

Transilvania University of Braşov, Romania

Study program: Forest Engineering

Faculty: Silviculture and Forest Engineering

Study period: 4 years (bachelor)

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematics	MATE	5	2	2	-	-

Course description: the discipline covers the following: Vectors and linear analytical geometry; Calculus; Linear algebra; Applications. The seminar consists of exercises on the topics learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Biostatistics	BIOS	4	2	-	2	-

Course description: the discipline covers: Introduction to and a description of the main statistical indicators; Description of the main theoretical fitting distributions; Correlation analysis; Regression analysis; Analysis of variance (one-way-ANOVA, two-way ANOVA) and Sampling designs. Laboratory consists of practical applications on the topics learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Engineering Drawing and Cartography	DTC	4	2	-	2	-

Course description: this course introduces international standards of engineering drawing. Topics include: Orthogonal projection; Multiview projection; Axonometric projection; Architectural drawing; Engineering drawing; Cartography; Map projections; Topographic map; Map design. Laboratory consists of practical applications on the topics learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Informatics	INFF	5	2	-	2	-

Course description: the discipline covers an introduction and work with spreadsheet software Microsoft Excel and Autodesk AutoCAD. It includes the following topics: Generations of computers; Numerical systems; Spreadsheet calculations; Introduction to Microsoft Excel; Spreadsheet editing; Data series; Working with commentaries; Data linking; Spreadsheet formatting; Registry formatting and printing; Implementing technical and scientific projects; Introduction to AutoCAD; Using commands; Specifying coordinates; Drawing configuration; Drawing lines, splines and points; Displaying drawings; Editing drawings; Drawing management using layers, colors, line types and weights; Obtaining information from drawings; Dimensioning; Creating dimension styles; Drawing complex objects and printing.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Biochemistry	BIOCH	4	2	-	2	-

Course description: the discipline covers: Introduction to biochemistry of plants (structure and properties of the biochemical compounds, biochemical processes and reactions, water-medium of plants life, structure and properties); Description of simple and complex carbohydrates from plants (structure, physical, chemical and biochemical properties); Carbohydrate metabolism (anaerobic metabolism-glycolysis, aerobic metabolism-citric acid cycle, fermentations, photosynthesis, light reactions, the Calvin cycle); Description of simple and complex lipids from plants (structure, physical, chemical and biochemical properties); Lipid metabolism (fatty acids synthesis and degradation,

phospholipids metabolism); Description of peptides and proteins (amino acids, peptides and protein structure and properties); Protein metabolism (amino acids biosynthesis and biodegradation, protein turnover, nucleotide degradation); Nucleic acids (DNA structure and properties, RNA structure and properties); Hydro-soluble vitamins and fat-soluble vitamins (structure, characteristics, functions); Enzymes (classification, structure, properties, biocatalytic mechanisms in plants) and Correlations between the carbohydrate metabolism, lipid metabolism and protein metabolism.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Soil Science and Basics of Geology and Geomorphology	PEGG	5	2	-	2	-

Course description: the discipline covers: Knowledge on the terrestrial cortex, its chemical, mineralogical and lithological composition, the internal and external processes that have contributed to the genesis of topography, topography's genetic factors and the main topography types, morpho-structural units and their classification in Romania, soil genesis processes and its physical, physio-mechanical, chemical, hydro-physical, aeration and thermal properties. Laboratory consists of practical applications and descriptions on the topics learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Academic Writing	SAC	1	1	-	-	-

Course description: the focus of this course is to understand how to search and present scientific data in forest sciences. Main issues to be discussed: Searching for scientific articles in databases; Writing a scientific paper; Making a PowerPoint presentation and a poster.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Soils and Classification of Forest Sites	SSFOR	5	2	-	3	-

Course description: the discipline covers: Classification and characterization of forest soils in Romania; Knowledge of forest stand sites as integrant systems and as subsystems of forests ecosystems with the purpose to provide a scientific background for a sound forest management; Classification of forest stand sites in the Romanian forestry. Laboratory includes: Description of the forest soils; Classification of forest soils; Visual recognition of forest soils; Practical applications on the properties of forest soils.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Meteorology and Climatology	METEO	4	2	-	2	-

Course description: the discipline covers topics on the: Atmosphere; Radiation energy; Heating and cooling processes; Air movement; Atmospheric water; Synoptic meteorology; Basics of climatology; Climate elements and factors; Regional and local climate; Microclimate; Climate genesis; Climate classification; Climate in steep terrain areas; Synthetic features; Climate-forest relationship; Possible climate changes and their effects on forests and Romanian forestry. Laboratory covers practical applications of measurement and reporting of meteorological data.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Botany	BOT	4	2	-	2	-

Course description: the discipline covers plants morphology: Plant cell; Plant tissues; Morphology and anatomy of plant organs; Plant reproduction; Plant systematics (taxonomy); Introduction to taxonomy - *Procariota: Bacteriophyta* and *Cyanophyta*, *Eucariota: Chlorophyta*, *Mycophyta* and *Lichenophyta*, *Bryophyta*, *Pteridophyta*,

Gymnospermatophyta and *Angiospermatophyta*. Laboratory includes practical applications on the identification and research related to the topics covered in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Topography and Geodesy I	TOPO1	4	2	-	2	-

Course description: this discipline introduces fundamental principles, methods and techniques for drafting topographic plans and maps. Topics include: Instruments and methods for angle measurement; Instruments and methods for distance measurement; Instruments and methods for leveling; Principles of land surveying; Traverse method; Traverse method based on geometric leveling; Area calculation; Map drafting. Laboratory includes practical applications on the methods described and learned in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dendrology I	DEN1	5	2	-	2	-

Course description: the discipline covers the study of forest woody species (trees and shrubs) from *Ginkgoaceae*, *Pinaceae*, *Taxodiaceae*, *Cupressaceae*, *Taxaceae*, *Ephedraceae*, *Magnoliaceae*, *Ranunculaceae*, *Berberidaceae*, *Fagaceae*, *Betulaceae*, *Ulmaceae* and *Moraceae* families in regards to their taxonomic classification, morphological description, natural area of distribution and their growing areas in Romania, species ecology and, for the main species, the biological characteristics. Laboratory includes practical applications designed to recognize tree and shrub species described in the course based on their main morphological characteristics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Genetics	GEN	4	2	-	1	-

Course description: the discipline covers: Introduction to forest genetics - concepts, scope and importance; Basic genetics - tree genome, gene expression, gene structure and regulation, cytogenetics, transmission genetics; Mendelian genetics - transmission and inheritance of chromosomes, extensions to Mendel's laws, sex determination in forest trees, types of characters; Genetic markers - morphological, biochemical and molecular markers; Population genetics - genetic structure, measurement of genetic variation within and among populations, mating system, inbreeding, mutations, gene flow, genetic drift, selection. Laboratory includes practical applications on the topics covered at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English Language	LES1	2	1	1	-	-

Course description: the discipline covers: English tenses (forms and meanings); English aspects (forms and meanings, temporal-aspectual combinations in the affirmative, interrogative, and negative); English spelling rules; Passive voice; Reported speech; Conditional clauses and a Revision. Course is complemented by interactive discussions using the rules learned in English language.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English Language	LES2	2	1	1	-	-

Course description: the discipline covers: The Noun, The Article, The Genitive, The Adjective, The Preposition, Relative Pronouns and a Revision. Course is complemented by interactive discussions using the rules and topics learned in English language.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Game Description and Management	FAUNA	6	3	-	3	-

Course description: the discipline covers: Description of the main game species; Ecology and ethology of game species; Distribution of game species in Romania; Management of game populations; Description of the mountain river fish species; Management of the mountain river fish populations; Management techniques for increasing productivity of mountain river fish populations. The discipline provides knowledge, techniques and skills regarding game and fish farming. Laboratory covers practical applications on the topics described in the course, including applied techniques of game and fish management.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Constructions	CONF	5	2	-	-	2

Course description: the discipline covers the following: Introduction to civil design and buildings; Description of building components; Dimensional design and tolerances; Technical prescriptions and construction design; Wood as a construction/building material; Mineral binders; Natural stone as a building material; Concrete produced with mineral binders; Ceramics; Roofs; Slabs; Walls and Foundations. Project consists of a practical application of designing from scratch a complex building for the forestry sector.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Topography and Geodesy II	TOPO2	3	1	-	1	-

Course description: the discipline introduces the fundamental principles of geodesy. Topics covered by this discipline include: Reference surfaces; Cartographic projections; The Stereographic '70 projection; Geodetic networks; Level geodetic networks; Global Positioning Systems and Coordinate transformation. Laboratory covers practical applications on the topics learned in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Geographic Information Systems	GIS	5	1	-	3	-

Course description: the discipline covers: Basic concepts of geographic information systems (GIS); Applicability of GIS in the management of forest resources; Models used in the representation of the digital maps as raster and vector formats; Technology used to create digital cartographic databases; Procedures used to design specific projects. Laboratory consists of practical computer-aided applications to use GIS software for the understanding of concepts, creation of databases and maps and map analysis in GIS.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dendrology II	DEN2	5	2	-	2	-

Course description: the discipline covers the study forest woody species (trees and shrubs) from the *Juglandaceae*, *Grossulariaceae*, *Rosaceae*, *Cesalpiniaceae*, *Fabaceae*, *Anacardiaceae*, *Simaroubaceae*, *Aceraceae*, *Hippocastanaceae*, *Staphyleaceae*, *Celastraceae*, *Rhamnaceae*, *Loranthaceae*, *Elaeagnaceae*, *Tamaricaceae*, *Salicaceae*, *Cornaceae*, *Tiliaceae*, *Ericaceae*, *Caprifoliaceae*, *Oleaceae*, *Solanaceae*, *Bignoniaceae* and *Scrophulariaceae* families with regards to the taxonomic classification, morphological description, natural area of distribution and growing areas in Romania, species ecology and, for the main species, it presents the biological characteristics. Laboratory includes practical applications designed to recognize tree and shrub species described in the course based on their main morphological characteristics.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Entomology	ENTO	4	2	-	2	-

Course description: the discipline covers: External structure of insects - head (antennae, mouthparts), thorax (legs, wings), abdomen, exoskeleton; Internal structure and functions: digestive, circulatory, respiratory, excretory, nervous and reproductive system; Reproduction types (sexed, parthenogenesis, polyembryony and pedogenesis); Insect development (embryonal, postembryonal and post metabolic development); Generation and biological cycle of insects; Outbreaks of insects; Population dynamics of forest insects; Insect detection and forecast; Prevention and control of insects; Preventive measures; Mechanical, chemical, biological and integrated control; Damaging insects; Insect biology and control; Defoliating insects (*Lepidoptera*, *Coleoptera*); Terminal, shoot, twig and root insects (*Coleoptera*, *Lepidoptera*, *Ensifera*); Phloem boring insects (*Coleoptera*); Wood boring insects (*Coleoptera*, *Lepidoptera*, *Hymenoptera*); Seed and cone insects (*Coleoptera*, *Lepidoptera*); Gall makers (*Hemiptera*, *Hymenoptera*, *Diptera*). Laboratory covers practical applications on the biology, morphology and description of insects as well as insect recognition based on their morphological features.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Afforestation I	IMP1	4	2	-	2	-

Course description: the discipline covers the fundamentals of: Seed production; Harvesting, processing and storage of fruits and seeds; Seed testing; Characteristics of seed germination process; Organization of forest nursery; Soil preparation and plant nutrition; Production of bare-root and containerized seedlings from seed; Vegetative production of seedlings; Forest seedling cultivation and maintenance; Lifting, storage and handling. Laboratory covers practical applications on the topics described in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dendrometry I	DENDR1	4	2	-	2	-

Course description: the discipline covers: Theory of stem form; Stem profile models; Taper functions; Theory of bole and sections volume computation; Theory of tree measurement; Diameter measuring instruments; Instruments for measuring tree height; Measurement of standing trees, breast height diameter, basal area, tree height, tree volume, bark thickness, tree crown and foliage; Measurement of felled trees; Stand structure; Diameter and height distributions; Fitting height curves; Tree volume equations with one, two or three predictor variables. Laboratory covers practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Ecology	ECOL	4	2		2	

Course description (Syllabus): ecology is a science of relationships between biological systems and their environment. Students will gain theoretical knowledge and a general overview of the forest as an ecosystem. They will understand how forest functions and the way it reacts to human interventions or to natural disturbances. The following main topics are covered by this course: Introduction, definition and divisions of ecology; Organization of the living world, types of systems, levels of organization in the living world; Population in ecology, population parameters and demographic strategies; Ecological niche and growing space; Laws of ecology; Biocenosis (i.e. the living community) and its trophic structure; The environment of the biocenosis (i.e. the biotope); Ecological factors with direct and indirect action; The ecosystem structure, function and dynamics; Production and flux of organic matter within the ecosystem; Intraspecific and interspecific relationships inside the forest ecosystem; Forest ecosystem dynamics; Disturbance - essential element in ecosystem dynamics; Types of disturbances and their effects on forest ecosystems; Structures of the forest ecosystem after disturbance; Models regarding forest dynamics following disturbances; Developmental stages of the forest ecosystem; Succession - essential process in ecosystem dynamics; Successional series; Successional models; Succession of fauna species; Ecosystem stability; Forest management and

ecosystem stability; Biological diversity; Types of biological diversity and evaluation methods; Natural resources management and biodiversity conservation; Ecology and forest management; Silviculture - applied forest ecology and adaptive management of forest ecosystems; Sustainable management of forests.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Products I	PROD1	4	2	-	2	-

Course description: the discipline is structured in the following: Woody plants - source for raw material for industrial applications; Anatomical constitutive parts of stems and branches; Secondary xylogenesis mechanism; Seasonal activity of the cambium; Wood architecture (morphological and chemical) at submicroscopic, microscopic and macroscopic levels - interspecies variations, wood identification, physical properties of the wood, mechanical properties, acoustic properties and wood burning; Wood natural durability and its improvement means; Products from or with wood participation: sawn timber, veneers, composites and coal, timber from forest: silver fir, spruce, resonance spruce, pines, larch, yew, Douglas-fir, oaks, black locust, sweet chestnut, ash, elms, wild cherry, walnut, beech, linden, maple, alder, silver birch, poplars, hornbeam. Laboratory consists of practical applications on the topics learned at the course, including the identification of wood species based on their main features.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Silviculture I	SILV1	5	2		2	

Course description (Syllabus): the discipline targets the knowledge of the extent, role and multiple functions played by the forest. It covers the following: Forest structure (phytocoenosis - tree layer, shrub layer, seedling layer, herbal layer, microphytocoenosis - and zoocoenosis); Ecosystem processes taking place in the life community of forests (e.g. natural regeneration of forest; completion of establishment phase; growth and increment of trees and stands; development of trees and stands; natural pruning of forest trees; tree differentiation and natural mortality in the forest; succession of forest vegetation). Laboratory consists of practical applications on the topics covered in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Introduction to Machinery (O1)	CGM	4	2	-	2	-

Course description (Syllabus): the discipline includes the following: Concepts used in the study of materials; Basics of mechanical engineering; Metallic joining: dismountable and undismountable components; Mechanical engineering of internal combustion engines; Use of internal combustion engines; Classification of machines used in forestry; Engineering and applications of machine transmissions. Laboratory covers a description and practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mechanics and Strength of Materials (O1)	MRMS	4	2	2	-	-

Course description (Syllabus): the discipline includes the following: Mechanical modeling of structures; The analysis and design of structures using the principles of materials' strength; Statics; Equilibrium of rigid bodies; Traction & compression; Shearing; Torsion and the evaluation of bending displacement. The course is complemented by practical applications on the topics learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English Language	LES3	2	1	1	-	-

Course description (Syllabus): The discipline covers the basics on the terminology used in forestry: Pedology - English terminology; Dendrology & Topography - English terminology; Ecology - English terminology; Botany - English terminology; Fauna & Atmospheric physics - English terminology; Entomology & Astronomy - English terminology and a Revision. The course is complemented by discussions on the concepts and terminology learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
English Language	LES4	2	1	1	-	-

Course description: the discipline covers the basics on the terminology used in: Academic writing as a process - planning and organizing a text; Elements of writing: logical connectors, style, accuracy in writing; Writing models: abstracts; Writing models: CVs; Writing models: cover letters and a Revision. The course is complemented by discussions on the concepts and terminology learned.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Management Planning I	AMEN 1	4	2	-	2	-

Course description: the discipline aims at describing and explaining the concepts, tools and methods of organization, optimization, management and regulation of structure and functions of the forests based on the socio-economic context and the forest ownership. Topics covered by this discipline include: General notions and principles; Principles, means and possibilities used in the territorial organization of forests; Basic criteria for the organization and for the structural and functional management of forest stands; Harvestability; Normalization of forest structure and functions. Laboratory consists of practical applications related to collecting, processing and analyzing data specific to forest management planning.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Silviculture II	SILV2	5	2	-	1	1

Course description: the discipline aims at presenting three important issues: Natural regeneration of forests (e.g. regeneration under shelter; regeneration on bare land; regeneration in the forest boundary); Tending operations (i.e. classification of tending operations; Description of various tending operations: release cutting, cleaning-respacing, thinning, hygiene cutting, artificial pruning, removal of epicormic branches, tending of forest boundary. The effect and intensity of tending operations); Regeneration methods and silvicultural systems (e.g. terminology, classification of regeneration methods and silvicultural systems; description of main silvicultural systems: clear-felling, strip felling, uniform shelterwood system, group shelterwood system, selection system, irregular shelterwood system, low coppice, pollarding, coppice-with-standards; selection of regeneration method and choice of silvicultural system; special conservation fellings). Laboratory and project activities consist of practical applications on the topics covered in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Products II	PROD2	4	1	-	2	-

Course description: the discipline covers the following: Wood grading; Edible and poisonous mushrooms in forest - biology, ecology and uses; Berries - taxa, properties and uses; Forest medicinal and aromatic plants - active ingredients and products; Bee products. Laboratory is designed to implement practical applications on the topics covered in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Afforestation II	IMP2	4	2	-	1	1

Course description: the discipline aims at providing knowledge on the aspects regarding installing of woody vegetation. Main issues covered are: The choice and association of species in forest cultures; Choice of species; Installing woody vegetation; Installing forest vegetation through planting; Installing woody vegetation by direct sowing; Tending operations in forest cultures; Cutting-back of planted seedlings; Forest crops in extreme conditions; Forest shelterbelts; Cultivation of forest tree species of hunting interest. Laboratory and project activities consist of practical application of the knowledge gained at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Operations and Timber Harvesting Technology I	TEL I	4	2	-	2	-

Course description: the discipline targets the following main aspects: Introduction to and description of the timber harvesting process structure (technology of processes used, work process, operations and work elements); Description of harvestable timber (species, density, shape, type of interventions, extracted volumes and extraction intensities etc.); Harvesting methods (whole tree, tree length, cut-to-length), harvesting systems (mechanized and non-mechanized based systems) and procedures used in timber harvesting; Principles and key performance areas in timber harvesting; Procedures of tree felling, delimiting and crosscutting using chainsaws (conditions in which they are used, tools and procedures used in correlation with the tree and stand characteristics); Multifunctional machines (fellers, feller-bunchers, processors, harvesters) - working conditions, setups and procedures applied in correlation with the tree and forest stand characteristics). Laboratory consists of practical applications that aim at familiarizing and instructing the students on the procedures, instruments and software used to plan and organize timber harvesting operations.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Management Planning II	AMEN 2	5	2	-	-	2

Course description: the discipline is concerned with the planning of forest management based on the principles of sustainability, modeling the structure and production of forests, design of the management measures in relation to the functions assigned to forests and the development of forest management plans. Topics covered in this course include: Planning methods; Management planning; Harvest planning; Establishment of allowable cut; Management plan revision and management project organization. The project activities consist of a practical application to develop a forest management plan.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Transportation Infrastructure	PODF	4	2	-	-	2

Course description: the discipline covers the following topics: Introduction to forest transportation infrastructure; Concepts and terminology of forest transportation infrastructure; Components of bridges and their description; Choosing the location for bridges; Design and dimensioning of bridges and culverts; Bridge dimensioning by calculus; Superstructure - composition, calculus and construction; Calculation of reinforced concrete superstructure beams; Infrastructure - composition, calculus and construction; Culverts. The project consists of an application of the concepts, methods and tools presented in the course part to design a bridge for forest transportation purposes.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Cable Yarding I	FUNIC1	4	2	-	2	-

Course description: the discipline covers the following: Introduction to cable yarding; Cable yarding systems; Cable yarding components (e.g. cables, anchors, supports, shoes, carriage design and functions etc.); Cable yarding planning; Design of cable yarding operations; Management of cable yarding operations. Laboratory covers practical applications

on: Sources of data for cable yarding planning; GIS tools for cable yarding planning; Instruments and equipment used to collect field data and field applications of data collection; Planning of two types of cable yarding operations based on the field collected data and the use of GIS and spreadsheet software.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Roads I	DRUM1	4	2	-	1	-

Course description: the discipline covers the following: Introduction to forest roads; Importance of forest roads in the forest transportation activities; Forest roads classification, types of forest roads and forest roads networks; Geometry and design principles and methods of forest roads (e.g. alignments, curves etc.); Main sections of forest roads and their representation and interpretation; Design of forest roads (e.g. principles, methods, tools and techniques used in forest road design). Laboratory covers practical applications on the design of forest roads geometry: main types of curves and alignments.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Economy and Management	MECFOR	4	2	2	-	-

Course description: the discipline covers the following: The basics of forest economy and forest management; Forecast, planning, and organization in the forestry sector; Decision (in certain and uncertain conditions, and risk); Leadership; Human resources management; Particularities of the forestry sector; The business environment; The Markets; Forestry marketing; Business strategies in the forestry sector; Business plan; Organisational behavior; Social responsibility; Assessment and control; Quality assurance; Entrepreneurship; Concepts; The entrepreneurial company; Entrepreneurial strategies. Activities of the seminars follow the concepts, tools and methods described at the course by interactive discussions and practical case studies.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Cadaster (O2)	CAD	2	1	-	1	-

Course description: the discipline covers the following: Introduction to general cadaster; Territorial organization and typology of land use in Romania; Methods of cadaster; Forest cadaster. Laboratory consists of practical applications on the development and implementation of forest cadaster.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Railways (O2)	CFFOR	2	1	-	1	-

Course description: the aim of this discipline is to acquire knowledge regarding the history, design, construction, use and management of forest railways in Romania. The discipline covers the following: Introduction and history of forest railways; Planning and design of forest railways; Construction and features of forest railways; Management and maintenance of forest railways. Laboratory consists of practical applications on the subjects covered at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Computer Aided Design in Forest Engineering (O3)	DISA	4	1	-	2	-

Course description: the discipline covers by course activities the following: Introduction to AutoCAD Civil 3D; Using Survey data; Using Surfaces to model the terrain; 2D design using Alignments; Vertical design using Profiles; 3D design using Corridors; Design of Cross Sections; Designing new terrain; Analyzing surfaces; Moving from design to construction. Practical activities of this discipline consist of designing a forest road segment using the knowledge acquired in the lecturing activities. Practical activities will enable the students to acquire the basic skills and

competences needed to handle the AutoCAD Civil software in design activities. The laboratory contents are the following: Getting familiar with AutoCAD Civil 3D; Importing survey data to model the terrain; Using external data to model the terrain; Building a terrain model using Surfaces; Designing a forest road alignment; Using Profiles to design vertical features; Using Corridors to design a forest road; Extracting the Cross Sections; Designing new terrain; Building production data and reports.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Dendrometry II (O3)	DENDR2	4	1	-	2	-

Course description: the discipline aims at acquiring theoretical knowledge and practical skills in biometric measurement and modeling of trees and forest stands in terms of structure, size and production. Topics covered in this course include: Forest inventory; Estimation of stand volume; Grading of forest stands; Estimation of tree and forest stand growth; Introduction to and basics of dendrochronology. Laboratory consists of practical applications on the subjects covered at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Equipment for Constructions in Forest Engineering (O4)	UTICO	5	2	-	2	-

Course description: the discipline covers: Equipment for forest roads construction; Equipment components; Work procedures; Equipment used in the preparatory work; Equipment used in earth-moving works; Equipment used in compaction work. Laboratory covers: Mechanical actuation systems; Hydraulic actuation systems; Running systems; Productivity of equipment and machines.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Machines for Constructions in Forest Engineering (O4)	MACO	5	2	-	2	-

Course description: the discipline covers: Machines used in forestry and their classification according to their construction and applicability; General description of machines and the level of technology integrated in them; Machine assemblies, subassemblies and components; Systems and subsystems specific to machines used in forestry; Work procedures. Laboratory covers practical applications and descriptions which include: Actuation systems; Running systems; Performance parameters.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Electrical Applications in Forest Engineering (O5)	UEF	4	2	-	2	-

Course description: the discipline covers: Electrical measurement and measurement instruments, Batteries and accumulators; DC machines; Electrical chainsaws; Converters; Electrical appliances; Electric circuits; Electronic ignition systems; Integrated circuits. Laboratory consists of an individual practical application that aims at dimensioning the energy requirements for a sawmilling facility.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Introduction to Automation in Forest Engineering (O5)	EMAUS	4	2	-	2	-

Course description: the discipline covers: Introduction to automation; Process control; Automated control; Automatic log grading; Automatic log measurement; Automation and technology level integrated in timber harvesting machines.

Laboratory covers several case studies on the automation of harvesting and wood processing equipment, machines and systems.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Operations and Timber Harvesting Technology II	TEL II	5	2	-	-	2

Course description: the discipline covers the following: Timber skidding and forwarding (equipment and machines used, applied procedures, setups, productivity, costs and ecological impact); Timber yarding (equipment used, applied procedures, setups, productivity, costs and ecological impact); Timber logging using non-mechanized equipment (equipment means, applied procedures, setups, productivity, costs and ecological impact); Timber logging using helicopters and small-sized mechanized means (equipment, applied procedures, setups, productivity, costs and ecological impact); Landing operations, primary processing operations, timber transport structure (equipment used, applied procedures, setups, productivity, cost and ecological impact); Productivity assessment and technical norms for timber harvesting activities; Work security in timber harvesting activity. Project activities consist of individual work and cover a full case study designed to plan, organize, implement and manage timber harvesting operations and a harvesting site.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Road Design II	DRUM2	5	2	-	1	2

Course description: the discipline covers: Materials, mineral aggregates and binders used in the construction of forest roads; Traditional and new materials used in the construction of forest road systems and surfacing of forest roads; Solutions for water discharge; Defence & consolidation features; Bridges; Techniques and technologies for the construction, rehabilitation and maintenance of forest roads. The laboratory applications are focused on the quality verification of the materials used in forest road construction (soils, mineral aggregates, bituminous binders and hydrated binders). The project consists of an individual case study to design the technical part (sections and tables of calculation) of a forest road (0.5 km) project.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Timber Harvesting Mechanization	MEF	6	4	-	4	-

Course description: the discipline covers: Theory and processes of timber harvesting, extraction and primary processing of wood; Machinery and equipment used in harvesting, extraction and primary processing of wood (sawing machines, multifunctional harvesting machines, forestry tractors, cable yarders, winches) in Romania and at the international level; Construction and operation of harvesting machines; Technical and economic parameters of machines; Technical use range and technical limits etc.; Selection criteria of some types of equipment, depending on the needs: power, average hourly productivity, specific fuel consumption, etc.; Possibilities and directions for improvement, in order to increase labor productivity. Laboratory consists of descriptions of equipment, tools and machines, hands-on working with machine parts and components and field trips to operate machines and to observe their parts and functions.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wood Processing Technology	PRELEF	5	2	-	2	-

Course description: the discipline aims at familiarizing students with main processes, equipment and work techniques in sawmills. The course is divided into three parts: Wood resources; Wood sorting and Timber processing. The first part contains statistical data regarding wood resources available at a certain moment and the factors which may influence it. The second part of the course describes the main wood grading & sorting systems (the industrial and the qualitative one), the criteria which constitute the foundations of wood grading & sorting, the main wood defects and the main

measurement techniques for these. The third part presents the main characteristics of timber, machining techniques and the organization of sawmilling facilities along with the description of activities characteristic of each of their compartment. Laboratory consists of field trips to explore and observe the activity in different sawmilling and wood processing facilities.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Cable Yarding II	FUN II	4	2	-	-	1

Course description: the discipline covers the following: Introduction to cable yarding design; Mechanics of cable yarding; Framework of cable yarding design projects; Terrain configuration and design of longitudinal section; Cable mechanics, calculation and design; Support mechanics, calculation and design; Anchor mechanics, calculation and design; Payload mechanics, calculation and design. Project consists of individual work to design and dimension a cable yarder and a cable yarding operation for the Romanian long-extraction distance conditions.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Management of Forest Operations Companies	MAFE	2	1	-	1	-

Course description: the discipline addresses the forestry enterprises management challenge of *designing* and *implementing* the best combination of internal organization, market strategies and marketing actions for better facing the market, institutional, and human resources realities. Specifically, this course seeks to develop skills in applying the analytic perspectives, decision tools, and concepts of management to the following areas: strategy formulation and implementation, human resources, operational management, financial accounting and management accounting. The following main topics are covered by this course: Management between theory and practice; Management in forestry enterprise; Financial and managerial accounting in forestry enterprises; Financial performance assessment of the companies activating in forestry; Operational management in forestry enterprises; Human Resources management in forestry enterprises; Financial management of forestry enterprises; Risk management in decision making in forestry enterprises. Case studies: i) managerial accounting - Romply Ltd case, ii) comparing financial performance of companies, iii) "Grigoriu Case" - operational management, iv) Case Study - recruiting young engineers - locus of control.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Work Science and Ergonomics	ERGOS	5	2	-	2	-

Course description (Syllabus): the discipline covers: The structure of work time; Estimation of human energy consumption and classification of activities according to it; Energetic metabolism; Physiology of fatigue (determinants and methods of investigation); Postural stress and its evaluation; Analysis of work place; Design and analysis of the work place; Ambient and microclimate of work place. Laboratory activities cover the following: Analysis of the work time; Estimation of human energy consumption based on the Haldane method; Fatigue tests; Microclimate of work place; Estimation of the exposure to noise and vibration.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Law and Legislation	DLF	4	2	-	2	-

Course description: the discipline covers the following: Basic information on the law and regulation formulation in Romania; Basic information about the property rights; The normative system in force for forestry in Romania; The legal tasks and skills of the people involved in the Romanian forestry and forest engineering field. Laboratory consists of discussions and case studies on the topics covered at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Trade of Forest Products	COMPF	3	1	-	3	-

Course description: the discipline addresses the forestry enterprises management challenge of *designing* and *implementing* the best combination of internal organization, market strategies and marketing actions for better market valuing of forest products. Specifically, this course seeks to develop skills in applying the analytic perspectives, decision tools, and concepts of marketing to the following decisions: Segmentation and positioning (assessing market potential, analyzing customer behavior, focusing resources on specific customer populations and against specific competitors); Product offering (including the breadth of product line, features, quality level, and customer service); Pricing (capturing the value created for the customer); Distribution channels (the role of distributors, retailers, and other intermediaries); marketing communications (developing an effective balance of advertising, sales promotion, and personal selling). The following main topics are covered by this course: Introductory notions; Demand and supply; Markets; Prices; Tending for selling/buying wood; SUMAL and traceability of wood; Traceability in Romania - institutional and legal; Valuing the forestry products; Sales techniques; Forestry products marketing; Market research; Non timber forest products: ecotourism, hunting, other products. Case study: wood products marketing: Munteni Forest District vs. Forestmar Ltd. Case study: ecotourism and hunting tourism - ROMSILVA.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Remote Sensing	FOTO	3	1	-	1	-

Course description: the discipline covers the following: Introduction to Photogrammetry and Remote Sensing; Frames and stereograms; Obtaining optical models; Determinations on single frames and stereograms; Restitution (recovery) photograms; Applications of photogrammetry in forestry. Laboratory consists of practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Mathematical Modelling in Forestry (O6)	MODS	2	1	-	1	-

Course description: the discipline covers: Introduction to modelling; Algorithms; AutoCAD and its modelling functionalities; ArcGIS and its modelling modules. Laboratory covers AutoCAD and ArcGIS applications by case studies selected from the forestry science and practice.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Xylology (O6)	XILO	2	1	-	1	-

Course description: the discipline covers: Investigation methodology of properties and structure of felled and/or standing trees: sampling, field and laboratory work protocols; Nondestructive methods for wood traits analysis - techniques and applications in wood science; Influencing and control factors in wood formation: annual and seasonal rhythm, eco-physiology; Dendrochronology: research design and applications; Wood as competitive technological material: advantages, disadvantages, improvement possibilities, esthetical function. Laboratory consists of practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Building and Interior Design (O7)	COLAI	3	2	-	1	-

Course description: the discipline aims at the following: Calculation methods and design principles of timber structures used in forestry; Aesthetics and functional principles used in the interior design; Developing the knowledge needed to design and build wood structures. Developing the knowledge needed for the interior design. Laboratory consists of practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Introduction to Maintenance of Forestry Equipment (O7)	BARUF	3	2	-	1	-

Course description: the discipline covers the following topics: Characteristics of forest work; Energy requirements; Machine and equipment maintenance; Estimation of the equipment condition; Effects of equipment condition on the performance of work; Effects of fuels and lubricants on the machine functioning; Transmission systems; Organization of repairing and maintenance workshops. Laboratory covers practical applications on the repairing and maintenance of forest equipment.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Forest Administration (O8)	ADMIN	3	1	-	1	-

Course description: the discipline covers the following topics: Basic information on the forest administration; Systems of forest administration in some European countries; The Romanian forest administration system; Structure and functioning of the organizations making up the Romanian forestry administration; The functional relationships that involve the Romanian forestry administration activities. Laboratory consists of practical applications on the topics learned at the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Green Energy Sources in Forestry (O8)	SUAVE	3	1	-	1	-

Course description: the discipline covers: Role of biomass as a green energy source; Technology used in biomass harvesting; Processes for obtaining the forest biomass; Methods used in wood chips storage; Parameters and metrics used to characterize the quantity and quality of wood chips; Production of wood pellets and briquettes; Willow (*Salix viminalis var. energo*) cultivation for energy. Laboratory activities cover the following: gasification of wood and the products resulted from it; components of gas generators; energy products obtained from deciduous wood; the use of charcoal, wooden gas and methanol as energy sources.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Communication and Public Relations (O9)	COMUNI	3	1	-	1	-

Course description: the discipline covers the following: Definition of communication; Categories of communication; Non-verbal communication; Negotiation; Strategy of negotiation; Public relations. Laboratory consists of practical applications on the topics covered in the course.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Accounting (O9)	CONTA	3	1	-	1	-

Course description: the discipline covers the following: Introduction, Accounts and accounting systems; Accounting management; Financial exercise; Capital accounting; Stock accounting; Treasury accounting. Laboratory covers practical applications of accounting.