	236197	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	Manager engineers must coordinate the use of resources through the management process, which involves planning, organizing, staffing, directing and controlling.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	D1 - Plan and organise the time study, work rationalisation, and perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate basic business KPIs, write basic financial reports, recognise types of expenses.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Define production functions and production strategies 2. Analyze concepts for planning and production management 3. Prepare the technical documentation 4. Organize technological, operational preparation of production and distribution of jobs 5. Connect documentation of business and manufacturing systems companies wood processing and furniture production 6. Modeling production process management systems in a wood processing and furniture manufacturing company 7. Recommend a software solution for integrated production planning and management 8. Apply the acquired knowledge and skills from the content of the course items to solve a specific task
2.5. Course content (syllabus)	Artificial intelligence. Virtual world learning environment. Experts systems. Modell for learning. Intelligence systems. On line decision. Work in Process. Contemporary production concepts in the wood industry: transfer line, flexible production line, working centre, working cell, numerically controlled machines (NC), computerized numerical controlled machine (CNC) and direct numerical control machine (DNC). Characteristic technologies in the wood industry. Theoretical concepts necessary to manage the production process. The

<table>
<tr><td></td><td colspan="9">system information and cybernetics theory. Systemic thinking. Modelling as learning. Decision Suppor System. The characteristic conception of production management in the wood industry. Production management methods: Reorder Point (ROP), Material Requirements Planning (MRP), Management Resource Planning II (MRP II), Money Resource Planning (MRP III), Capacity Resource Planning (CRP), Just in Time/Total Quality Control (JIT/TQC), Bussines Requirements Planning (BRP), Enterprise Resource Planning (ERP). Network production. Production preparations aims and orders. Technological, operative production preparations and work distribution. Production preparation as a part of the management system. Work order. Primary bearer of information for production management. Planning of issuing work orders, job dispatching, execution and control of their accomplishment. Production documentation as a part of the information system. Projection of the information system. Optimisation methods and techniques as support in the production management modelling process. A development concept for computerization of the production preparation jobs. IT environment. Computer-aided business in the wood industry. Database. Characteristic necessary of information system. A computer-aided system of plan and development of the product (3D). Product database. Technology for numerically controlled machines. Directly numerically controlled machines. Adapt management. Flexible manufacturing system management.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ exercises in computer practicum</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>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 responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises, preparation and presentation of seminar work. Taking 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">Grladinović T.: Upravljanje proizvodnim sustavima u preradi drva i proizvodnji namještaja, Šumarski fakultet Sveučilišta u Zagrebu, Zagreb, 1999., str. 1-298.</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td colspan="4">Jelačić, D.: Upravljanje proizvodnim sustavima u drvnoj industriji (zbirka zadataka), Šumarski fakultet Sveučilišta u Zagrebu, Zagreb, 1995., str. 1-128.t</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Jacobs, R. F., Chase, R. B. : Upravljanje operacijama i lancem opskrbe, 13. zadnje. Mate, Zagreb, 2018.,396-623.
2. Majdandžić, N., Čuljak, S.: Priprema proizvodnje 1-3, Strojarski fakultet u Slavonskom Brodu, Slavonski Brod, 1991.</td></tr>
</table>

	3. Schroeder, R.G.: Upravljanje proizvodnjom, M.E.P., Zagreb, 1999. str. 1- 672.

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Asst. Prof. Tomislav Sedlar, PhD Branimir Jambreković mag. ing. techn. lign. Assoc. Prof. Bogoslav Šefc, PhD	1.7. Number of ECTS credits	3
1.2. Course title	Technological properties of wood	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+8
1.3. Course code	236198	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	The course aims to acquire knowledge about the characteristics of wood in primary wood processing. Influence of macroscopic, physical and mechanical properties of wood and wood defects on technological aspects of wood. Technological characteristics of some commercial, domestic and foreign types of wood.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verifications; B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Determining the influence of physical and mechanical properties of wood on technological characteristics of wood processing 2. Determining the impact of wood defects on technological characteristics of wood processing 3. Determining the basic technological characteristics of wood important for certain types of mechanical wood processing 4. Evaluation of technological characteristics of wood for certain types of mechanical wood processing 5. Practical recognition of technological characteristics of domestic and foreign types of wood 6. Evaluation of wood types according to technological characteristics of wood

<table>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">The behaviour of wood in processing, treatment and mechanical disintegration, and its characteristics in these processes. Wood processing and treatment. Physical and mechanical properties of wood and their influence on technological characteristics of wood. Wood-cutting theory. Theory of wood-cutting and the impact of physical and mechanical properties of wood on the process of wood-cutting. Effect of water content on technological characteristics of wood. Influence of temperature on technological characteristics of wood. Wood deformations at different water contents and temperatures. Impact of the load speed on technological characteristics of wood. Effect of anatomical structure and texture of wood on technological characteristics of wood. Processing and analysis of wood wear resistance. Influence of the size of the angle of the fibre direction according to the direction of the force. Factors affecting the mechanical properties and technological characteristics of wood. Influence of wood defects on technological characteristics of wood. Technological characteristics and workability of domestic, commercial types of wood.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>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></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 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 classes and exercises and preparation and submission of exercises within the set deadline. Taking 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">Bađun, S.: Tehnološke karakteristike drva I, skripta, Zagreb, 1979,str.1-50</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td colspan="4">Govorčin,S.; Sinković,T.: Tehnološke karakteristike drva, interna skripta, Zagreb, 2004</td><td colspan="2">NO</td><td colspan="3">YES, Merlin</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Giordano, G.: Tecnologia del legno, Volume I, Torino, 1971, str. 1-1086.
2. Koh, P.: Processi mehaničeskoj obrabotki drevesini, Moskva, 1969, str. 1-325
3.Kollmann F. R., Cote, W A Jr Principles of Wood Science and Technology I solid Wood, New York, 1968, str. 1-592.
4. Tsoumis, G.: Science and Technology of Wood, New York,1991, str. 1-233.</td></tr>
</table>

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Igor Đukić, PhD	1.7. Number of ECTS credits	3
1.2. Course title	Woodworking machinery II	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+16
1.3. Course code	236199	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 the knowledge for selecting, optimal usage and maintenance of machinery for wood processing. Acquiring the basics knowledge required for assigning project tasks to the manufacturers of special equipment for wood processing.
2.2. Enrolment requirements and/or entry competencies required for the course	-
2.3. Learning outcomes at the level of the programme to which the course contributes	C1 - Analyse the wood cutting process, select, optimally use and maintain primary process machinery, select machinery working regimes and tools for final wood processing, and recommend project assignments to special equipment manufacturers.
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Suggest optimum tool-tip material (high-speed steel, hard alloy, hard metal, or diamond) for the default workpiece material and processing parameters. 2. Suggest optimum processing parameters (feed speed, cutting speed...) for basic woodworking processes. 3. Calculate the energy efficiency of a particular processing method as the ratio of average energy consumed in kWh and unit quantity of the processed material. 4. Comment the results of measured and calculated operating regimes for mechanical woodworking machines with reference to the recommended values. 5. Measure feed per tooth, feed per revolution and cutting speed on the band saw, circular saw, planer, moulder, drill, and report the measurement results as a report. 6. Distinguish the causes of tool wear and the tool's sharpness reduction. 7. Analyze the influential factors on tool life according to Taylor and suggest increasing tool life under the processing conditions. 8. Derive the formula for the calculation of the cutting force, cutting power and theoretical roughness in wood cutting 9. Calculate the cutting speed and tool life for the optimum productivity, analyze influencing parameters, and suggest the economical cutting speed 10. Differentiate the evaluation criteria of wood machinability for different species of wood processed on band saws, circular saws, planers, mills, lathes, drills. 11. Illustrate and measure basic parameters that make up the technical criteria for selecting woodworking machines.
2.5. Course content (syllabus)	Log frames saw. Carriages and guiding devices. Sawing speeds and feeds. Calculation of log frame output. Circular log saws. Multiple blade circular saws. Log band mills. Circular resaws. Band resaws. The band saw output. Machines for planing and moulding. Planing and jointing machines. Multi sides planing and moulding machines. Rourters and carving machines. Tenoning machines. Machines for boring and mortising. Machine for turning. Universal woodworkers and combination machines. Sanding machines. Machines for finishing surfaces. Hogs, chippers and debarking machines. Woodcutting by laser and water jet

<table>
<tr><td></td><td colspan="9">machines. Methods of machine failure diagnostics. Preventive machine maintenance. Machine and tool inspection and maintenance.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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>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>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>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 responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Taking 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">Goglia V. (1994) STROJEVI I ALATI ZA OBRADU DRVA – I dio, Šumarski fakultet Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Zupčević R. (1988) MAŠINE ZA OBRADU DRVETA I dio, TEORIJA REZANJA, Mašinski fakultet Sarajevo</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Ettelt, B.; Gittel, H (2004): Sägen, Fräsen, Hobeln, Bohren - Die Spanung von Holz und ihre Werkzeuge, DRW-Verlag</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Lisičan J. (1996) TEORIJA A TECHNIKA SPRACOVANIA DREVA, MAT-CENTRUM, Zvolen
2. Williston E. M. (1978) SAWS – design, selection, operation, maintenance, Miller Freeman, S.Francisco
3. Šavar Š. (1990) OBRADA METALA ODVAJANJEM ČESTICA Svezak 1, Školska knjiga Zagreb
4. Šavar Š. (1990) OBRADA METALA ODVAJANJEM ČESTICA Svezak 2, Školska knjiga Zagreb</td></tr>
</table>

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Zoran Vlaović, PhD	1.7. Number of ECTS credits	3
1.2. Course title	Furniture construction	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+16
1.3. Course code	236200	1.9. Expected enrolment in the course	20

1.4. Study programme	University Undergraduate Studies of Wood Technology	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 constructing, constructions and types of furniture, the dependence of constructions on the mode of manufacture. Skills in development and implementation of the complete construction system: planning, design, construction and production of technical documentation applied in the final product production.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties; C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To identify and describe furniture construction, to classify (kitchen furniture, dining room furniture, office and school etc.) and to identify furniture (whose main features are visual, aesthetic and functional elements and inner construction and functional structure) and to use technical terms (rail, panel, hinge etc) 2. To design, draw and describe furniture for storage, dining and work (home, office, school) by way of the conceiving stage (analysing tasks and dealing with the issue of constructing), designing (selecting the best variant and making a drawing) and by constructional elaboration to parts and assemblies. 3. To design, draw and describe furniture for sitting and resting in accordance with HRN EN standards. 4. To draw up the basic construction documentation and approach it systematically to its completion. 5. To design, draw and describe furniture for lying (beds, deck chairs) while considering the user's comfort.) 6. To design, draw and describe furniture for people with special needs in accordance with anthropometric requirements. 7. To design, draw and describe furniture of the exteriors. 8. To use CAD systems for making technical drawings or drawings as data carriers in relation to product shape, construction and quality. 9. To define and sketch paper- and cardboard-made furniture 10. To deal with calculations for the construction of different furniture types (to dimension construction) 11. To manage the equipping of a facility with furniture for storage, sitting and lying. 12. To identify and describe quality factors for the said furniture types. 13. To identify and distinguish fittings for storage furniture		
2.5. Course content (syllabus)	Introduction to furniture construction (classification, identification, vocabulary). Construction and drawing of the furniture for keeping and supporting the objects (furniture made of massive wood, furniture made of wooded and other materials), work furniture (office, school and home), furniture for serving meals, sitting furniture and furniture with backrest; upholstered sitting furniture, rest furniture (beds and deck chairs), furniture fitted to the people with special needs, furniture of the exteriors, paper- and cardboard-made furniture. Construction-calculation methods in the construction of various types of furniture.		
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
☒ fieldwork</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>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></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 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. Taking exam.</td></tr>
<tr><td rowspan="8">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">Tkalec, S. (1985): Konstrukcije namještaja, monografija, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Tkalec, S., Prekrat, S. (2000): Konstrukcije proizvoda od drva I – Osnove drvnih konstrukcija, sveučilišni udžbenik, Sveučilište u Zagrebu, Šumarski fakultet, Znanje, Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Domljan, D., Grbac, I., Jirouš Rajković, V., Vlaović, Z., Živković, V., Župčić, I. (2015): Kvaliteta i tehnički opisi proizvoda od drva, Svezak I. Opremanje zgrada za odgoj i obrazovanje, sveučilišni priručnik, Šumarski fakultet Sveučilišta u Zagrebu, Hrvatska gospodarska komora, Zagreb.</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Vlaović, Z. (2009): Činitelji udobnosti uredskih stolica, disertacija – odabrana poglavlja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Grbac, I. (2006): Krevet i zdravlje, sveučilišni udžbenik – odabrana poglavlja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td><td colspan="2">YES</td><td colspan="2"></td></tr>
<tr><td colspan="5">Panero, J. i Zelnik, M. (1991): Antropološke mjere i interijer, Zbirka preporuka za standarde u projektiranju, IRO ''Građevinska knjiga'', Beograd
Katalozi svjetskih proizvođača okova za namještaj</td><td colspan="2"></td><td colspan="2">Web</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">1. Hrvatski zavod za norme – odabrane HRN EN
2. Nutsch, W., 2009. Holztechnik: Gestaltung: Konstruktion: Arbeitsplanung. Lektorat Wolfgang Nutsch. Verlag Europa-Lehrmittel.
3. Grbac, I. (1988): Istraživanje kvalitete ležaja i poboljšanje njegove konstrukcije – disertacija, odabrana poglavlja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td></tr>
</table>

	4. The Taunton Press (2000): Practical Design Solutions and Strategies, Key advise for sound construction from Fine Woodworking, The Taunton Press Inc. Newtown, USA

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Zoran Vlaović, PhD Assoc. Prof. Danijela Domljan, PhD	1.7. Number of ECTS credits	3
1.2. Course title	Upholstered furniture	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+16
1.3. Course code	236201	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 construction, types and functions, requirements in use, and the dependence of construction upon production technology of upholstered furniture.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD; D1 - Plan and organise the time study, work rationalisation, and perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate basic business KPIs, write basic financial reports, recognise types of expenses		
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. To identify historical periods, styles and development of upholstered furniture 2. To design and construct types of upholstered furniture intended for sitting, lying and for multiple purposes (resting and relaxation) 3. To distinguish and recommend materials for making upholstered furniture (such as the frame construction, the elastic layer, and the decorative-covering layer…) 4. To choose materials for the frame construction; for the base of furniture for sitting and lying; for the elastic layer, i.e. the core; for surface softness and the decorative covering layer: 5. To explain the specificity of material utilisation for upholstered furniture (e.g. leather or decorative fabric with a pattern) 6. To design furniture and plan its manufacture depending on available technology (classical (hand), machine-made, construction technology of bed-mattress…) 7. To draw a classical construction of upholstered furniture for sitting and lying		

<table>
<tr><td></td><td colspan="9">8. To define and apply functional requirements for upholstered furniture
9. To plan. recommend and assess upholstered furniture quality
10. to distinguish and compare the resistance to the flammability of upholstered furniture
11. To recognise and apply ecological production of upholstered furniture
12. To differ stages of the technological process of upholstered furniture manufacturing (e.g. when producing mattresses, to recognise the process of making the mattress core, making outer layers etc.)
13. To recognise the type (quality) of sponge materials (eg. the difference between viscoelastic foam and latex, differences in density (hardness)</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">Introduction to upholstered furniture and history of upholstered furniture. Constructional classification of upholstered furniture (construction types of upholstered furniture for sitting; construction types of upholstered furniture for rest – bed systems; construction types of multipurpose upholstered furniture – sitting, relaxation and laying). Materials for upholstered furniture (materials for frame construction, bases for sitting furniture (seat) and rest (bed bases), materials for elastic layer, i.e. seat cores and mattresses, materials for soft surfaces – covering materials, materials for decorative-covering layer, auxiliary materials, specificities of material utilization in upholstered furniture). Relevance of construction for the production technology of upholstered furniture, classical construction of upholstered furniture for sitting and rest. Functional requirements upon upholstered furniture (anthropometry, health aspects of upholstered furniture, functional dimensions of upholstered furniture, comfort, physiological-hygienic requirements, aesthetic requirements). Quality of upholstered furniture. Flammability of upholstered furniture and ecological aspect of the production of upholstered furniture.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="4">☒ lectures
☐ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</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="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></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>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 responsibilities</td><td colspan="9">Regular attendance and active participation in lectures and exercises. Taking 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>Availability via other media</td></tr>
<tr><td></td><td colspan="5">Grbac, I. (2005): Ojastučeni namještaj, sveučilišni udžbenik, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td><td colspan="2">YES</td><td></td></tr>
<tr><td></td><td colspan="5">Vlaović, Z. (2009): Činitelji udobnosti uredskih stolica, disertacija – odabrana poglavlja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb</td><td colspan="2">YES</td><td></td></tr>
</table>

	Domljan, D., Grbac, I., Jirouš Rajković, V., Vlaović, Z., Živković, V., Župčić, I. (2015): Kvaliteta i tehnički opisi proizvoda od drva, Svezak I. Opremanje zgrada za odgoj i obrazovanje, sveučilišni priručnik, Šumarski fakultet Sveučilišta u Zagrebu, Hrvatska gospodarska komora, Zagreb.	YES	
	Grbac, I. (2006): Krevet i zdravlje, sveučilišni udžbenik, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb	YES	
	Panero, J. i Zelnik, M. (1991): Antropološke mjere i interijer, Zbirka preporuka za standarde u projektiranju, IRO ''Građevinska knjiga'', Beograd	NO	Web
	Katalozi svjetskih proizvođača okova za namještaj	NO	Web
2.12. Optional literature	1. Hrvatski zavod za norme – odabrane HRN EN 2. Tkalec, S. (1985): Konstrukcije namještaja, monografija, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb 3. Grbac, I. (1988): Istraživanje kvalitete ležaja i poboljšanje njegove konstrukcije – disertacija, odabrana poglavlja, Sveučilište u Zagrebu, Šumarski fakultet, Zagreb 4. Krasny, J., Parker, W. and Babrauskas, V., 2000. Fire behavior of upholstered furniture and mattresses. William Andrew 5. de Witte, H.L., 2017. Impression tests upholstered furniture and mattresses. Arnhem: Institute For Safety., Arnhem 6. Morley, J. (1999): Furniture: The western tradition, History, style, design, Thames & Hudson Ltd., London		

COURSE DESCRIPTION

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Assoc. Prof. Danijela Domljan, PhD Assoc. Prof. Zoran Vlaović, PhD	1.7. Number of ECTS credits	3
1.2. Course title	Furniture design	1.8. Number of hours in a semester (L+E+F+e-learning)	30+30+16
1.3. Course code	236202	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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	YES
2. COURSE DESCRIPTION			
2.1. Course objectives	Mastering and understanding of theoretical, practical and methodological principles of furniture design as a complex interdisciplinary process aimed at developing skills for independent analytical and creative design and action.		
2.2. Enrolment requirements and/or entry competencies required for the course	Knowledge and skills acquired in the subjects Basics of design drawing, Applied technical graphics and Wooden constructions: - knowledge and application of artistic expression, principles of aesthetics and types and techniques of design drawing - application of ACAD or similar computer programs for 2D and 3D drawing		

	- understanding and application of 3D plane, orthogonal projections and perspectives - knowledge of the basics of the construction of wood products - knowledge of at least one foreign language (preferably English) - equipped workshop/practicum DTO with a lathe, laser cutter and other basic machines for wood and wood panels and mouldings.
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verificationsB3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods; C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties; C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD; C8 - Recommend materials and procedures that are applied in the wood finishing process in the interior and the exterior, operate the wood finishing process starting from base preparation to the hardening of the material; D2 - Perform wood industry-specific calculations, define and analyse expenses, organise and conduct distribution, promotion and market research, plan products and product programmes, form product cost and selling prices, organise and conduct sales of wood and wooden products; E1 - Continue specialization in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	1. Recognize and apply the characteristics of historical styles and heritage in furniture design 2. Compare and monitor contemporary trends and innovations in furniture design (internet, magazines, books) in the context of economic development, culture, heritage and social, developmental and historical factors of each nation and apply them in designing new furniture design solutions. 3. Explain the importance of an interdisciplinary approach and the inclusion of knowledge of other professions in furniture design 4. Recognize and explain the term good design using the parameters of good design 5. Design and shape furniture and other wooden products using design elements (means of expression) and the principles of modern design (functional, aesthetic, technical-technological, human, economic, environmental principles, etc.) or according to given characteristics (input data) 6. Use innovations and new materials and technologies in designing conceptual furniture solutions on a given topic 7. Apply knowledge of aesthetics, ergonomics, anthropometry, ecology, standards, new materials, and technologies, marketing and visual identity in the design of furniture and other wood products 8. Define design-functional, construction-technological and other characteristics of the executive design of furniture 9. Apply knowledge of design drawing (spatial and / or, computer) and workshop work (professional practice) in the development of conceptual and implementation solutions for designed furniture.

<table>
<tr><td></td><td colspan="9">10. Present the solution of designed furniture in all stages of product development with the final model/prototype in the design of furniture and other wood products</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td colspan="9">What is design. Historical overview of furniture design development. Characteristics of world and European styles in furniture manufacturing. The use and meaning of shapes, materials and constructions in certain historical styles. Contemporary trends in furniture design. Development of contemporary design. Basics of product design. Theory of form. Elements and principles of form. Aesthetic components of the product. Product perception. Expressive means of industrial design. Design elements of industrial design: Design principles. Functional principles. Aesthetic principles. Technical and technological principles. Human principles. Economic principles. Ecological principles. Product development. Which is a good design. The role and importance of good product design. The relationship between the designer and the company. Methods in the design process. Design and interdisciplinarity. Product quality. Design and standardization. Design and ergonomics. Anthropometry and ergonomics. Ergonomic methods. Design and marketing. Marketing information and market and user research. Design and visual communications. The importance of visual culture in communication with the product. Environmental design. Ecology and furniture design. Bionics. Biophilia. The role of information technology in product development. The relationship between furniture and dedicated space. The impact of sustainable development in product and space design.</td></tr>
<tr><td>2.6. Format of instruction</td><td colspan="3">☒ lectures
☒ seminars and workshops
☒ exercises
☐ online in entirety
☒ partial e-learning
☒ fieldwork</td><td colspan="3">☒ independent assignments
☐ multimedia and the internet
☐ laboratory
☐ work with mentor
☒ some of the tasks are performed in a DTO practicum/workshop</td><td colspan="3">2.7. Comments:
The student's practical work implies the creation of a model/prototype of a product solution designed within the main task in the exercises.</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>YES</td><td></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>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>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>3</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, exercises and fieldwork, preparation and submission of exercises, papers and seminars within the specified time. Taking 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="3">Availability in the library</td><td colspan="2">Availability via other media</td></tr>
<tr><td colspan="4">Domljan, D. (2015): Ekologija i ergonomija namještaja, (interna skripta), Šumarski fakultet. Zagreb</td><td colspan="3">NO</td><td colspan="2">YES, Merlin</td></tr>
<tr><td colspan="4">Domljan, D; Grbac, I; Jirouš Rajković, V; Vlaović, Z; Živković, V; Župčić, I. (2015): Kvaliteta i tehnički opisi proizvoda od drva. Svezak I. Opremanje zgrada za odgoj i obrazovanje, sveučilišni priručnik, Šumarski fakultet Sveučilišta u Zagrebu, Hrvatska gospodarska komora, Zagreb</td><td colspan="3">YES</td><td colspan="2"></td></tr>
</table>

	Lapaine, B. (1994): Dizajn, Sveučilište u Zagrebu Šumarski fakultet, Zagreb	YES	
	Noblet de, J. (1999): Dizajn, pokret i šestar, Golden marketing, Zagreb	YES	
	Panero, J. i Zelnik, M. (1987): Antropološke mere i interijer, Zbirka preporuka za standarde u projektiranju, IRO ''Građevinska knjiga'', Beograd	YES	
	Baxter, M. (2000): Product Design, CRC Press, London, Boca Raton, NY, Washington	NO	Web
	IDSA (2001): Design secrets – products. 50 Real-Life Product Design Projects, Rockport, USA	NO	Web
	Luchs M.G. Swan S.; Griffin, A (2015): Design Thinking: New Product Development Essentials from the PDMA. Willey, New Jersey	NO	Web
	Bridger, R.S. (2018): Introduction to Human Factors and Ergonomics. Fourth Edition. CRC Press, Taylor & Francis Group, USA	NO	Web
	Lidwell, W., Holden, K., Butler, J. (2006) : Univerzalna načela dizajna, Mate, Zagreb	YES	
2.12. Optional literature	1.Berman, D.B. (2009): Do Good Design. New Riders & AIGA Design Press, USA 2.Beazley, M. (2003): The Elements of Design, Octopus Publishing Group Ltd, UK 3.Fuad-Luke, A. (2007): The Eco-design Handbbook, Thames & Hudson, London, UK 4.Dul, J.; Weerdmeester, B. (2008): Ergonomics for Beginners. A Quick Reference Guide. 3rd Edition, CRC Press,Taylor & Francis Group, FL, USA 5.Grbac, I. (2003): Zdrav život – zdravo stanovanje, Prvi priručnik iz područja namještaja u funkciji zdravlja, Spektar media, Zagreb 6.IDSA (2001): Design secrets – products. 50 Real-Life Product Design Projects, Rockport, USA 7.Lapaine, B (1998): Stolica kao problem rješenja sjedenja, 8.Luchs M.G. Swan S.; Griffin, A (2015): Design Thinking: New Product Development Essentials from the PDMA. Willey, New Jersey 9.Konz, S.; Johnson, S. (2016): Work design - Occupational Ergonomics. 7th edition. CRC Press, Taylor & Francis Group, FL, USA. 10.Kroemer, K.H.E. (2017): Fitting the Human. Introduction to Ergonomics / Human Factors Engineering, 7th edition. CRC Press, Taylor & Francis Group, USA 11.Meštrović, M. (1980): Teorija dizajna i problemi okoline, Biblioteka Naprijed, Zagreb 12.Pheasant, S. (2003): Bodyspace.Anthropometry, Ergonomics and the Design of Work. 2nd edition. CRC Press, Taylor & Francis Group, UK, USA 13.Papanek, V. (1973): Dizajn za stvarni svijet, M. Marulić, Split 14.Pevsner, N. (1936. i dalje): Pioneers of Modern Design, Penguin, London 15.Sparke, P. (1986): Design in context, Quatro Publishing, London 16.Quarante, D. (1991): Osnove industrijskog dizajna, Sveučilište u Zagrebu Arhitektonski fakultet - Interfakultetski studij dizajna, Zagreb 17.Urlich, K.T.; Eppinger, S.D. (2012): Product Design and Development, 5th ed. McGraw-Hill, NY 18.Vukić, F. (1996): Stoljeće hrvatskog dizajna, Meandar, Zagreb 19.*** (1999): Living spaces, Ecological Building and Design, Öko test, Könemann, English Edition, (Edit.: Schmitz-Gunther T.), Mladinska knjiga tiskarna d.d., Ljubljana		

COURSE DESCRIPTION

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 a semester (L+E+F+e-learning)	-
1.3. Course code	226052	1.9. Expected enrolment in the course	20
1.4. Study programme	University Undergraduate Studies of Wood Technology	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 thesis is 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 final thesis may be related to interdisciplinary knowledge if it corresponds to the title and objectives of the thesis. The preparation of a thesis of an experimental nature means the student's independent work based on small-scale research or part of it that the student conducts independently and analyzes, describes and presents the results himself. The final thesis should not contain original views and results. The final review thesis has cognitive value because it gives a complete overview of a problem/topic based on published papers and studies and requires the study and analysis of relevant literature.		
2.2. Enrolment requirements and/or entry competencies required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	A1 - Apply a physical approach of experimental observation and mathematical modelling, solve mathematically various research and practical problems, statistically process, present and analyse data, and reach conclusions based on analysed data; A2 - Apply basic laws of physics that present the basis of wood technology, understand Newton's axioms and apply them to solve technical problems, explain phenomena in the field of electrical engineering, and make accurate and optimal use of electric energy A3 - Competently maintain, work with and use the possibilities of basic technical components; A4 - Apply skills in solving practical issues in the business, either by control measurements, calculations or testing verificationsB3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; B1 - Identify parts and shapes of trees, macroscopic, physical and chemical wood properties, identify and explain the anatomic structure of the xylem of wood-like plants, identify wood-like species based on different morphological characteristics, and apply theoretical and practical knowledge of commercially important indigenous and foreign species of wood and shrubbery; B2 - Recognise and determine the most important types of xylophagous bacteria, insects, fungi and marine borers, and determine flaws on wood incurred due to their activity; learn the basic principles of wood protection based on physical, chemical and structural properties of wood, and apply basic procedures and methods for wood protection; B3 - Apply knowledge about the mechanical properties of wood, mechanical properties arrangement within individual trees and groups of trees, tree flaws and the influence of flaws on the mechanical properties of wood; B4 - Apply technical knowledge for the purpose of mastering wood industry procedures and processes, means of work and material handling methods; B5 - Organise transport of wood and wooden materials, calculate and adjust the capacities of means of transport with technological procedures, calculate and analyse energy consumption, and recommend solutions for less complex wood and wooden material transport projects;		

<table>
<tr><td></td><td>C1 - Analyse the wood cutting process, select, optimally use and maintain primary process machinery, select machinery working regimes and tools for final wood processing, and recommend project assignments to special equipment manufacturers;
C2 - Recognise and assess sawmilling raw material and products, conduct the categorisation and measurements of sawmilling raw material and products, apply basic skills of wood sawmilling technology and techniques of log and board sawing, and identify factors of successful sawmilling wood processes;
C3 - Monitor and control processes of massive wood, veneer and wood particle drying, other special drying processes, and wood steaming;
C4 - Recognise particular types of veneer and wood panel, analyse the basic structural components of wood panels, explain the interdependency of structural components and technical properties of wood panels, monitor and control the manufacturing process in wood board factories, select and use wood panels with optimal properties;
C5 - Size constructions, define systems of construction compositions as a prerequisite for product construction, define the basic construction documentation and develop it systematically, apply CAD systems in the wood industry and 2D modelling with the help of AutoCAD;
C6 - Use wood glueing technology, select materials with optimal properties important for final processing, apply simpler technological methods in final wood processing;
C7 - Define the specifics of wood used in construction, recommend adequate applications of a particular type of wood for building purposes, recommend the basic shape, physical and construction solutions, explain and ensure functional requirements, types and construction solutions for main product groups;
C8 - Recommend materials and procedures that are applied in the wood finishing process in the interior and the exterior, operate the wood finishing process starting from base preparation to the hardening of the material;
D1 - Plan and organise the time study, work rationalisation, and perform quality control in technological processes and on finished products, maintain supply, stock and logistic support optimization, plan and calculate the production, calculate basic business KPIs, write basic financial reports, recognise types of expenses;
D2 - Perform wood industry-specific calculations, define and analyse expenses, organise and conduct distribution, promotion and market research, plan products and product programmes, form product cost and selling prices, organise and conduct sales of wood and wooden products;
E1 - Continue specialization in university graduate studies at the Wood Technology Department of the Faculty of Forestry and Wood Technology.</td></tr>
<tr><td>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</td><td>1. be able to apply existing knowledge to solve professional problems for the selected topic
2. create a term work plan following 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 bachelor thesis in written and oral form</td></tr>
<tr><td>2.5. Course content (syllabus)</td><td>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. The bachelor thesis is usually prepared during the final semester of undergraduate study and ends with an oral exam.</td></tr>
<tr><td>2.6. Format of instruction</td><td>☐ lectures
☐ seminars and workshops
☐ exercises
☐ online in entirety
☐ partial e-learning
☒ fieldwork
☒ independent assignments
☐ multimedia and the internet
☒ laboratory
☒ work with mentor
☐ (other)</td><td>2.7. Comments:</td></tr>
<tr><td>2.8. Monitoring student work</td><td>
<table>
<tr><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>YES</td><td></td><td>Report</td><td></td><td>NO</td><td>Thesis</td><td>YES</td><td></td></tr>
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<table>
<tr><td rowspan="3"></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>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>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 theme and mentor of the thesis, prepare the thesis and submit it to the mentor. Report the thesis and prepare for the oral 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>Availability via other media</td></tr>
<tr><td></td><td colspan="5">Ordinance on the preparation and taking the bachelor thesis</td><td colspan="2"></td><td>website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td></td><td colspan="5">Form ZR-1 Request for approval of the topic and mentor of the bachelor thesis</td><td colspan="2"></td><td>website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td></td><td colspan="5">Instructions on the layout and content of the diploma thesis</td><td colspan="2"></td><td>website of the Faculty of Forestry and Wood Technology</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="9">-</td></tr>
</table>