Transilvania University of Braşov, Romania
Study program: Wood Technology for Constructions

Faculty: Furniture Design and Wood Engineering
Study period: 2 years (master)

1st Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood structure and properties	DS	6	2	0	2	0

Course description (Syllabus): Wood as an ecological and renewable material. General notions. Representative wood species. Wood structure: Main sections through wood; The chemical composition of wood; The microscopic structure of coniferous and deciduous wood; The macroscopic structure of resinous and deciduous wood; Physical characteristics of wood; Wood defects (reaction wood, uneven annual rings, knots, cracks, fiber deviations, resin bags). Physical properties: Wood humidity; Swelling and shrinking of wood; Density and specific weight; Factors of influence. Mechanical properties: Wood as an anisotropic material; Elastic properties; Mechanical resistances; The behavior of wood in bending, compression, shearing, traction, hardness; Factors of influence.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood and wooden materials for constructions	DS	6	2	0	1	2

Course description (Syllabus): Introduction. The importance of using wood in construction. Wood and its importance in the context of global warming. Solid wood. Assortments. Conditions of use in construction. Properties. Wood composite materials for constructions (MCL). Classification, description. Method of manufacture. MCL. Advantages disadvantages. Comparative properties. Engineering products for construction. Lamellar beams. Manufacturing technology. Comparative properties. Other innovative materials. Smart wood – the material of the future. Aspects related to the marketing of wood-based materials for construction.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Technology of wood for constructions	DS	6	2	0	1	1

Course description (Syllabus): Characterization of wood material used in construction: species, physical-mechanical properties. Cutting timber to length for construction. Four-sided processing of timber for construction. Wood processing for walls from overlapping logs (beams). The technology for making CLT. CLT joining technologies. Structures and technologies for making exterior cladding.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Heat and mass transfer in wooden buildings	DS	4	1	0	1	0

Course description (Syllabus): Introduction and Terminology. Heat yield and influencing factors. Thermal conductivity and influencing factors. Case studies concerning heat transfer in wooden buildings. Thermal insulation of wooden buildings. Moisture in wooden buildings. Mass (moisture) transfer in wood and wood-based materials. Case studies concerning mass transfer in wooden buildings. Vapour barriers. Modelling of heat and mass transfer.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ethics and academic integrity	DC	2	1	1	0	0

Course description (Syllabus): Fundamentals of academic ethics. Moral and academic deontology. Ethics in teaching and learning. Ethics in research. Intellectual property. Ethics in business. Plagiarism – how we avoid it.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Internship 1	DS	6	0	0	0	12

Course description (Syllabus): Documentation and individual analysis in companies and/or within the Research Institute of Transilvania University of Braşov (ICDT).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood constructions 1	DS	6	2	0	2	0

Course description (Syllabus): Wooden materials used in construction. Constructive systems for wooden constructions - vertical load-bearing structures: lightweight walls. Constructive systems for wooden constructions - vertical load-bearing structures on posts and beams. Constructive systems for wooden constructions – vertical load-bearing structures: stacked logs (beams) walls. Constructive systems for wooden constructions – horizontal load-bearing structures: floors. Constructive systems for wooden constructions – roof structures and coverings. Constructive systems for wooden constructions - exterior cladding.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Adhesives and coating materials for wooden buildings	DS	3	1	0	1	0

Course description (Syllabus): Fundamental aspects regarding the use of wood in construction. The importance of the wood gluing process in construction. Properties of glued wooden structures. Adhesives for wooden structures in construction (bearing and non-bearing). Classification criteria. Adhesives for load-bearing structures. Properties and standardized test methods. Adhesives for non-load-bearing structures. Properties and standardized test methods.
Wood finishing - General concepts. Finishing technological materials and types of finishes. Principles of wood treatment and finishing in construction. Exterior finishes. Evaluation of the quality of exterior finishes.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood pathology and wood protection in constructions	DS	3	1	0	1	0

Course description (Syllabus): Pathology of construction wood: factors and phenomena of biodegradation; economic, ecological and human health consequences (Mycotoxins). Premises and specific causes of wood biodegradation in construction. Case studies (wooden structures, historical monuments, recent constructions). Principles, products, technologies of preventive protection of construction wood. Principles, products, technologies of curative protection of construction wood. Testing the natural durability and effectiveness of wood protection products / technologies through laboratory and field tests. Estimated life span. Principles of good practice for the protection of wood in construction and the rehabilitation of old wooden structures / constructions. Assortments of improved wood with applicability in constructions.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Prefabrication of wooden buildings	DS	3	1	0	0	1

Course description (Syllabus): General considerations, principles and guidelines regarding the prefabrication and standardisation of structures for wooden constructions. Prefabricated constructive systems for the floors of wooden buildings. Prefabricated constructive systems for the walls of wooden constructions. Prefabricated constructive systems for horizontal load-bearing structures – floors. Prefabricated constructive systems for frames and coverings. Elements on the optimization of packaging, marking and transport. Assembly of prefabricated systems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
CAD for wooden buildings	DS	6	2	0	2	0

Course description (Syllabus): The advantages of using BIM 3D-CAD/CAM programs – CadWork. Frame structures - types of structures and way of working. Frame structures – wooden elements that form the structures on the frames (pillars, beams, nodes, braces). Design of structures on frames using BIM 3D-CAD/CAM programs. Wall structures – types of walls. Wall structures – wooden elements that make up the wall structures (structural walls, load-bearing walls, floors, roofs). Design of wall structures using BIM 3D-CAD/CAM programs.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
History of wooden constructions	DS	3	1	0	0	1

Course description (Syllabus): Introduction. History of wooden constructions. Timber construction, sustainability and energy efficiency. Major structural typologies. Vernacular wooden constructions in the world. Vernacular wooden constructions in Romania. Modern wooden constructions in Romania and globally. Contemporary design using wooden structures.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Internship 2	DS	6	0	0	0	12

Course description (Syllabus): Documentation and individual analysis in companies and/or within the Research Institute of Transilvania University of Braşov (ICDT).

2nd Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood constructions 2	DS	3	1	0	0	1

Course description (Syllabus): Solid wood-based panels used in construction: CLT, DLT, NLT, GLT. Constructive systems for wooden constructions - load-bearing structures made of CLT. Constructive systems for wooden constructions – load-bearing structures made of SIP. Introductory elements regarding hydro, thermal and acoustic insulation of wooden constructions.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Energy-efficient buildings	DS	4	1	0	0	1

Course description (Syllabus): General considerations regarding low energy / passive houses. Presentation of the passive house standard developed by the Passive House Institute. The advantages of passive houses, the current energy context, energy sources and climate change. The design of houses with low energy consumption / passive. Establishing the shape, structure, location, windows. Solutions to reduce energy consumption. Solutions regarding the appropriate thermal insulation of houses with low energy consumption/passives. Calculation of thermal resistances and thermal bridges. Solutions regarding heating, ventilation, air conditioning and natural lighting of passive constructions. Canadian wells. Solutions regarding the use of renewable energy in passive houses and solutions

regarding the use of rainwater for domestic use. Specific comfort features in passive houses and the profitability of a passive house. Presentation of case studies. SES ECO House and EFDEN House.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Calculus of wooden buildings	DS	6	2	0	2	0

Course description (Syllabus): Introduction. Overview of limit state strength calculation. Characteristic and calculation resistances of wood according to SR EN 1995:2004 (Eurocode 5). Actions and calculation of demands according to SR EN 1990:2004 (Eurocode 1): permanent actions, variable actions (operational loads, climatic loads), calculation combinations. Calculation of simple section timber elements subjected to centric tension and compression. Calculation of wooden elements with simple section subjected to shear, torsion, and bending. Calculation of wooden elements with simple section subjected to tension or eccentric compression (axial forces with bending). Calculation of wood elements with composite section. Calculation and construction of mortise joints and wedge joints. Calculation and design of mechanical joints with cylindrical rods subjected to shearing and those with rods subjected to pulling. Calculation and composition of joints made using metal connectors with teeth. Calculation and design of joints subjected to tension perpendicular to the fibers and joints subjected to bending. Ductility and stiffness of mechanical joints. Fire behavior and calculation of timber elements and joints.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Finite Element Method for wooden buildings	DS	3	1	0	1	0

Course description (Syllabus): Introduction to the finite element method. Steps for solving a problem with the finite element method, Advantages and disadvantages of using MEF in solving structural analysis problems, The role of the engineer. Brief presentation of some basic elements from the theory of elasticity: stresses; deformations; trips; energy theorems. The displacement matrix method for the calculation of deformable mechanical structures: the concept of rigidity; determination of the stiffness matrix for several straight bar elements under different stress conditions (tension-compression, bending, torsion); the physical meaning of the coefficients of the stiffness matrix; coordinate transformations; calculation steps of the displacement matrix method. Direct formulation and variational formulation of the finite element method. Types of finite elements and their selection criteria. Shape functions. Isoparametric finite elements (one-dimensional, two-dimensional, three-dimensional). Practical problems when using the finite element method. Influence of discretization, testing and case study. Introduction of boundary conditions. Assembling the matrix. Solving the linear system. Calculation of deformations and stresses: displacement vector, strain tensor, stress tensor at a certain point. Interpretation of finite element analysis results.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Doors, windows, interior stairs and floorings	DS	5	2	0	0	2

Course description (Syllabus): Introduction. General considerations. Doors for wooden constructions: terminology, functions, classification. Frame type doors: Structure; Typology; Technology. Panel type doors: Structure; Typology; Technology. Cellular doors: Structure; Typology; Technology. Windows for wooden constructions: terminology, functions, classification. Classic wooden windows: Structure; Typology; Technology. Laminated wood windows: Structure; Typology; Technology. Wooden stairs: terminology and classification. Wooden stairs: Typology; Structure; Technology. Flooring: terminology, functions and classification. Flooring: Typology; Structure; Technology.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Package of optional disciplines: Wood properties and non-destructive testing / Recycling and recovery of wood wastes from buildings	DS	3	1	0	1	0

Wood properties and non-destructive testing

Course description (Syllabus): Thermal properties of wood - Combustion of wood and calorific power. Thermal properties of wood: wood conversion into energy (pyrolysis, gasification, direct catalytic liquefaction). The electrical and magnetic properties of wood. Acoustic properties of wood. Acoustic parameters and the soundboard. Acoustic properties of wood. Sound and ultrasound and their applications. The behavior of wood to non-ionizing radiation. Applications. The behavior of wood to ionizing radiation. Applications.

Recycling and recovery of wood wastes from buildings

Course description (Syllabus): Innovative wood and wood-based waste recycling technologies - first part. Innovative wood and wood-based waste recycling technologies - part two. Innovative materials and technologies that use wood and wood-based waste (Eurolight, Dendrolight, Iisocore, wood-plastic composites). Innovative materials and technologies using wood and wood-based waste (green bonding, reconstituted veneers). Wood as a source of energy. Methods of converting wood into energy - first part. Methods of converting wood into energy - part two.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Internship 3	DS	6	0	0	0	12

Course description (Syllabus): Documentation and individual analysis in companies and/or within the Research Institute of the Transilvania University of Braşov (ICDT).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Preparation of dissertation thesis - internship	DS	15	0	0	0	14

Course description (Syllabus): Individual documentation based on the theme of the dissertation thesis.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Elaboration of the dissertation thesis	DS	15	0	0	0	14

Course description (Syllabus): Dissertation topics - examples: Technical and technological project for a passive house intended for single-family housing. Reorganization of the technological flow at SC.... S.A/S.R.L. for the purpose of the production of semi-finished wooden houses. Designing a technological flow for the production of semi-finished wooden houses. Evaluation of the quality of some lignocellulosic briquettes.Tests and determinations related to lignocellulosic pellets. Innovative techniques for making curved wooden chairs. Study on the structure, use and manufacturing technology of flexible wood. Research on its acoustic properties. Studies and research regarding the use of the laser cutting technique for veneers in order to carry out inlay works.Studies and research regarding the production of panels from lignocellulosic materials used for the acoustic insulation of buildings. Studies and research on the behavior of innovative panels to mechanical stress in order to use them as partitions. Innovative wall structures intended for thermal insulation of buildings. Studies and research regarding the creation of structures from ecological materials used for the thermal insulation of buildings. Study on the market of round wood and timber in the world and in Europe. Evolution, trends. Experimental studies and research on determining the thermal and sound insulation capacity of panels for wooden houses made of ecological materials. Experimental studies and research regarding the determination of the coefficient of thermal conductivity of some new composites used in thermal and sound-insulating panels. Experimental studies and research on thermal optimization of constructive solutions for exterior doors. Optimizing a technological process / wood product using the experiment planning method. The influence of the

type of experimental plan applied in the research on the optimal configuration of a joint with applied cylindrical dowels. The influence of the cross-section of the parts and the type of adhesive on the strength of a joint with applied cylindrical dowels.

Theoretical and experimental study on the valorization of the bark by obtaining briquettes with improved properties.

Experimental research on the utilization of woody remains by obtaining pellets with improved properties.

Theoretical and experimental study of lignocellulosic briquettes from the point of view of physical and mechanical properties. Comparative study of lignocellulosic pellets in terms of physical and mechanical properties.