

# Forestry Course Descriptions – Virginia Tech

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## Undergraduate Courses (FOR) Forestry

### **2154: INTRODUCTION TO MICROCOMPUTING IN FORESTRY**

Operating systems, data management, BASIC programming, statistical analysis, and simulation with applications in forestry. (3L,1C) II.

### **2214: INTRODUCTION TO LAND AND FOREST MEASUREMENTS**

Measurement of forest land and vegetation attributes including geographic position, land distance, direction and area, tree size and forest overstory and understory vegetation attributes. Use and development of maps used in natural resources inventories. Use of global positioning systems and geographic information systems in the acquisition and management of land and forest measurements. Assessment of tree and forest attributes with sample plots. Use of computer software to manage and analyze data and present results. Pre: MATH 1016. Co: 2324. (2H,3L,3C)

### **2314: FOREST BIOLOGY AND DENDROLOGY**

Pre: BIOL 1006 or BIOL 1106. Co: 2324. (2H,2C) Introduction to the botany, physiology, genetics and silvics.

### **2324: DENDROLOGY LABORATORY**

Field identification of trees of North America with particular emphasis on trees native to the Eastern United States. I (3L,1C)

### **2514: WILDLAND FIRE: ECOLOGY AND MANAGEMENT**

Provide students with basic knowledge on how: fire has an impact on forest environments; the environment and weather influence fire behavior; wildland fires are suppressed; and fire is used as a land and vegetation management tool. The course will also provide students with the knowledge and training to qualify as a basic wildland firefighter (FFT2-Red Card). Extended laboratory sessions will provide practice in fire behavior prediction, prescribed burning techniques, and fire control methodology. Pre: BIOL 1105 or BIOL 1106, CHEM 1035. (2H,3L,3C)

### **2554 (LAR 2554): NATURE AND AMERICAN VALUES**

Introduces students to the evolving relationship between nature and American society; emphasizing the ethics and values which underlie forest, park, and wildlife management. Students are introduced to contemporary land use issues and learn to articulate, defend, and critique the ethical positions surrounding these issues (i.e., wilderness, sustainability, biodiversity, hunting, old growth, suburban sprawl, environmental activism). I,II (3H,3C)

### **2714: INTRODUCTION TO INDUSTRIAL FORESTRY OPERATIONS**

The forest management operations carried out by the forest industry such as harvesting, site preparation, regeneration, silvicultural treatments, and stand maintenance. I (1H,1C)

### **2784 (WOOD 2784): WORLD FORESTS AND FOREST PRODUCTS**

A socio-economic approach to examining the management and use of the world's forests, enhance knowledge of global forest resources and products, and understand the roles and relationships of key stakeholders. Sophomore standing. (3H,3C)

### **2974: INDEPENDENT STUDY**

Variable credit course.

### **2984: SPECIAL STUDY**

Variable credit course.

### **3215-3216: FOREST MEASUREMENTS**

Principles and practices of forest land and resource measurements. 3215: Measurement of distance and direction, size and content of felled and standing trees, elements of forest inventory, and sampling. 3216: Derivation of volume and weight equations for standing trees, equal and unequal probability sampling in timber inventory, site quality, stand density, forest growth, and yield modeling. I,II Pre: 2214. (3H,3C)

**3224: FOREST MEASUREMENTS FIELD LABORATORY**

Field practice in forest measurements, forest inventory, and forest growth estimation. II Co: 3216. (3L,1C)

**3314: FOREST ECOLOGY AND SILVICS**

Environmental factors affecting the establishment, growth, and development of forests; silvical characteristics of trees; forest community structure and function; forest ecosystem analysis. I Pre: 2314, (CSES 3114 or CSES 3134). (2H,4L,3C)

**3324: SILVICULTURE PRINCIPLES AND APPLICATIONS**

Theory and practices involved in controlling forest establishment, composition, and growth are developed in a regional context. Formulation of silvicultural systems and the study of reproduction methods, site preparation, intermediate stand manipulations, and reforestation operations. II Pre: 3314. (3H,4L,4C)

**3334: SILVICULTURE FIELD LAB**

Practice and observation of various silvicultural procedures, including stand and site evaluation, intermediate cuttings, site preparation, vegetation control, harvesting, and regeneration. II Co: 3324. (4L,1C)

**3344: FOREST FIELD STUDIES**

Field observations and discussion of current forestry operations and practices. Junior standing required. Pass/Fail only. (3L,1C)

**3354 (HORT 3354): URBAN FORESTRY AND ARBORICULTURE**

A study of the uses, biology, ecology and silviculture of trees and forested green space in urban and urban-rural interface environments. Planning, planting, establishment, growth and development of urban trees, site assessment, individual tree condition assessment, and tree maintenance; special emphasis on energy relationships, soil physical and chemical properties, soil stabilization, and insect and disease problems that are related to existing and planned trees and forested areas. Lab provided practical experience in arboriculture and tree care practices. Pre: (2314, 2324) or (HORT 3326). (2H,3L,3C)

**3364: SURVEY OF FOREST ECOLOGY AND MANAGEMENT**

Survey of the forest, its environment, and its management including forest community structure and function, properties and management of forest soils, and basic silviculture. Partially duplicates 3314. I Pre: 2324. (2H,4L,3C)

**3414: SMALL WOODLAND MANAGEMENT**

Forestry principles and practices applied to private nonindustrial woodlands. Consideration of biological, managerial, marketing, harvesting, and multiple use issues affecting the landowner. Not for professional forestry options. II (2H,3L,3C)

**3424: FOREST RESOURCE ECONOMICS**

Application of economic principles to problems in forestry such as multiple use of forest lands, including wildlife, recreation, watershed, timber production and consumption. I Pre: ECON 2005 or AAEC 1005. (3H,3C)

**3434: FOREST MANAGEMENT FIELD LAB**

Field instruction and practice in forest management techniques, including tract and boundary location; tract and timber valuation; delineation of forested wetlands; pre-harvest planning; and writing sustainable forest management plans using financial, biological, and operational considerations. Pre: 3216, 3324, 3424. (3L,1C)

**3524: ENVIRONMENTAL INTERPRETATION**

Interpretation theory and techniques; program planning and evaluation; role of interpretation in enhancing visitor experiences and protecting park resources. Pre: 2554. (2H,3L,3C) II.

**3534: OUTDOOR RECREATION FIELD STUDIES**

Field instruction and practice in measuring amount and type of recreational use, and resource impacts from recreational use. Field inspection and review of federal, state, local, and private recreation areas and management in Virginia and elsewhere. II Pre: 2554. Co: 3544. (1H,9L,4C)

**3544: OUTDOOR RECREATION MANAGEMENT**

Outdoor recreation management objectives; land acquisition; use measurement; impact assessment; facility operation and maintenance; role of private sector. Pre: 2554. (3H,3C) II.

**3554 (FIW 3554): OUTDOOR RECREATION POLICY**

Policy process for outdoor recreation, with emphasis on the federal level; major federal policies for outdoor recreation; role of the professional in the policy process; public involvement in planning and management; analysis of current policy issues. II Pre: 2554. (3H,3C)

**3564: OUTDOOR RECREATION PLANNING**

Techniques of planning for resource-based outdoor recreation, including: estimation of recreation demand; wildland recreation classification and resource inventory; methods of public involvement; social impact analysis; state comprehensive planning; site design; and values questions associated with these techniques. II Pre: 2554. (3H,3C)

**3714: FOREST HARVESTING**

Principles and application of forest harvesting. Terminology, phases, function, and the interrelationships of people, money, machines, and environment. I Pre: 2214. (2H,3L,3C)

**3724: FOREST BOUNDARIES AND ROADS**

Application of basic land surveying and forest measurement techniques to the location, establishment, and maintenance of forest boundaries and roads. Consideration of stream crossings, best management practices, and costs. Pre: 2214. (2H,3L,3C)

**3734: TIMBER PROCUREMENT**

Analysis of the U. S. forest industry raw material supply process with emphasis on the evolution and dynamics of timber procurement systems and strategies. Pre: 3215. (2H,2C) II.

**3954: STUDY ABROAD**

Variable credit course.

**3964: INTERNSHIP THROUGH DIRECTED FIELD STUDY**

Variable credit course.

**4114: INFORMATION TECHNOLOGIES FOR NATURAL RESOURCE MANAGEMENT**

An introduction to computer information systems used in natural resources management. Course will introduce students to the theory and applications of database management systems (DBMS) and geographic information systems (GIS). Uses, challenges, and limitations of these technologies in natural resource management applications will be discussed. Students will receive extensive hand-on instruction in the use of current software packages for DBMS and GIS. Pre: 2214 or GEOG 2314. (2H,3L,3C)

**4214: FOREST PHOTOGRAMMETRY AND SPATIAL DATA PROCESSING**

Films, filters and camera photogeometry; scale; measurement estimation; image processing; flight planning and photo acquisition; geographic information systems; spatial data analysis techniques and applications. Senior standing required. (2H,3L,3C) I.

**4334 (CSES 4334): PRINCIPLES AND PRACTICE OF AGROFORESTRY**

Biological, social, economic, and technical aspects of agroforestry, training and technology transfer techniques, and application of forestry and agriculture principles. Roles of animals and fish, trees, and agricultural crops in agroforestry systems. Community involvement in planning and implementation of agroforestry projects. I (3H,3C)

**4354: FOREST SOILS AND HYDROLOGY**

Principles of forest soils and hydrology and applications to forest management. Forest soil development, relationships of soil and hydrologic properties to tree growth, and the management of soil and soil water to enhance fiber production. Pre: 3314. (2H,3L,3C) I.

**4364: ADVANCED SILVICULTURE AND FOREST VEGETATION MANAGEMENT**

Advanced topics in silviculture with an emphasis on species silvical differences; forest vegetation management and control, herbicides used in forestry, their chemistry, toxicology, application technology; environmental considerations; tree improvement, individual tree growth, and stand dynamics as affected by intermediate silvicultural operations; implications of atmospheric deposition. II Pre: 3324. (3H,3C)

**4374: FORESTED WETLANDS**

Classifications, jurisdictional delineation, and management options of forested wetlands. Relationship of hydrology, soils, and vegetation to ecosystem processes, societal values, and management with regard to environmental and legal considerations and best management practices. Emphasis is on forested wetlands in the southern U.S., but national and international wetlands are included. Pre: CSES 3114 or CSES 3134. (3H,3C) II.

**4424: FOREST RESOURCE MANAGEMENT**

Examines classical and current forest decision-making principles and methods under various owner objectives. Explores the implications of managing forest resources in a multiple-resource setting. I Pre: 3216, 3314, 3424. (2H,3L,3C)

**4434: FOREST RESOURCE POLICY**

Historical development of U.S. forest resource policy. Key issues in each of the major forest uses. Policy determination at the federal, state, and private levels. Policy conflict resolution. Senior standing required. II (3H,3C)

**4444: INTEGRATED FOREST MANAGEMENT PRACTICUM**

Student teams apply accumulated discipline-oriented knowledge and techniques to a real forest resource management problem. A practicum in forest resource management and planning, applying multiple use concepts to solve a forest management problem. Senior standing required. Must be Forestry major. II (1H,8L,3C)

**4454: URBAN FOREST MANAGEMENT AND POLICY**

Focuses on the planning, administration, financing and management of trees, forests and green space associated with urban areas and the urban/rural interface. It will include a study of the social needs and values of urban situations; urban tree/forest resource inventories; tree and vegetation ordinances; the development, financing, and management of tree maintenance programs; and community involvement, public relations, and urban forestry education programs. Senior standing. II. Pre: 3354. (2H,3L,3C)

**4474: THE CONSULTING FORESTRY BUSINESS**

Objectives of private timberland owners and forest industry from the perspective of professional consultants. Organization of a successful consulting firm. Stresses service to landowners such as appraisal, marketing, taxation, economic analysis, and ethics. II Co: 4424. (2H,3L,3C)

**4514: FOREST AND TREE PEST MANAGEMENT**

Identification and ecology of biotic and abiotic influences on forest and landscape tree health. Developing a theoretical and practical understanding for diagnosing and managing pests and stresses of trees in both the forest and landscape setting. Insects and diseases that attack trees. Pre: 3324 or HORT 3325 or HORT 3326. (2H,3L,3C)

**4534: NATURAL RESOURCE BASED TOURISM**

Components of the tourism industry and its relationship to natural resources planning, management, and the provision of tourist services on public lands. I Pre: 2554. (3H,3C)

**4544: SEMINAR IN OUTDOOR RECREATION**

Practitioner-oriented capstone laboratory exercise in outdoor recreation planning and management. Senior standing in Outdoor Recreation Option required. II (1H,3L,2C)

**4614: ECONOMICS OF FOREST PRODUCTS MARKETING**

Economics of marketing forest products. Pricing, marketing channels and institutions, marketing research, product policy and planning, forecasting. II Pre: 3424. (3H,3C)

**4714: HARVESTING SYSTEMS EVALUATION**

Principles and techniques for evaluating harvesting machines and systems design, application, productivity, and financial performance. Pre: 3216, 3424, 3714, 3734. (3H,3C) II.

**4964: FIELD STUDY**

Variable credit course.

**4974: INDEPENDENT STUDY**

Variable credit course.

**4984: SPECIAL STUDY**

Variable credit course.

**4994: UNDERGRADUATE RESEARCH**

Variable credit course.

## **Course Descriptions (WOOD)**

### **1234: INTRODUCTION TO WOOD SCIENCE AND FOREST PRODUCTS**

Wood as a material. Introduction to laboratory techniques, wood processing, machining and woodworking, moisture interactions, species characteristics, microscopic techniques, measuring material properties, characteristics of forest products industry, career opportunities. (1H,3L,2C)

### **2104: PRINCIPLES OF PACKAGING**

Packaging systems, materials, and forms and their relationship with the requirements of global societies for the distribution and storage of industrial and consumer products; packaging laws and regulations. (3H,3C) I.

### **2124: WOOD STRUCTURE AND PROPERTIES**

Macroscopic and microscopic structure and chemical composition of wood. Identification of commercially important woods. Impact of structure on physical and mechanical properties of wood. Principles of wood processing, including sawmilling, veneering, composite boards, paper. Description of the wood products industry including the products manufactured, the raw material requirements for each product, and the processing procedures. (2H,3L,3C)

### **2554: WOOD MATERIALS SCIENCE AND TECHNIQUES**

Introduction to the basic materials science of wood, and to the common analytical techniques for characterizing and testing wood. Scientific measurements and data collection. Wood thermal properties. Mass transport in wood. Water and wood equilibria. Wood electrical properties. Wood microscopy and digital image analysis. Material property testing. Pre: 1234. (1H,3L,2C)

### **2614: FOREST PRODUCTS MARKETING**

Study of marketing systems and methods used by North American primary and secondary forest product industries. Emphasis on wood product industries. Marketing of hardwood lumber, softwood lumber, panels, composites, furniture, and paper products. Role of North American industries and markets in world trade of forest products. (3H,3C)

### **2784 (FOR 2784): WORLD FORESTS AND FOREST PRODUCTS**

A socio-economic approach to examining the management and use of the world's forests, enhance knowledge of global forest resources and products, and understand the roles and relationships of key stakeholders. Sophomore standing. (3H,3C)

### **2974: INDEPENDENT STUDY**

Variable credit course.

### **2984: SPECIAL STUDY**

Variable credit course.

### **3124: PAPER AND PAPERBOARD PACKAGING**

Paper and paperboard properties and types. Types and performance of flexible paper packaging, sacks, and wraps. Folding carton design, properties of corrugated fiberboard. Corrugated fiberboard container design and performance. Packaging regulations and hazards of the distribution environment. Printing, labeling and automatic identification methods. Pre: 2124, 3434. (2H,3L,3C)

### **3224: PACKAGING AND MATERIALS HANDLING**

Unit load and parcel supply chains. Principles of operation and design of warehouse distribution and fulfillment centers. Principles of operation and design of shipping and distribution systems. The relation between packaging design, pallet design, and unit load design and the operation of industrial consumer goods supply chain. Pre: 2104. (3H,3C)

### **3234: WOOD IDENTIFICATION PROPERTIES LABORATORY**

Physical properties and characteristics of wood. Methods for determining its physical properties. Variation of the properties. Structure, properties, & processing of tropical woods. I (3L,1C)

**3315,3316: MECHANICAL PROPERTIES OF WOOD**

Behavior of wood members as rigid bodies. Axial and flexural response to forces applied to wood structural elements in simple beams, columns, trusses and frames. Introduction to anisotropic material properties of wood and methodology for correct use of wood in the design of wood structures and components. 3316: Mechanical properties of wood including concepts of stress, strain, Poisson's Ratio, orthotropic properties, tension, compression, bending, torsion and buckling. Effects of moisture on properties. Mechanical properties of wood composites, glue laminated lumber. Advanced topics in vibration, and dynamic forces. Current issues of wood use in buildings. Standard methods of evaluating important mechanical properties of solid wood, composites and fiber. Pre: 2124, MATH 2015 for 3315; 3315 for 3316. (2H,3L,3C)

**3334: SURVEY OF NON-TIMBER FOREST PRODUCTS**

In depth study of non-timber forest products of NTFP throughout Appalachia with overseas example – their heritage, uses and markets, economic development opportunities, and sustainable management. Emphasis will be placed on utilization and management issues. Students will gain skills necessary to assess and plan for NTFP business opportunities. (3H,3C)

**3434: WOOD CHEMISTRY, PRODUCTS AND PROCESSES**

Chemistry of structural wood components, polysaccharides, lignin, and extractives. Principles of industrial wood processes that involve chemical technology: pulping, bleaching and papermaking. Products derived from wood by chemical processes. II Pre: 2114, CHEM 2514. (3H,3C)

**3534: LUMBER MANUFACTURING AND DRYING**

The processing of logs into dry lumber. Principles of log and lumber grading. Design and operation of log sawing and lumber drying systems. Techniques for measuring lumber manufacturing and lumber drying efficiency. The relationship between log quality, sawing, and drying and the quality of the product produced. Pre: 3114. (2H,3L,3C)

**3544: SECONDARY WOOD PRODUCTS MANUFACTURING**

Secondary wood products manufacturing, including raw materials, rough mill, finish mill, assembly, and finishing. Also covers machinery, wood machining, plant layout, production methods, modern industrial engineering concepts in secondary manufacturing, and wood treating. Visits to local secondary wood products manufacturing industry. Pre: 3114, 3534. (2H,3L,3C)

**3954: STUDY ABROAD**

Variable credit course.

**3964: FIELD STUDY**

Variable credit course.

**4004: SENIOR SEMINAR IN FOREST PRODUCTS MARKETING AND MANAGEMENT**

Integrated application of principles of management and marketing. This capstone class will develop skills in business planning and decision making for future managers in the forest products industry. Senior standing required. (1H,1C)

**4024: PACKAGING DYNAMICS FOR DISTRIBUTION**

Understanding, identification, and measurement of hazards in physical distribution. Design and analysis of packaging protection against such hazards as shock, vibration, compression, and climate. Includes laboratory tests of shock, vibration and compression, and performance testing of packaging and components. Pre: 3224. (2H,3L,3C)

**4154: COMPUTER APPLICATION SYSTEMS IN FOREST PRODUCTS**

Computer control systems with applications in the forest products industry. Survey of systems for gathering, inputting, conditioning, and managing information. Hardware and software systems for computer control applications. Use of information technologies to integrate control subject to raw material, quality, and market fluctuations. Forest products case studies in data acquisition, data analysis, database management production planning, process control, inventory control, and systems specification. Junior standing is required. (2H,3L,3C)

**4224: WOOD PALLET, CONTAINER, AND UNIT LOAD DESIGN**

Wood pallet design and performance. The design of wood containers and crates. Design and performance of unit loads. Design and performance of unit load equipment, i.e., conveyors, racking systems, automatic guided vehicles, fork trucks. Principles of unit load design. Mechanical interactions between pallets, packaging, and unit load handling equipment. Unit load stabilization techniques, i.e., strapping, stretch wrapping. Int'l phytosanitation regulations of solid wood packaging; principles of dunnage, blocking and bracing. Pre:3534,4124,4315. (2H,3L,3C)

**4445-4446: WOOD ADHESION AND COMPOSITES**

4445: Introductory polymer science and surface chemistry. Fundamentals of adhesion and fracture in adhesively bonded wood. Industrially significant adhesive systems used for bonding wood with emphasis on wood-based composites. Introduction to wood coatings, formulation, application and weather durability. 4446: Processing of wood-based composites, product design and performance; product testing and standards. Pre: 3434 for 4445; 4445 for 4446. (2H,3L,3C)

**4514: WOOD PRODUCTS INDUSTRY STUDIES**

Field studies of the processing systems and product manufacturing procedures of various wood products industries. I Pre: 3114. (3L,1C)

**4624: WOOD INDUSTRY PRODUCTION OPERATIONS MANAGEMENT**

Study of the operation of wood products organizations. Problems facing these organizations and current management practices used to address these problems. Investigation of the design and implementation of wood industry management improvement efforts. How organizations and groups design, implement, and evaluate improvements efforts. The application of techniques to production planning, financial management, inventory management, quality, human resources management, technology, performance measures, and assessment. Includes case studies of wood products manufacturing companies. Pre: 3544. (2H,3L,3C)

**4634: FOREST PRODUCTS BUSINESS MANAGEMENT**

This course will describe the allocation of resources within a forest products business. Students will determine how to allocate natural, human and financial resources to maximize profitability within the organization. How allocation decisions affect all stakeholders of the organization will be demonstrated and this allocation's impact upon strategic planning will be discussed. The course will also show the impact of the external business environment on management decisions. Pre: 1234, 2614, 3114. (3H,3C)

**4714: WOOD PERFORMANCE IN CONSTRUCTION**

Interactions of building code requirements, wood materials and building construction with special emphasis on relative merit of wood and wood-based composites versus non-wood alternatives. Construction details that lead to long-term performance such as controlling moisture infiltration, preservatives, and proper selection of materials, preservation of historic wood buildings, effectiveness and efficiency of wood building systems. II Pre: 4315. (3H,3C)

**4974: INDEPENDENT STUDY**

Variable credit course.

**4984: SPECIAL STUDY**

Variable credit course.

**4994: UNDERGRADUATE RESEARCH**

Variable credit course.