

FOREST ENGINEERING, RESOURCES AND MANAGEMENT

The mission of the Department of Forest Engineering, Resources and Management (FERM) is to develop, communicate, and teach the science, knowledge and engineering necessary for the sustainable management of forest, land, and water resources to achieve economic, environmental, and social objectives. Teaching and research focus on support and enhancement of active forest management across the full range of owner objectives, from ecosystem restoration to timber production. FERM includes biologists, engineers, economists, biometricians, hydrologists, silviculturists and applied ecologists.

The Department of Forest Engineering, Resources and Management offers undergraduate degree programs leading to professional practice in forestry and forest engineering. It also offers more broadly defined graduate programs at the master's and doctorate levels in Sustainable Forest Management, including six areas of concentration.

Forestry Undergraduate Program

The forest management profession requires an understanding of natural resource systems and the management of forest resources for multiple uses. The Bachelor of Science (BS) degree in Forestry provides a broad-based education with the goal of preparing students to be successful forest managers. Graduates must understand biological and physical processes occurring in forests, the social and economic forces that influence policies and actions affecting forests, natural resource systems, and management of forest resources for multiple uses. Students also learn how values affect forest management planning so they can communicate effectively with others and make relevant decisions.

The core curriculum provides a broad-based education which includes basic courses in the biological, physical, social sciences, as well as professional courses designed to prepare students to manage forest resources. The Forestry BS also requires six months of relevant work experience intended to provide the enhanced understanding of the professional workplace. Students are required to select one of three options and serves to fulfill the 180 credits for graduation:

- Forest Management
- Forest Operations Management
- Forest Restoration and Fire

Graduates are employed by private and public organizations. The private sector includes the timber and forest products industry, forestry consulting firms, environmental organizations, and self-employment. Public employers include federal, state, and local government agencies such as the U.S. Forest Service, Bureau of Land Management, National Park Service, and state departments of forestry and natural resources.

The Bachelor of Science degree in Forestry is accredited by the Society of American Foresters.

Forest Engineering Undergraduate Program

The Forest Engineering Undergraduate Program provides an engineering education within a strong forestry context. The program is founded on fundamental principles of forest science and engineering science. Forest Engineering program objectives are to prepare graduates to plan and implement complex forestry and natural resource operations that help meet global demands for wood products while sustaining water, habitat, and other forest resources. It provides 'work-ready' graduates for entry into the diverse professional field of forest engineering. Early career accomplishments include harvest unit design, forest road location and design, contract inspection and administration, cost analysis, and forest transportation management. Mid-career accomplishments commonly expand to involve aspects of engineering management, including planning and budgeting, supervision, wood supply procurement, harvest and road design reviews, and scheduling and controlling forest operations.

Specifically, the Forest Engineering Undergraduate Program provides fundamental coverage of the following:

- Fundamental engineering and forestry principles
- Physical and biological aspects of soil and water resources
- Surveying and measurement of land and forest resources
- Analysis and design of the forest transportation system
- Analysis and design of harvesting operations
- Economics and operational planning principles

Integration of these topics enables forest engineering graduates to develop and manage safe, economical, and environmentally sound forest operations. Design experiences that integrate the topics listed above and steadily build on previous course material are distributed throughout the upper-division portion of the program. The Forest Engineering capstone sequence during the senior year provides an opportunity for students to bring together all the topics from the curriculum in a project framework that includes the field and office engineering tasks associated with the planning and design of forest operations. The capstone sequence is integrated with the Forestry capstone sequence to provide realistic interdisciplinary planning and design experience.

Forest engineering graduates are employed by private forestry firms, public forestry agencies, logging and construction companies, engineering consulting firms, and surveying firms. Some graduates establish their own consulting businesses after a few years of field experience. Career progression following graduation can be quite varied. Some graduates gravitate toward technical positions while others move quickly toward management of harvesting and other forest operations, or more broadly defined management of the forest land base.

The Bachelor of Science degree in Forest Engineering can be earned through completion of the Forest Engineering program or the Forest Engineering-Civil Engineering double degree program. The Bachelor of Science and Honors Bachelor of Science degrees in Forest Engineering are accredited by the Engineering Accreditation Commission ABET, <http://www.ABET.org>.

The BS in Forest Engineering is also accredited by the Society of American Foresters.

Completion of the five-year, double-degree Forest Engineering-Civil Engineering program results in a BS in Forest Engineering and a BS in Civil Engineering, offered by the School of Civil and Construction Engineering. The Bachelor of Science and Honors Bachelor of Science degrees in Civil Engineering are accredited by the Engineering Accreditation Commission of ABET, <http://www.ABET.org>.

Forest engineering is a licensed profession in the state of Oregon. The BS in Forest Engineering meets the administrative rules established by the Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS) as evidence of adequate preparation for the Fundamentals of Engineering Examination, the first of two examinations required for professional engineering licensing. The BS in Forest Engineering, with the completion of appropriate program electives, also meets the OSBEELS administrative rules for evidence of adequate preparation for the Fundamentals of Land Surveying Examination, the first of two examinations required for professional land surveyor licensing.

Undergraduate Programs

Majors

- Forest Engineering (<http://catalog.oregonstate.edu/college-departments/forestry/forest-engineering-resources-management/forest-engineering-bs-hbs/>)
- Forest Engineering-Civil Engineering (<http://catalog.oregonstate.edu/college-departments/forestry/forest-engineering-resources-management/forest-engineering-civil-engineering-bs-hbs/>)
- Forestry (<http://catalog.oregonstate.edu/college-departments/forestry/forest-engineering-resources-management/forestry-bs-hbs/>)

Options:

- *Forest Management*
- *Forest Operations Management*
- *Forest Restoration and Fire*

Minor

- Forestry (<http://catalog.oregonstate.edu/college-departments/forestry/forest-engineering-resources-management/forestry-minor/>)

Graduate Programs

Major

- Sustainable Forest Management (<http://catalog.oregonstate.edu/college-departments/forestry/forest-engineering-resources-management/sustainable-forest-management-mf-ms-phd/>)

Jeff Hatten, *Department Head*

234 Peavy Hall

Oregon State University

Corvallis, OR 97331-8615

Phone: 541-737-8720

Email: fermdept@oregonstate.edu

Website: <http://ferm.forestry.oregonstate.edu/>

Faculty

Professors Bailey, Chung, Davis, Fitzgerald, Johnson, Landgren, Maguire, Reed, Sessions^{PE}, Shaw, Temesgen

Associate Professors Bennett, Hatten, Leshchinsky^{PE}, Lyons, Panches, Wing^{CWRE,PE,PLS}

Assistant Professors Belart, Bladon, Gonzalez-Benecke, Kuusela, LeBoldus, Powers, Segura, Souder, Strimbu

Assistant Professor of Practice Cushing, Christiansen, Grand, Leavell, Kline

Senior Instructor II Wimer

Senior Instructor I Kiser

Emeritus D. Adams, P. Adams, Atkinson, Bell, Boyle, Brodie, Brown, Elwood, Fletcher, Garland^{PE}, Hann, Hermann, Hobbs, Kellogg, Montgomery, Murphy, Newton, Olsen, Pyles^{PE}, Skaugset^{RPF}, Tappeiner, Tesch, Walstad

Adjunct Faculty

J. Jones, M. Olsen

Courtesy/Affiliate Faculty

Ager, Amishev, Argerich, Barrett, Burnett, Cloughesy, Coble, Dumroese, Ferreiro, Frey, Fried, Han, Harrington, Hessburg, Johnson, Kaetzel, Kerns, Kim, Lake, Latta, Lee, Lesmeister, Lieberg, Light, Marshall, McNassar, Monleon, Moriarty, Pinto, Rathbun, Riegel, Sobota, Stednick, Strunk, Ver Hoef, Wagenbrenner, White, Zald, Zamora

CWRE

Certified Water Right Examiner

PE

Registered Professional Engineer in one or more states

RPF

Registered Professional Forester in one or more states

PLS

Registered Professional Land Surveyor in one or more states

Forest Engineering (FE)

FE 101, INTRODUCTION TO FOREST ENGINEERING, 2 Credits

Introduction to the forest engineering discipline. Discussion of critical issues, available resources, career opportunities and professional opportunities. Overview of field instruments and analytical approaches.

FE 102, FOREST ENGINEERING PROBLEM SOLVING AND TECHNOLOGY, 3 Credits

A technology applications course designed to introduce students to formulating and implementing computational solutions to engineering analysis and design problems in a digital environment. Students will learn to evaluate engineering problems, formulate one or more solution techniques or algorithms, and code the solution using spreadsheet and/or programming software. Professionalism in completing and presenting laboratory exercises is emphasized. Laboratory examples draw from a variety of engineering topics. This course may be substituted for CE 102, Civil Engineering I: Problem Solving and Technology.

Equivalent to: FE 215

Recommended: Calculus

FE 206, ENGINEERING FOREST BIKING TRAILS, 2 Credits

Students will design trails that mitigate impact on the environment and other trail users, while still providing a fun experience for mountain bike riders. Topics include site classification, trail safety, water management, digital terrain models, and commercial road design software. This course will emphasize field and design work.

FE 208, FOREST SURVEYING, 4 Credits

Introduction to theory and practice of surveying methods and measurements as applied to the specifics of forestry problems and their solutions. This is the first of a four-course sequence (FE 208, 209, 310, 311). Together with FE 257 it is designed to prepare students for the Fundamentals of Land Surveying exam, which is necessary to become a professional land surveyor.

Prerequisite: MTH 112 with C or better or MTH 241 with C or better or MTH 251 with C or better or MTH 251H with C or better or MTH 252 with C or better or MTH 252H with C or better

Equivalent to: FE 308

Available via Ecampus

FE 209, FOREST PHOTOGRAMMETRY AND REMOTE SENSING, 4 Credits

Management and conservation of natural resources with the fundamentals of spatial data acquisition from airborne and spaceborne sensors. Introduction to theory of spectral reflectance properties of vegetation, the principles of photographic analysis and aerial photo-interpretation and new advances such as LIDAR.

Prerequisite: MTH 112 with C or better or MTH 241 with C or better or MTH 251 with C or better or MTH 251H with C or better or MTH 252 with C or better or MTH 252H with C or better

Equivalent to: FE 309

Available via Ecampus

FE 257, GIS AND FOREST ENGINEERING APPLICATIONS, 3 Credits

An introduction to the appropriate use and potential applications of geographic information systems (GIS) and related technologies (GPS and remote sensing) in forest management and operational planning and problem solving. Students are presented with lectures and exercises that cover a wide range of GIS and GIS-related topics and issues including spatial database creation, structure, analysis, and modeling. Lec/lab.

Equivalent to: FE 357

Available via Ecampus

FE 307, JUNIOR SEMINAR, 1 Credit

College is the time to develop the skills necessary for the transition between academics and career. In conjunction with the expertise already available on campus, this course will guide students through career planning, exploration, placement, and employer expectations. CROSSLISTED as FE 307/FOR 307.

Equivalent to: FOR 307

FE 310, FOREST ROUTE SURVEYING, 4 Credits

Route surveying and site surveying applied to forestry problems. Use of surveying equipment; traversing; computations; leveling; horizontal, vertical, compound, reverse and spiral curves; earthwork; construction staking as applied to new road and existing road P-line survey. Includes rapid survey techniques. Lec/lab.

Prerequisite: (FE 208 with C or better or FE 308 with C or better) or CE 361 with C or better or CEM 263 with C or better

FE 312, FORESTRY FIELD SCHOOL, 2 Credits

A hands-on experience in the major aspects of forestry, including regeneration surveys, silviculture, cruising, recreation, forest disturbances, logging site and mill visits, east and west of the Cascades Range. CROSSLISTED as FE 312/FOR 312.

Equivalent to: FOR 312

FE 315, SOIL ENGINEERING, 4 Credits

Use of soil in engineering and construction. Identification and classification. Engineering properties of soil: permeability, compressibility, and strength. Compaction principles and methods. Field control of soil engineering projects.

Prerequisite: ENGR 213 (may be taken concurrently) with D- or better

Recommended: CE 311 or CEM 311 or FE 330

FE 316, SOIL MECHANICS, 4 Credits

Soil strength and soil mechanics theories applied to analysis of slope stability, retaining structures, foundations, and pavements. Lec/lab.

Prerequisite: FE 315 (may be taken concurrently) with C- or better or CE 372 (may be taken concurrently) with D- or better

FE 330, FOREST ENGINEERING FLUID MECHANICS AND HYDRAULICS, 3 Credits

Fluid properties, pressure, fluid statics, continuity, energy equation, single and series pipe flow, open channel hydraulics, peakflow estimates for culvert design, stream crossing design. Lec/lab.

Prerequisite: ENGR 213 (may be taken concurrently) with D- or better and FE 102 (may be taken concurrently) [C-]

Equivalent to: FE 431

FE 370, HARVESTING OPERATIONS, 4 Credits

Timber harvesting and transport methods from the forest to the mill. Technical feasibility, economic, and environmental relationships in forestry operations. Junior standing in forestry required. For non-forest engineering students.

Prerequisite: PH 201 with C or better or PH 211 with C or better

FE 371, HARVESTING PROCESS ENGINEERING, 4 Credits

Timber harvesting equipment and systems. Harvesting process evaluation and decisions aided by forest engineering analysis. Lec/lab.

Prerequisite: ENGR 211 with C or better and FE 102 [C]

Recommended: Concurrent enrollment in FE 208 and FE 357

FE 403, THESIS, 1-16 Credits

PREREQ: Departmental approval required.

This course is repeatable for 16 credits.

FE 405, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

FE 406, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

FE 407, SEMINAR, 1-16 Credits

This course is repeatable for 16 credits.

FE 415, FOREST ROAD ENGINEERING, 3 Credits

Location, surveying, design, cost estimation, and construction practices for forest roads. Lecture on principles, and laboratory field practice in locating, surveying, designing, and cost estimating.

Prerequisite: FE 310 with C- or better

FE 416, FOREST ROAD SYSTEM MANAGEMENT, 4 Credits

Structural characteristics of bridges, load rating, structural design of culverts, aggregate testing and evaluation, environmental assessment of forest road systems, road maintenance cycles and management.

Prerequisite: (ENGR 211 with D- or better or ENGR 211H with D- or better) and (ENGR 213 [D-] or ENGR 213H [D-]) and FE 316 [C-] and FE 415 [C-]

FE 423, UNMANNED AIRCRAFT SYSTEM REMOTE SENSING, 3 Credits

Unmanned Aircraft System (UAS) Geomatics presents techniques in UAS design and applications for remote sensing measurements of both natural and constructed landscapes.

Prerequisite: FE 309 with C or better or GEOG 480 with C or better or GEOG 481 with C or better or GEO 444 with C or better or GEO 466 with C or better

FE 430, WATERSHED PROCESSES, 4 Credits

Effects of land use practices on the physical hydrology (interception, infiltration, evapotranspiration, subsurface flow and surface runoff, water yields, and peak flows) of forested watersheds. Surface erosion, mass soil movements, stream temperatures, nutrient levels and effects of management activities upon riparian systems; forest practice rules. Lec/lab.

Available via Ecampus

FE 434, FOREST WATERSHED MANAGEMENT, 4 Credits

Physical hydrology, erosion processes, streams, and riparian areas of forested ecosystems. The material can be widely applied, but is applicable primarily to the humid, temperate rainforests of the Pacific Northwest.

Prerequisite: (CH 121 with C or better or CH 201 with C or better or CH 231 with C or better) and (SOIL 205 [C] or CSS 305 [C] or CSS 205 [C]) and (MTH 241 [C] or MTH 251 [C] or MTH 251H [C])

FE 436, FOREST DISTURBANCE HYDROLOGY, 3 Credits

Impacts of forest disturbance, including timber harvest, wildfire, insect outbreaks, and low frequency storms and floods on watershed hydrology and streams.

Prerequisite: FE 434 with C or better

Equivalent to: FE 435

FE 440, FOREST OPERATIONS ANALYSIS, 4 Credits

Identification and measurement of production components in harvesting systems. Methods analysis, productivity improvement and engineering economics. Report writing skills emphasized. Lec/lab.

Prerequisite: FE 102 with C- or better and (FE 370 [C-] or FE 371 [C-])

Recommended: Basic statistics

FE 444, FOREST REMOTE SENSING AND PHOTOGRAMMETRY, 4 Credits

Introduction to spectral reflectance, photogrammetry, image analysis, and point clouds. Fundamentals of data acquisition with passive and active sensors installed on airborne and spaceborne platforms. Radar and lidar in forestry. Lec/lab.

Prerequisite: FE 257 with C or better and (MTH 112 [C] or MTH 241 [C] or MTH 251 [C] or MTH 251H [C] or MTH 252 [C] or MTH 252H [C]) and (PH 201 [C] or PH 211 [C])

FE 456, *INTERNATIONAL FORESTRY, 3 Credits

An introduction to the biological, physical, and sociological factors that shape the world's forests and the activities used to manage those forests. What influence these factors have on forest policies, practices, and outcomes. CROSSLISTED as FE 456/FOR 456. (Bacc Core Course)

Attributes: CSGI – Core, Synth, Global Issues

Equivalent to: FOR 456

Recommended: Introductory course in biology.

FE 457, TECHNIQUES FOR FOREST RESOURCE ANALYSIS, 4 Credits

Use of linear programming, nonlinear programming, dynamic programming, and simulation to solve complex forest management problems, with emphasis on intertemporal multiple-use scheduling. Forestry transportation problems, multiple-use allocation, and investment analysis. Field trips required. CROSSLISTED as FE 457/FOR 457 and FE 557/FOR 557.

Prerequisite: FOR 329 with C or better and FOR 441 [C] and FOR 443 [C]

Equivalent to: FOR 457

FE 459, FOREST MANAGEMENT PLANNING AND DESIGN I, 4 Credits

Integration of environmental, economic, and social aspects of forestry in management planning. Development of strategic and tactical plans using diverse data types and sources. Senior capstone class projects. Lec/lab. CROSSLISTED as FE 459/FOR 459.

Prerequisite: FE 457 with C or better or FOR 457 with C or better

Equivalent to: FOR 459

FE 460, ^FOREST OPERATIONS REGULATIONS AND POLICY ISSUES, 3 Credits

Reviews regulations and other policies that affect timber harvesting and other forest practices, particularly policies that address concerns of environment, safety, employment and transportation. Discusses how such rules and other policies evolve, including the role of public perceptions, forestry professionals and other key policy players. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

FE 469, FOREST MANAGEMENT PLANNING AND DESIGN II, 4 Credits

A team-based, project-centric course for integrated timber harvest planning. Establish tactical and operational planning goals and constraints, identify feasible harvesting and transportation systems, and design harvest units to meet objectives and constraints. Lec/lab. CROSSLISTED as FE 469/FOR 469.

Prerequisite: FE 459 with C or better or FOR 459 with C or better

Equivalent to: FOR 469

FE 470, LOGGING MECHANICS, 4 Credits

Relationship of torque, power, and thrust to the operation of cable and ground-based harvesting systems. On-highway and off-highway heavy truck performance.

Prerequisite: (ENGR 211 with D- or better or ENGR 211H with D- or better) and ENGR 213 [D-] and FE 371 [C-]

FE 471, HARVESTING MANAGEMENT, 3 Credits

Verification of harvesting assessment plans and operational planning/field layout. Practical logging skills related to harvest planning, operations monitoring, and designing worker training programs. Lec/lab.

Recommended: FE 371 and FE 470

FE 472, MECHANIZED HARVESTING AND SIMULATION, 2 Credits

Study of harvesters, forwarders, and processing of timber for maximizing stand value. The use of a harvesting simulator will provide for a hands-on approach to learning.

Recommended: FOR 321

FE 479, SLOPE AND EMBANKMENT DESIGN, 3 Credits

A comprehensive overview of evaluating stability and performance for natural and engineered slopes. Design aspects include construction of road embankments, slope remediation techniques and application of geosynthetics for slope stabilization, slope and wall construction, and drainage. CROSSLISTED as CE 479/FE 479 and CE 579/FE 579.

Prerequisite: CE 373 with C or better or FE 316 with C or better

Equivalent to: CE 479

FE 480, FOREST ENGINEERING PRACTICE AND PROFESSIONALISM, 1 Credit

Personal and professional skills, attributes, and issues in forest engineering practice. Includes topics such as ethics, land stewardship, media relations and risk management.

FE 499, SPECIAL TOPICS, 1-16 Credits

This course is repeatable for 8 credits.

FE 501, RESEARCH AND SCHOLARSHIP, 1-16 Credits

This course is repeatable for 16 credits.

FE 503, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

FE 505, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

FE 506, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

FE 507, SEMINAR, 1-16 Credits

Subject matter as required by graduate programs.

This course is repeatable for 16 credits.

FE 515, FOREST ROAD ENGINEERING, 3 Credits

Location, surveying, design, cost estimation, and construction practices for forest roads. Lecture on principles, and laboratory field practice in locating, surveying, designing, and cost estimating.

Recommended: Basic surveying

FE 516, FOREST ROAD SYSTEM MANAGEMENT, 4 Credits

Structural characteristics of bridges, load rating, structural design of culverts, aggregate testing and evaluation, environmental assessment of forest road systems, road maintenance cycles and management.

Recommended: FE 415 or FE 515

FE 523, UNMANNED AIRCRAFT SYSTEM REMOTE SENSING, 3 Credits

Unmanned Aircraft System (UAS) Geomatics presents techniques in UAS design and applications for remote sensing measurements of both natural and constructed landscapes.

Prerequisite: GEOG 580 with C or better or GEOG 581 with C or better or GEO 544 with C or better or GEO 566 with C or better or OC 678 with C or better

FE 530, WATERSHED PROCESSES, 4 Credits

Effects of land use practices on the physical hydrology (interception, infiltration, evapotranspiration, subsurface flow and surface runoff, water yields, and peak flows) of forested watersheds. Surface erosion, mass soil movements, stream temperatures, nutrient levels and effects of management activities upon riparian systems; forest practice rules. Lec/lab.

FE 532, FOREST HYDROLOGY, 4 Credits

Physical hydrology, erosion processes, and attributes of stream ecosystems for forested watersheds. Material can be widely applied, but is applicable primarily to the humid, temperate rainforests of the Pacific Northwest. Lec/rec.

Recommended: BEE 512 or introductory hydrology course

FE 536, FOREST DISTURBANCE HYDROLOGY, 3 Credits

Impacts of forest disturbance, including timber harvest, wildfire, insect outbreaks, and low frequency storms and floods on watershed hydrology and streams.

Recommended: FE 434

FE 540, FOREST OPERATIONS ANALYSIS, 4 Credits

Identification and measurement of production components in harvesting systems. Methods analysis, productivity improvement and engineering economics. Report writing skills emphasized. Lec/lab.

Recommended: FE 102 and (FE 370 or FE 371) and basic statistics.

FE 544, FOREST REMOTE SENSING AND PHOTOGRAMMETRY, 4 Credits

Introduction to spectral reflectance, photogrammetry, image analysis, and point clouds. Fundamentals of data acquisition with passive and active sensors installed on airborne and spaceborne platforms. Radar and lidar in forestry. Lec/lab.

Recommended: FE 257 and (MTH 112 or MTH 241 or MTH 251 or MTH 251H or MTH 252 or MTH 252H)

FE 545, SEDIMENT TRANSPORT, 4 Credits

Principles of sediment erosion, transportation and deposition in rivers, reservoirs, and estuaries; measurement, analysis, and computational techniques. Offered even years in winter term. CROSSLISTED as BEE 545/FE 545.

Equivalent to: BEE 545

Recommended: CE 313 or FE 330

FE 552, FOREST TRANSPORTATION SYSTEMS, 4 Credits

Analysis of interactions between harvesting and road systems. Advanced topics in road and landing spacing, determination of road standards, analysis of logging road networks, transfer and sort yard facility location. Simultaneous resource scheduling and transportation planning.

Recommended: FE 102 and (FE 440 or FE 540)

FE 555, FOREST SUPPLY CHAIN MGMT, 3 Credits

Develop and implement operational planning and logistics scheduling systems to manage a forestry supply chain for typical forest organizations in the Pacific Northwest. Once developed, these supply chain plans will be implemented using simulation software that will allow students to view the results of their forest operations plans.

Recommended: (CS 151 or FE 102) and FE 357 and FOR 457

FE 557, TECHNIQUES FOR FOREST RESOURCE ANALYSIS, 4 Credits

Use of linear programming, nonlinear programming, dynamic programming, and simulation to solve complex forest management problems, with emphasis on intertemporal multiple-use scheduling. Forestry transportation problems, multiple-use allocation, and investment analysis. Field trips required. CROSSLISTED as FE 457/FOR 457 and FE 557/FOR 557.

Equivalent to: FOR 557

Recommended: FOR 329 and FOR 441 and FOR 443

FE 560, FOREST OPERATIONS REGULATIONS AND POLICY ISSUES, 3 Credits

Reviews regulations and other policies that affect timber harvesting and other forest practices, particularly policies that address concerns of environment, safety, employment and transportation. Discusses how such rules and other policies evolve, including the role of public perceptions, forestry professionals and other key policy players.

FE 570, LOGGING MECHANICS, 4 Credits

Relationship of torque, power, and thrust to the operation of cable and ground-based harvesting systems. On-highway and off-highway heavy truck performance.

Recommended: ENGR 211 and ENGR 213 and FE 371

FE 571, HARVESTING MANAGEMENT, 3 Credits

Verification of harvesting assessment plans and operational planning/field layout. Practical logging skills related to harvest planning, operations monitoring, and designing worker training programs.

Recommended: FE 371 and FE 470

FE 579, SLOPE AND EMBANKMENT DESIGN, 3 Credits

A comprehensive overview of evaluating stability and performance for natural and engineered slopes. Design aspects include construction of road embankments, slope remediation techniques and application of geosynthetics for slope stabilization, slope and wall construction, and drainage. CROSSLISTED as CE 479/FE 479 and CE 579/FE 579.

Equivalent to: CE 579

Recommended: CE 373 or FE 316

FE 599, SPECIAL TOPICS, 1-16 Credits

This course is repeatable for 16 credits.

FE 601, RESEARCH AND SCHOLARSHIP, 1-16 Credits

This course is repeatable for 16 credits.

FE 603, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

FE 605, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

FE 606, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

FE 607, SEMINAR, 1-16 Credits

Subject matter is required by graduate programs.

This course is repeatable for 16 credits.

FE 640, SPECIAL TOPICS IN FOREST ENGINEERING, 1-3 Credits

Recent advances in logging engineering, forest engineering, and forest operations. Content will vary with instructor. May be retaken for credit.

This course is repeatable for 99 credits.

Forestry (FOR)**FOR 111, INTRODUCTION TO FORESTRY, 3 Credits**

Forest resources in the world; forests and human well-being; where and how forests grow; environmental and human values; products, characteristics, and uses; basic elements of use, planning and management. Interpretation of forestry literature; professional origins in the U.S. Field trips required.

Equivalent to: F 111

Available via Ecampus

FOR 112, COMPUTING APPLICATIONS IN FORESTRY, 3 Credits

An overview of computing applications used in all aspects of forestry work, but largely focused on development of intermediate and advanced spreadsheet skills using Microsoft Excel (e.g., complex formulas and functions, charting, and pivot tables). Additionally, the course rounds out essential skills in document formatting and presentation development.

FOR 199, SPECIAL STUDIES, 1-16 Credits

This course is repeatable for 16 credits.

FOR 206, *FOREST SOILS LABORATORY FOR SOIL 205, 1 Credit

Laboratory exercise and field trips designed to develop student competency in soil processes, description, analysis, and assessment with a particular emphasis on the role of soils in managed and unmanaged forest ecosystems. (Bacc Core Course if taken with SOIL 205)

Attributes: CPBS – Core, Pers, Biological Science; CPPS – Core, Pers, Physical Science

Corequisites: SOIL 205

FOR 208, FOREST SOILS RECITATION, 1 Credit

Readings, exercises, discussions designed to develop student competency in forest soil processes, description, analysis, and assessment. A particular emphasis will be placed on the role of soils in managed and unmanaged forest ecosystems.

Recommended: An introductory soils course.

Available via Ecampus

FOR 307, JUNIOR SEMINAR, 1 Credit

College is the time to develop the skills necessary for the transition between academics and career. In conjunction with the expertise already available on campus, this course will guide students through career planning, exploration, placement, and employer expectations. CROSSLISTED as FE 307/FOR 307.

Equivalent to: FE 307

FOR 312, FORESTRY FIELD SCHOOL, 2 Credits

A hands-on experience in the major aspects of forestry, including regeneration surveys, silviculture, cruising, recreation, forest disturbances, logging site and mill visits, east and west of the Cascades Range. CROSSLISTED as FE 312/FOR 312.

Equivalent to: FE 312

FOR 321, FOREST MENSURATION, 5 Credits

Encompasses methods used to measure tree, stand and forest-level attributes, and sample and analyze forest resources data. Provides information that support forest management decisions at the stand and forest levels. Focuses mainly on quantitative analysis of forest vegetation. Uses considerable time and effort on measuring other forest resources (e.g., wildlife habitat and riparian zones).

Prerequisite: (FOR 141 with C or better or FES 141 with C or better or FOR 241 with C or better or FES 241 with C or better) and FE 208 [C] and (MTH 241 [C] or MTH 245 [C] or MTH 251 [C] or MTH 251H [C]) and (ST 201 [C] or ST 314 [C] or ST 314H [C] or ST 351 [C] or ST 351H [C])

FOR 322, FOREST MODELS, 3 Credits

Introduction to static and dynamic forest models: defining what they are, how they might be used, and, in general terms, how they are developed.

Prerequisite: FOR 321 with C- or better and MTH 241 [D-] and (ST 201 [D-] or ST 351 [D-])

Equivalent to: F 322

FOR 329, FOREST RESOURCE ECONOMICS I, 4 Credits

Forest products markets, appraisal, rotation, thinning, uneven-aged management and forest regulation. Economics of timber management and harvest scheduling.

Prerequisite: ST 201 with D- or better or ST 351 with D- or better

Equivalent to: FOR 331

FOR 330, FOREST RESOURCE ECONOMICS II, 4 Credits

Basic arithmetic of interest and capital budgeting. Basic wood products markets. Forest resource markets and market failures. Nonmarket valuation and multiple-use forestry. Impacts of forest management and policy decisions on forest resource use. Lec/lab.

Prerequisite: (AEC 250 with C or better or (ECON 201 with C or better or ECON 201H with C or better)) and (MTH 241 [C] or MTH 245 [C] or (MTH 251 [C] or MTH 251H [C]))

Equivalent to: FOR 430

FOR 346, TOPICS IN WILDLAND FIRE, 3 Credits

An interdisciplinary survey of concepts relating to fire science, ecology, management, and policy. Includes case studies of several representative ecosystems, ranging from west- and eastside forests of the Pacific Northwest to shrub steppe ecosystems of the Intermountain West and chaparral ecosystems of southern California. Distance and campus-based delivery using videos, website, and discussion.

Equivalent to: FW 346, RNG 346

Recommended: Coursework in forest biology or ecology (eg. FOR 240 or FES 240 or FES 341)

Available via Ecampus

FOR 399, SPECIAL TOPICS, 0-16 Credits

Equivalent to: FOR 399H

This course is repeatable for 16 credits.

FOR 399H, SPECIAL TOPICS, 1-16 Credits

Attributes: HNRS – Honors Course Designator

Equivalent to: FOR 399

This course is repeatable for 16 credits.

FOR 401, RESEARCH AND SCHOLARSHIP, 1-16 Credits

Equivalent to: F 401

This course is repeatable for 16 credits.

FOR 403, THESIS, 1-16 Credits

This course is repeatable for 16 credits.

FOR 405, READING AND CONFERENCE, 1-16 Credits

Equivalent to: F 405, FRR 405

This course is repeatable for 16 credits.

FOR 406, PROJECTS, 1-16 Credits

Section 4: Integrated Projects, Graded.

Equivalent to: F 406, FRR 406

This course is repeatable for 16 credits.

FOR 407, SEMINAR, 1-16 Credits

Equivalent to: F 407, FRR 407

This course is repeatable for 16 credits.

FOR 408, WORKSHOP, 1-3 Credits

Equivalent to: FRR 408

This course is repeatable for 16 credits.

FOR 410, INTERNSHIP, 1-16 Credits

Full-time supervised professional experience emphasizing functional proficiency under joint sponsorship of university and agency personnel. Graded P/N.

Equivalent to: FRR 410

This course is repeatable for 16 credits.

FOR 413, FOREST PATHOLOGY, 3 Credits

Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips.

Lec/lab. CROSSLISTED as BOT 413/FOR 413.

Prerequisite: BI 204 with C or better or BI 212 with C or better or BI 212H with C or better or BI 213 with C or better or BI 213H with C or better or BI 221 with C or better or BI 221H with C or better

Equivalent to: BOT 413

FOR 417, ADVANCED FOREST SOILS, 4 Credits

Synthesize current information on fundamental properties and processes of forest soils with emphasis on applications to silviculture, soil conservation, and sustainable management of forested ecosystems. Lec/lab.

Prerequisite: SOIL 205 with C- or better and ((CH 231 with C- or better or CH 231H with C- or better) and (CH 261 [C-] or CH 261H [C-] or CH 201 [C-]) and (MTH 241 [C-] or MTH 251 [C-] or MTH 251H [C-] or MTH 252 [C-] or MTH 252H [C-])

Equivalent to: FOR 417X

FOR 431, ECONOMICS AND POLICY OF FOREST WILDLAND FIRE, 3 Credits

General overview of the history of fire and the interaction of people with fire on forested landscapes. Forest fire policy history and current issues in the U.S. Basic legal concepts relevant to forest fire policy. An economic framework for understanding spatial externalities, decision-making under certainty, institutional economics, and incentives.

Prerequisite: AEC 351 with C or better or AEC 352 with C or better or FOR 330 with C or better or ECON 352 with C or better

Available via Ecampus

FOR 436, WILDLAND FIRE SCIENCE AND MANAGEMENT, 4 Credits

Principles and applications of fire as a natural resource management tool; the role of fire in conservation management, restoration, and preservation of ecosystems. Covers basic techniques and current research used to describe fire behavior and spread, fuels and fuel manipulation, and fire effects on the biota. Focus will be on fire as a natural process in ecosystem dynamics. Lec/lab.

Equivalent to: FW 436, RNG 436

Available via Ecampus

FOR 441, SILVICULTURE PRINCIPLES, 4 Credits

Nursery operation, vegetation management, herbivores, fire, seeding and planting techniques. Introduction to principles and techniques involving vegetation control, thinning, fertilizing, and harvesting. Environmental considerations related to forest stand treatments. Lec/lab.

Prerequisite: (FES 240 with C or better or FOR 240 with C or better) and (FES 141 [C] or FES 241 [C])

FOR 442, SILVICULTURE REFORESTATION, 4 Credits

Silvicultural principles and practices needed to successfully regenerate forestlands in North America. Topics include artificial and natural regeneration, genetic improvement, seed orchards, forest tree nurseries, site preparation, seedling quality and handling, vegetation management, animal damage protection, early stand management, and ecological and ecophysiological considerations. Emphasis is placed on regeneration methods applied to plantations in western Oregon. Field trips required.

Prerequisite: SOIL 205 with C or better and (FES 240 [C] or FES 240H [C] or FOR 240 [C])

Corequisites: FOR 443

FOR 443, SILVICULTURAL PRACTICES, 4 Credits

Manipulation of forest stand structure and dynamics to meet various resource management objectives. Covers key concepts and practices associated with vegetation control, thinning, fertilization, even-aged and uneven-aged regeneration systems including social and environmental considerations associated with treatments. Two-day field trip required. Lec/lab.

Prerequisite: (FES 240 with C or better or FES 240H with C or better or FOR 240 with C or better) and FOR 321 [C]

Corequisites: FOR 442

FOR 456, *INTERNATIONAL FORESTRY, 3 Credits

An introduction to the biological, physical, and sociological factors that shape the world's forests and the activities used to manage those forests. What influence these factors have on forest policies, practices, and outcomes. CROSSLISTED as FE 456/FOR 456. (Bacc Core Course)

Attributes: CSGI – Core, Synth, Global Issues

Equivalent to: FE 456

Recommended: Introductory course in biology.

FOR 457, TECHNIQUES FOR FOREST RESOURCE ANALYSIS, 4 Credits

Use of linear programming, nonlinear programming, dynamic programming, and simulation to solve complex forest management problems, with emphasis on intertemporal multiple-use scheduling. Forestry transportation problems, multiple-use allocation, and investment analysis. Field trips required. CROSSLISTED as FE 457/FOR 457 and FE 557/FOR 557.

Prerequisite: FOR 329 with C or better and FOR 441 [C] and FOR 443 [C]

Equivalent to: FE 457

FOR 459, FOREST MANAGEMENT PLANNING AND DESIGN I, 4 Credits

Integration of environmental, economic, and social aspects of forestry in management planning. Development of strategic and tactical plans using diverse data types and sources. Senior capstone class projects. Lec/lab. CROSSLISTED as FE 459/FOR 459.

Prerequisite: FE 457 with C or better or FOR 457 with C or better

Equivalent to: FE 459

FOR 460, ^FOREST POLICY, 4 Credits

Policy formulation and analysis for forest resources. Consideration of policy affecting land management approaches to planning, management, and social and economic development. Major forestry policy areas covered include outdoor recreation, range, timber, wilderness, and wildlife and fish. Lec/lab. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

FOR 462, NATURAL RESOURCE POLICY AND LAW, 3 Credits

First of two offerings designed to provide an introduction to current environmental and natural resource law issues and disputes for students who will have to meet, consult, and work with lawyers throughout their professional career. Focus is on mechanisms governing resource allocation within the constraints of private property rights. Emphasis is placed on the federal Endangered Species Act and its relation to water allocation and public trust doctrines. Students will also gain a broad understanding of regulatory

FOR 469, FOREST MANAGEMENT PLANNING AND DESIGN II, 4 Credits

A team-based, project-centric course for integrated timber harvest planning. Establish tactical and operational planning goals and constraints, identify feasible harvesting and transportation systems, and design harvest units to meet objectives and constraints. Lec/lab. CROSSLISTED as FE 469/FOR 469.

Prerequisite: FE 459 with C or better or FOR 459 with C or better

Equivalent to: FE 469

FOR 499, SPECIAL TOPICS, 0-16 Credits

Topics of current importance in forest resources issues, education, policies, economics, management, business, social values, silviculture, and biometrics. Topics will change from term to term. May be repeated with different topics for credit. Section 8: Social aspects of natural resource management (3 credits) graded.

This course is repeatable for 16 credits.

Available via Ecampus

FOR 501, RESEARCH AND SCHOLARSHIP, 1-16 Credits

Equivalent to: F 501

This course is repeatable for 16 credits.

FOR 503, THESIS, 1-16 Credits

Equivalent to: F 503

This course is repeatable for 999 credits.

FOR 505, READING AND CONFERENCE, 1-16 Credits

Equivalent to: F 505, FRR 505

This course is repeatable for 16 credits.

FOR 506, PROJECTS, 1-16 Credits

Equivalent to: F 506

This course is repeatable for 16 credits.

FOR 507, SEMINAR, 1-16 Credits

Equivalent to: F 507, FRR 507

This course is repeatable for 16 credits.

FOR 508, WORKSHOP, 1-3 Credits

This course is repeatable for 16 credits.

FOR 510, INTERNSHIP, 1-9 Credits

This course is repeatable for 16 credits.

FOR 513, FOREST PATHOLOGY, 3 Credits

Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips. Lec/lab. CROSSLISTED as BOT 513/FOR 513.

Equivalent to: BOT 513

Recommended: BI 204 or BI 212 or BI 212H or BI 213 or BI 213H

FOR 517, ADVANCED FOREST SOILS, 4 Credits

Synthesize current information on fundamental properties and processes of forest soils with emphasis on applications to silviculture, soil conservation, and sustainable management of forested ecosystems. Lec/lab.

Recommended: SOIL 205 and (((CH 231 or CH 231H) and (CH 261 or CH 261H)) or CH 201) and (MTH 241 or MTH 251 or MTH 251H or MTH 252 or MTH 252H) all with a minimum grade of C-

FOR 518, MANAGING FOREST NUTRITION, 3 Credits

Synthesize current information on nutrient limitations of forest productivity, long-term forest productivity, and mitigating and managing forest nutrition with emphasis on forests of the Pacific Northwest.

FOR 520, GEOSPATIAL FOREST ANALYSIS, 3 Credits

Review of passive and active sensors used in remote sensing. Geospatial data manipulation in R Image classification. Point clouds: lidar and photogrammetric. Point cloud manipulation for forestry application. Sampling for accuracy assessment. Lec/lab.

Prerequisite: FE 444 with C or better or GEOG 480 with C or better

FOR 524, FOREST BIOMETRICS, 3 Credits

Advanced topics in forest biometrics, including measurement of forest structure and dynamics, application of sampling theory and methods, and statistical techniques for interpreting forestry data.

Equivalent to: F 524

Recommended: FOR 322 and ST 511

FOR 525, FOREST MODELING, 3 Credits

Examination of regression techniques and assumptions used to develop static and dynamic equations of tree and stand attributes.

Prerequisite: ST 552 with C or better

Equivalent to: F 525

FOR 528, PROFESSIONAL COMMUNICATION AND ETHICS, 2 Credits

Conventions of written and oral communication in forestry and related disciplines including basic narrative development. Exploration of environmental, professional, and research ethics, and the role they play in effective communication with multiple stakeholders.

FOR 531, ECONOMICS AND POLICY OF FOREST WILDLAND FIRE, 3 Credits

General overview of the history of fire and the interaction of people with fire on forested landscapes. Forest fire policy history and current issues in the U.S. Basic legal concepts relevant to forest fire policy. An economic framework for understanding spatial externalities, decision-making under certainty, institutional economics, and incentives.

Recommended: FOR 330 or AEC 351 or AEC 352 or ECON 352

Available via Ecampus

FOR 534, ECONOMICS OF THE FOREST RESOURCE, 3 Credits

Topics include optimal stand and forest management for timber production, economics of ecosystem services (e.g. recreation, biodiversity, carbon sequestration, water quality and regulation), non-market valuation methods, management under risk and uncertainty, discounting, intergenerational equity, sustainability, international trade and other global issues.

Recommended: FOR 330 and FOR 331

FOR 536, WILDLAND FIRE SCIENCE AND MANAGEMENT, 4 Credits

Principles and applications of fire as a natural resource management tool; the role of fire in conservation management, restoration, and preservation of ecosystems. Covers basic techniques and current research used to describe fire behavior and spread, fuels and fuel manipulation, and fire effects on the biota. Focus will be on fire as a natural process in ecosystem dynamics. Lec/lab.

Equivalent to: FW 536, RNG 536

FOR 542, INTERNATIONAL INTENSIVE SILVICULTURE, 2 Credits

Operational and ecological aspects of intensive silvicultural management of planted forests around the world. Guest speakers in different countries will describe the type of silvicultural management that is carried out in the speaker's country from species and genetic selection, to harvest and rotation length, including site preparation and planting techniques. Emphasis on comparing silvicultural practices in each country to the management of plantations in western Oregon.

FOR 543, SILVICULTURAL PRACTICES, 5 Credits

Manipulation of immature and mature forest stands for various resource management objectives. Principles and techniques involving vegetation control, thinning, fertilizing, and harvesting. Environmental considerations related to stand treatments. Two-day field trips required.

Recommended: (FOR 240 or FES 240) and FOR 321 and concurrent enrollment in FOR 429

FOR 549, SILVICULTURAL INFLUENCES ON FOREST ECOSYSTEM DYNAMICS, 3 Credits

Fundamental biological and ecological principles for the design and implementation of silvicultural regimes that achieve a wide diversity of forest ecosystem management objectives.

Recommended: Undergraduate course in silviculture and in forest mensuration.

FOR 550, SUSTAINABLE FOREST MANAGEMENT, 3 Credits

Sustainable forestry as part of the global sustainability movement. History of sustainability and its influence on decision-making in forest management. Current dimensions of sustainability: forest certification, climate change, role of environmental ethics, biodiversity conservation, maintenance of long-term site productivity, conservation of soil and water resources, roles of social institutions, and links to concerns for social justice.

FOR 557, TECHNIQUES FOR FOREST RESOURCE ANALYSIS, 4 Credits

Use of linear programming, nonlinear programming, dynamic programming, and simulation to solve complex forest management problems, with emphasis on intertemporal multiple-use scheduling. Forestry transportation problems, multiple-use allocation, and investment analysis. Field trips required. CROSSLISTED as FE 457/FOR 457 and FE 557/FOR 557.

Equivalent to: FE 557

Recommended: FOR 329 and FOR 441 and FOR 443

FOR 561, FOREST POLICY ANALYSIS, 3 Credits

Basic elements of forest policy problems, including resource allocation and efficiency, distribution, and interpersonal equity, taxation, regulation, and control, and planning and uncertainty. Emphasis on policy and analysis and its uses in policy decision.

FOR 562, NATURAL RESOURCE POLICY AND LAW, 3 Credits

First of two offerings designed to provide an introduction to current environmental and natural resource law issues and disputes for students who will have to meet, consult, and work with lawyers throughout their professional career. Focus is on mechanisms governing resource allocation within the constraints of private property rights. Emphasis is placed on the federal Endangered Species Act and its relation to water allocation and public trust doctrines. Students will also gain a broad understanding of regulatory

FOR 563, ENVIRONMENTAL POLICY AND LAW INTERACTIONS, 3 Credits

Second of two offerings designed to provide an introduction to current environmental and natural resource law issues and disputes for students who will have to meet, consult, and work with lawyers throughout their professional career. Focus is on the arena of regulatory environmental laws. Environmental torts, regulation of point and non-point source pollution under the federal Clean Water Act, wetlands protection, and laws governing agricultural and forest practices will be examined as examples of regulatory frameworks for achieving resource protection. Students will be exposed to the basic framework of federal laws regulating air and hazardous waste pollutants.

FOR 599, SPECIAL TOPICS, 1-16 Credits

Topics of current importance in forest resources issues, education, policies, economics, management, business, social values, silviculture, and biometrics. Topics will change from term to term. May be repeated with different topics for credit. Section 8: Social aspects of natural resource management (3 credits) graded.

This course is repeatable for 16 credits.

Available via Ecampus

FOR 601, RESEARCH AND SCHOLARSHIP, 1-16 Credits

Equivalent to: F 601

This course is repeatable for 16 credits.

FOR 603, THESIS, 1-16 Credits

Equivalent to: F 603

This course is repeatable for 999 credits.

FOR 605, READING AND CONFERENCE, 1-16 Credits

Equivalent to: F 605

This course is repeatable for 16 credits.

FOR 606, PROJECTS, 1-16 Credits

Equivalent to: F 606

This course is repeatable for 16 credits.

FOR 607, SEMINAR, 1-16 Credits

Equivalent to: F 607

This course is repeatable for 16 credits.

FOR 699, SPECIAL TOPICS, 1-16 Credits

Topics of current importance in forest resources issues, education, policies, economics, management, business, social values, silviculture, and biometrics. Topics will change from term to term. May be repeated with different topics for credit.

This course is repeatable for 16 credits.

FOR 808, WORKSHOP, 1-9 Credits

This course is repeatable for 16 credits.