



Graduate Programs

Forest Engineering

2009—2010

**Forest Engineering, Resources and Management
Department Office — 204 Peavy Hall
541-737-4592**

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Preface

Welcome from the Department of Forest Engineering, Resources and Management faculty, staff, and students. This department is recognized throughout the world for excellence in student education, creative problem-solving research, and innovative extended education. The faculty represents a unique critical mass of engineers, hydrologists, and forest scientists that apply engineering and forestry principles to solve complex forestry problems in forested watersheds and support sustainable forests. If you are interested in a graduate program with a concentration in forest engineering, forest operations, harvesting, forest hydrology, forest soils, or silviculture we invite you to further explore the opportunities described in this booklet.

The Department of Forest Engineering was formed in 1913 after the Pacific Logging Congress petitioned western forestry schools to provide courses in logging engineering and to grant degrees upon completion. In 1947, the name of the department was changed to Forest Engineering. In 2008, the department was reorganized and the name changed to Forest Engineering, Resources and Management. Today, Forest Engineers are charged with an array of responsibilities that include planning and resource protection, as well as classic engineering design of the forest transportation network and harvesting systems. After Oregon passed the nation's first Forest Practices Act in 1971, forest hydrologists and soil scientists were added to the department to stimulate improved understanding and protection of water and soil resources during forestry activities. Many students customize graduate programs that integrate elements of several areas. We typically attract a diverse group of students representing several continents, so the education goes well beyond the classroom. Forest Engineering, Resources and Management Department programs are focused on forested ecosystems and watersheds. If you have broader interests, we encourage you to consider opportunities available through the OSU Water Resources Graduate Program. Forest Engineering, Resources and Management faculty also serve as major professors for students enrolled in these degree programs.

Many FERM faculty members are recognized research leaders and several provide leadership in international scientific organizations. The faculty is pursuing a wide range of basic and applied research projects on topics that include: harvesting process engineering, transportation system design, understanding and mitigating environment impacts of forestry activities, spatially-explicit landscape modeling, applications of emerging information technologies, forestry workforce issues, and basic hydrological sciences. In addition, we have developed several decision-support software programs used throughout the world in designing forest operations. We are proud of our longstanding efforts to promote high quality forest management and

The collective strengths of the faculty, the university and associated research partners, and the Oregon environment make this a special place for pursuing a graduate education. The Corvallis community is a very pleasant place to live, and it is just a short distance to abundant recreational and cultural opportunities at the Oregon coast, the Coast Range and Cascade Mountains, and the metro areas of Portland, Salem, and Eugene.

This booklet provides only a brief overview of opportunities for graduate study within the FERM Department. If it attracts your interest, I encourage you to seek further information from the individual faculty in your area of interest.

Darius Adams, Interim Department Head
Department of Forest Engineering, Resources and Management
Oregon State University
204 Peavy Hall
Corvallis, OR 97331-5706
Tel: 541-737-5504
Fax: 541-737-4316
Email: fermdept@oregonstate.edu

INTRODUCTION

This booklet describes graduate programs in Forest Operations, Forest Engineering, Forest Hydrology, Forest Soil Science, and Silviculture within the Department of Forest Engineering, Resources and Management. The Department of Forest Engineering, Resources and Management offers degrees of Master of Forestry, Master of Science, and Doctor of Philosophy. Current policies of the Department for administering the graduate programs authorized by the Graduate School and the Oregon State System of Higher Education are presented. This information is intended to answer many questions of prospective students, and should continue to be a useful reference for enrolled graduate students. Further amplification and details are available from our Graduate Faculty members, Department office staff, the Department Head, or from our Forest Engineering, Resources and Management web page found at www.ferm.forestry.oregonstate.edu/.

College of Forestry

Forestry is important to the people of Oregon. Forty-nine percent of the state's 61.4 million acres is forestland. These lands support one of Oregon's most important industries — wood products. The forests also provide water, fish habitat, recreation, wildlife, rangeland, and other resources, which contribute to the state's and region's economy and quality of life.

Oregonians have recognized this importance by providing outstanding facilities for our College of Forestry. Oregon State University is located in Corvallis, a community of about 50,000 in the heart of the Willamette Valley. The forests of Oregon provide a living laboratory for the study of forest management, forest land-use planning, and forest hydrology. Over 14,500 acres, most of which is within twenty miles of OSU are College Forest lands. These forests are actively managed by the College of Forestry for education and research. In addition to College-owned lands, research facilities such as the HJ Andrews watershed and research facilities on partner private industrial forestlands provide exceptional infrastructure for cutting edge research. Research through our Forest Research Laboratory keeps the College in the forefront of new developments in forestry. Peavy and Richardson Halls, home of the College of Forestry, are adjacent to the Forest Sciences Laboratory of the USDA Forest Service Pacific Northwest Research Station and the Western Regional Laboratory of the USEPA. Together with our Forest Research Laboratory buildings, these facilities and associated scientists comprise one of the largest forestry research centers in the United States.

The Forestry Extension Program at OSU is one of the finest in the nation. Ten on-campus extension forestry specialists and fifteen county forestry agents provide educational opportunities, forestry information, and advice for practicing foresters, the forest industries, forest landowners, and other

The College of Forestry has a long tradition of graduate education. Our programs provide a solid forestry background and competence in specialized fields. Potential employers in the forest industries, government agencies, and academic institutions recognize this strength. Few forestry programs have the breadth and internationally recognized excellence represented by the three departments of the College of Forestry at OSU: Forest Engineering, Resources and Management, Forest Ecosystems and Society and Wood Science and Engineering.

Undergraduate, graduate, Extension, and research programs are offered in the Departments of Forest Engineering, Resources and Management (includes forest operations and hydrology/watershed management, silviculture and economics), Wood Science and Engineering (wood industry management and wood science), and the Department of Forest Ecosystems (forest social science) includes a graduate program, Extension, and research in biological sciences.

For more information about programs other than the Department of Forest Engineering, Resources and Management, visit the College of Forestry web site (www.cof.orst.edu), write directly to the department of interest, or consult OSU's Graduate Catalog or General Catalog (available on the OSU web site at www.oregonstate.edu).

The Department of Forest Engineering, Resources and Management

Programs of the Department of Forest Engineering, Resources and Management include undergraduate and graduate curricula, Extension, continuing education, and research in forest engineering. Graduate and research programs in the Department of Forest Engineering, Resources and Management focus on forest hydrology, watershed management, forest soils, and the design and analysis of forest harvesting operations. Degree programs lead to the Master of Forestry (MF), Master of Science (MS), and Doctor of Philosophy (PhD) degrees. Subsequent sections detail the requirements for each degree.

Although students from varied backgrounds enroll in Forest Engineering, Resources and Management most have undergraduate degrees in forestry, natural resources, engineering, or related fields. Beyond certain requirements, each student has considerable flexibility in designing a curriculum to achieve a desired blend of theory and practice in one or more specialties. All degree programs include coursework in other departments of the University. Related departments play a strong supporting role in graduate research, with their faculty serving on graduate committees of Forest Engineering students. Departments outside the College of Forestry that have

especially strong ties with Forest Engineering, Resources and Management include Civil Engineering, Bioresource Engineering, Geosciences, Fisheries and Wildlife, and Statistics.

Students are directed to the Department of Forest Engineering, Resources and Management web site for a complete listing of faculty backgrounds and research specialties, as well as departmental facilities.

We will be happy to answer your questions about graduate education in Forest Engineering at Oregon State University. If you need more information, visit the Department of Forest Engineering, Resources and Management web site at <http://ferm.forestry.oregonstate.edu> and the College of Forestry web site at www.cof.orst.edu. Call 541-737-4952, or write to:

Chairman
Graduate Admissions Committee
Department of Forest Engineering, Resources and Management
Oregon State University
204 Peavy Hall
Corvallis, OR 97331-5706

GRADUATE DEGREES AND PROGRAMS IN FOREST ENGINEERING, RESOURCES AND MANAGEMENT

The Department of Forest Engineering, Resources and Management offers the degrees of Master of Forestry, Master of Science, and Doctor of Philosophy with concentrations listed in the summary table below. This section describes the specific departmental requirements for these degrees. The OSU Graduate Catalog details general requirements for graduate programs. All master's degree programs require a minimum of 45 graduate credit hours. There is no rigid graduate credit requirement for a PhD program; however, the equivalent of at least three years of full-time work (at least 108 credits) beyond the bachelor's degree is required.

Summary of Concentrations in the Department of Forest Engineering, Resources and Management

Forest Engineering

Master of Forestry (MF) Degree, Master of Science (MS) Degree,
and Doctor of Philosophy (PhD) Degree

with concentrations in:

- Forest Engineering
- Forest Hydrology
- Forest Operations
- Forest Soil Science
- Harvesting
- Harvesting and Silviculture

Forest Resources

Master of Forestry (MF) Degree, Master of Science (MS) Degree,
and Doctor of Philosophy (PhD) Degree

with concentrations in:

- Forest Biometrics/Modeling
- Forest Ecology
- Forest Management
- Forest Management Science/Operations Research
- Forest Measurement
- Forest Recreation Resource Management and Tourism
- Forest Social Science
- Forestry/Wildlife
- Natural Resource Education and Extension
- Natural Resource Policy and Law
- Remote Sensing and GIS
- Restoration Ecology
- Silviculture
- Soils

ADMISSION TO THE DEPARTMENT

All applicants to a graduate program in Department of Forest Engineering, Resources and Management must submit current scores for the Graduate Record Examination (GRE) General Test. GRE scores must not be older than five (5) years. We do not require a minimum score for admission. The GRE score is considered along with all other application materials in making admission decisions.

Applicants must meet the standards and requirements of the Graduate School (see the OSU Catalog or visit the OSU web site at www.oregonstate.edu) in addition to those of the Department. An applicant must hold a bachelor's degree in forestry, engineering or a related area and have a high scholastic record (a grade point average of 3.0 or higher on a scale of 4.0). Applicants without this background may be admitted provisionally subject to completion of background requirements.

International students whose native language is not English must provide a photocopy of their TOEFL scores that must not be older than two (2) years or IELTS scores that must not be older than two (2) years. This requirement is waived for applicants who have completed a bachelor's or advanced degree from a U.S. university. The minimum TOEFL score is 550 (paper-based), 213 (computer-based) or 80 (internet) with minimum sub-scores of 18. The minimum IELTS score is 6.0. Applicants with lower scores may be admitted conditionally. See the OSU General Catalog.

THE ADMISSIONS PROCESS

The Graduate School receives applications and passes them on to the Department of Forest Engineering, Resources and Management for evaluation. The Graduate Chairman of the Department assigns a panel of faculty members in the area(s) of the applicant's interests to examine the material you submit to determine the adequacy of your scholastic background and decide whether departmental facilities are adequate for your expressed aims. A critical consideration in the decision is whether or not your academic objectives can be fulfilled satisfactorily by the Department's graduate program. Note: The Department faculty cannot effectively review an application until all materials have been received.

Notice of acceptance by the department is sent within two months of the deadline date for applications for admission in a given term. Applicants occasionally confuse notices of fellowships, assistantship awards, letters of acceptance from the department, or correspondence from faculty as equivalent to admission. The "Notice of Admission" issued solely by the Graduate School is the official university notice to the applicant that all

application and review procedures have been completed and that the student may enroll in the term for which he or she applied.

International Students

International students may be required to take a test of spoken and written English after arrival at Oregon State University. If this test indicates that remedial work is needed to successfully complete the requirements of the graduate program, the student may be required to take the needed remedial work at his/her own expense through the English Language Institute.

Financial Assistance

All qualified applicants and returning graduate students are automatically considered for financial assistance. No special application or additional materials are required. Notification of the award of financial aid is sent together with your departmental letter of acceptance.

Graduate Research Assistantships (GRAs)

The most common form of financial assistance is a GRA. The maximum assistantship is a 0.49 fte appointment for 12 months and pays \$21,727 (Masters) to \$22,568 (PhD) as of summer 2009. In addition, tuition is waived. An assistant is expected to pay incidental fees of about \$530 per term. An assistant on a 0.49 fte appointment normally spends one-third of his or her time on assigned projects during the academic year and full-time during the summer.

Because research assistantships are associated with individual faculty research projects, the major professor usually supervises work. Normally, this work serves as the basis for the student's thesis, although the student may also be required to perform other research tasks. The number of assistantships varies from year to year depending on the research programs of the Department and availability of funds.

Departmental Fellowships

Through the generous support of donors, the Department of Forest Engineering, Resources and Management is able to offer several full support graduate fellowships (equivalent to 0.49 fte). These are similar to GRAs and can include a tuition scholarship. In 2009, the Forest Engineering, Resources and Management Department will allocate over \$176,000 in fellowship from the Richardson, Steward, Strachan and Lematta endowments.

College Fellowships

The College of Forestry administers a number of fellowships that are typically intended to supplement other forms of financial support from the departmental level. Fellowship requirements vary. All recipients must meet academic standards and have taken the GRE. The Department Head nominates applicants and the College of Forestry Fellowship Committee considers nominees from all departments and awards the fellowships to the most qualified nominees.

Registration Requirements

Students on assistantships and fellowships must register for 16 credit hours each term of the academic year (fall, winter, and spring term). At least 4 of the 16 credit hours must be project or thesis hours. In order to maintain an assistantship through summer term a student must be registered for 9 credit hours. Any hours registered for above 16 academic year (fall, winter, spring) credit hours and above 12 summer credit hours are not included in tuition remission, and the student must cover the cost of the additional hours.

The University Financial Aid Office administers student loans, grants, College Work-Study, and scholarship programs, including international student tuition scholarships.

The Financial Aid Office also helps students find part-time employment. For more information, call 541-737-2241 or write to:

Office of Financial Aid and Scholarships
Oregon State University
218 Kerr Administration Building
Corvallis, OR 97331-2120

Graduate School Registration Requirements

The Graduate School Catalog provides detailed general information on University regulations and procedures. The Catalog also contains a complete list of graduate level courses offered by all departments at OSU. The Graduate School Guide to Success is a compilation of all regulations about graduate programs, examinations, and graduation requirements. Both may be obtained from the Graduate School or online. Call 541-737-4881 or write to:

Graduate School
Oregon State University
300 Kerr Administration Building
Corvallis, OR 97331-2121

Web Sites

Graduate School site address:
http://oregonstate.edu/dept/grad_school/index.htm

Graduate School Catalog site address:
<http://catalog.oregonstate.edu/Default.aspx?section=Graduate>

Graduate School Guide to Success site address:
http://oregonstate.edu/dept/grad_school/current/success.html

Housing On-Campus
<http://oregonstate.edu/uhs/>

Housing Off-Campus:
The Daily Barometer, The Corvallis Gazette-Times, and The Renter's Guide (published by ASOSU) advertise available housing. See also the MU Bulletin Board.

The Corvallis Convention and Visitors Bureau provide information on property managers and real estate agents. (See City of Corvallis.)

APPLICATION PROCEDURES

Application forms required for admission to the Graduate School are available from the Graduate School. The office is located on the third floor of the Kerr Administration Building at Oregon State University, and the phone number is 541-737-4881. An electronic application is also available on the Web at <http://oregonstate.edu/admissions/index.php>.

Persons seeking admission to any of the graduate programs of the Department should follow these instructions.

1. Send to the:
 - Graduate School
 - Oregon State University
 - 300 Kerr Administration Building
 - Corvallis, OR 97331-2121
- a. Original and one copy of the paper application form or one electronic version of the graduate application.

- b. A \$55 check or money order in U.S. dollars payable to Oregon State University for the **nonrefundable** application fee. Alternately, this must be paid by Visa/MasterCard if applying electronically.
- c. Two photocopies of all transcripts (grade slips/reports, computer printouts, internal transcripts are not acceptable) of **all** previous academic work, graduate and undergraduate, whether or not credit was earned. *If **admitted**, two official transcripts from the above institutions must be received by the Graduate School prior to the student's second term of registration.*
- d. Two copies of your objectives for graduate student and interests in the Forest Engineering, Resources and Management program. Please be as specific as possible because the Graduate Chairman relies heavily on your letter to determine the appropriate reviewers for your application. If applying electronically, this will be automatically forwarded to the department.)
- e. Three letters of professional reference are required of all students, addressed to the Department of Forest Engineering, Resources and Management.
- f. References should be from instructors in courses related to your major, forestry employers, or others who can critically evaluate your potential as a graduate student. Reference letters should be on official letterhead. An applicant with a master's degree should include a letter from his/her major professor. Applicants are encouraged to give thoughtful attention to their choice of references and to their written Statement of Objectives.

International applicants must also send the following documents with their application materials:

- g. Financial Certificate with supporting documentation, demonstrating sufficient financial resources for the desired academic program. Even if an applicant is acceptable to the Department, a prospective student is required to certify that he/she has adequate funds for proposed studies in this country before a visa form is prepared and acceptance to the university is definite. This Financial Certificate form is available from the Graduate School office or the Department of Forest Engineering, Resources and Management.
- h. **International applicants from countries where English is not the primary language** must have proof of English language proficiency by submitting a Test of English as a Foreign Language (TOEFL) or the International English Language Testing System

(IELTS) test score, unless exempt. Your official TOEFL or IELTS test score must be received by the Graduate School prior to the start of your first term enrollment. TES school code for OSU is 4586. Information about where and when the TOEFL is administered in each country may be obtained at a U.S. embassy or consulate.

- i. Graduate Records Examination (GRE) results are required for the Forest Engineering, Resources and Management degree program. The exam results cannot be over 5 years old.

2. Application deadlines:

Although applications will be received at any time, to ensure full consideration for admission and financial assistance applications (including **all** materials above) should be completed by the designated dates for the desired academic term of admission.

Applications should be received for admission by the Department on or before:

Fall Term:	February 1 of the same year
Winter Term:	July 1 of the preceding year
Spring Term:	September 1 of the preceding year
Summer Term:	January 1 of the same year

GRADUATE PROGRAM DEGREE REQUIREMENTS

The sections that follow describe the requirements for completion of graduate degrees offered within the Department of Forest Engineering, Resources and Management. University requirements are imposed by the Graduate School and are common to programs across campus. The Graduate School has recently changed its policy on minors. Graduate minors are not optional for MS and PhD degree programs, and the FERM Department has endorsed this policy.

The Department of Forest Engineering, Resources and Management faculty has established some concentration areas. Recommended core courses have been listed after much thought on the part of the faculty based on their experience in providing a comprehensive education in some concentrations. However, it is the clear intention of the Department of Forest Engineering, Resources and Management faculty that individual student programs of study should have the flexibility to be customized to meet the needs and interests of the student. Thus, it is essential that the student establish an active partnership with his/her major professor and program committee to design a challenging and meaningful graduate education experience.

50% Rule

All graduate student programs of study submitted to the Graduate School must consist of 50% graduate stand-alone courses, at a minimum.

Dual-Major Option

The Graduate School has specific guidelines for dual-major programs which are followed by the Department of Forest Engineering, Resources and Management. For PhD dual-major students there is only one preliminary exam and one defense. For MS dual-major students there is only one defense. Knowledge of both majors should be represented at preliminary exams and defenses.

DEPARTMENTAL EXPECTATIONS OF GRADUATE STUDENTS

As a part of graduate student professional development, the Department expects each graduate student to support the departmental missions of teaching, research, extension, and outreach. Specific expectations to provide this support are to be decided through discussions between the graduate student and their major professor.

GRADUATE STUDENT ACADEMIC SUCCESS

An important goal of the Department of Forest Engineering, Resources and Management and the University is to maximize the graduate student's chance of academic success. Tips for achieving academic success are provided at <http://success.oregonstate.edu/Graduate.html> and http://oregonstate.edu/dept/grad_school/index.html. Maintaining harmonious relations among students, faculty, and staff is a key to achieving academic success. To this end, candid and informal discussions between graduate students and their major professors, as well as others in the Department of Forest Engineering, Resources and Management are encouraged as a means of achieving harmony and of arriving at mutually satisfactory solutions to graduate student concerns. Graduate students are also encouraged to form their graduate committees early in their program and to interact regularly with these committee members to discuss progress and concerns. A Graduate Council Representative is included in each student's graduate committee and should be selected when the committee is formed. If informal discussions with the student's major professor, graduate committee members, or Department of Forest Engineering, Resources and Management Department Head are not adequate to address concerns then procedures for dealing with grievances can be found at http://oregonstate.edu/dept/grad_school/current/grievance.html. Another important resource for graduate students is The Graduate School Survival Guide. It is a compilation of all regulations about graduate programs,

examinations, and graduation requirements and can be found online at http://oregonstate.edu/dept/grad_school/Survival_Guide/survival.htm.

MASTER OF FORESTRY (MF) DEGREE

The degree of Master of Forestry is designed for students who want a year or more of formal graduate work and who anticipate managerial, administrative, or staff positions with forestry organizations, private or public. It also is designed to provide an opportunity to update professional skills. The MF degree is intended for persons augmenting an existing career or pursuing a new career path in natural resources management or a related field. However, this program would not inhibit any graduate from pursuing an advanced degree at the doctoral level in the future. Master of Forestry concentrations in the Department of Forest Engineering, Resources and Management generally provide either 1) sound theoretical training in the physical principles governing the harvesting of timber resources or 2) broad training in the principles of forest hydrology and soils with an emphasis on the role of water and soil resources in natural resource management. General objectives of the program include developing competence in the application of harvesting techniques to solve problems in forest resource management within physical, economic, and social constraints, and/or applying principles of forest hydrology and soils to sustainable natural resource management. A thesis is not required, but a professional paper is required.

Major Professor and Program Committee

In most cases, prospective graduate students correspond with faculty members prior to acceptance into the Department. Through communication with Departmental faculty, the Department Head assigns a major professor for each MF student when admitted. The major professor serves as the student's primary advisor in developing a program of coursework, in selecting the topic of a professional paper, and in other academic matters.

During the student's first term, the major professor will help the student establish a program committee of at least two other faculty members. No later than the end of the student's second term of enrollment, the student will forward the committee's approved program of study to the Department Head.

Concurrent MF Degree

Students seeking an MF degree from the Department of Forest Engineering, Resources and Management while concurrently enrolled in another graduate degree program are required to meet all degree requirements of both programs and have a different major professor for each degree.

Students enrolled in a concurrent MF degree program must complete the MF degree program prior to completion of the concurrent MS or PhD degree program.

Professional Paper

To provide experience in the communication of technical information, MF students are required to prepare a professional paper. Acceptable paper topics can be an engineering analysis using a limited test, a case study, an application of existing knowledge to solve a specific problem, or a literature review that synthesizes and summarizes information from diverse sources. Depending upon the student's objectives and the assessment of the program committee, the work may include collection of new data or be based on existing data or information. The paper should be of sufficient quality and depth to earn a grade of B or better in a 3-credit course (FE 506). The student will present a summary of the paper during the FE 507 Seminar. A study plan for the professional paper must be prepared, approved by the program committee, and submitted to the Department Head prior to the end of the second term of enrollment. Up to 5 hours of FE 506 Project credit can be included in the program of study.

Final Oral Examination

Given the broad educational objectives of the MF program, the oral examination is intended as a comprehensive evaluation of the candidate's ability to integrate knowledge from the diverse areas of forest engineering and/or forest hydrology and soils. Consideration of the professional paper may initiate the discussion but because it is not designed to be a work of original and innovative research, the topic of the paper usually will not dominate the examination. The oral examination is usually 2 hours in length. A final examination may not be scheduled until an acceptable paper has been written. A written examination may precede the final oral examination if the candidate and the candidate's committee agree that the examination would be useful in providing a measure of the candidate's abilities.

Work Experience

Because practical experience complements academic education, the student is strongly encouraged to work at least one summer for a forestry-related organization while earning the MF degree, if such experience was not obtained previously.

Program of Study

The program of study is based on the student's educational background, professional experience, current interests, and future goals. The program is developed, documented, approved, and its progress monitored by the program committee.

Five program concentrations are available: Forest Operations, Forest Engineering, Forest Hydrology, Forest Soil Science, and Silviculture. The minimum background and core requirements are similar between Forest Operations and Forest Engineering and between Forest Hydrology and Forest Soil Science; students will develop the operations, engineering hydrology, or soil strengths through choice of elective courses. A special option, the M.F. in Silviculture, is intended for students desiring to specialize in prescribing silviculture practices.

MF Concentration in Forest Operations

Forest Operations goal statement: for the student that intends on working in industrial or governmental forest management, this program provides an emphasis on operational aspects. The curriculum can also be used to broaden the technical and managerial abilities of mid-level forest managers.

I. Minimum Background

We recommend that incoming students have completed courses or equivalent experience equal to one three-credit course in each of the following areas: differential calculus, integral calculus, engineering statics, harvesting processes, watershed management, silviculture, and forest economics, and be computer literate. Students lacking that background will need to develop a program with their committee that will need to develop a program with their committee that will sufficiently prepare them to reach their goals. A maximum of two 400/500 level courses taken to provide this background, can count toward the 45 credits of graduate work needed for the degree.

II. Recommended Core Classes

Course	Title	Credits
FE 501	Research Paper	3
FE 507**	Forest Engineering Seminar	2
FE 515	Forest Road Engineering	3
FE 541	Production Planning	3
FE 552	Forest Transportation Systems	4
FE 560	Forest Operations Regulations & Policy Issues	3
FE 570	Logging Mechanics	4
FE 571	Harvesting Management	3
Total Credits		26

**Students are also required to enroll in the departmental seminar each year of their program.

III. Recommended Elective Courses

This is not an exhaustive list. Courses from the Forest Engineering MF electives list are also highly recommended. A total of 45 hours of graduate credit is necessary. Graduate courses are 500 level and above. Refer to the course catalog for necessary prerequisites.

At least two courses should be from Forestry (FE, FS, FOR, WSE).

Course	Title	Credits
Forest Engineering		
FE 540	Forest Operations Analysis	3
FE 532	Forest Hydrology	3
FE 533	Forest Hydrology Lab	1
FE 535	Water Quality and Forest Land Use	3
Forest Science		
FS 550	Integrated Forest Protection	4
FS 553	Forest Wildlife Habitat Management	4
FS 543	Advanced Silviculture	4
FS 545	Advanced Forest Community Ecology	4

Course	Title	Credits
Forest Resources		
FOR 534	Economics of the Forest Resource	3
FOR 561	Forest Policy Analysis	3
FOR 457/557	Techniques for Forest Resource Analysis	4
Business		
AREC 432/532	Environmental Law (cross listed as BA 432/532)	4
BA 550	Organization Movement	3
BA 553	Human Resources Management	4
Economics		
ECON 539	Public Policy Analysis	4
Political Science		
PS 575	Environmental Politics and Policy	4
Soils		
CSS 575	Ag Mgt of Oregon Soil Resources	2
Statistics		
ST 511	Methods of Data Analysis (Simple Linear)	4
ST 512	Methods of Data Analysis (Multiple Linear)	4
Geosciences		
GEO 444/544	Remote Sensing	4
GEO 465/565	Geographic Information Systems and Science	3
GEO 580	Adv GIS Applications in the Geosciences	4

MF Concentrations in Forest Engineering

Forest Engineering goal statement: for the student that intends on specializing in timber harvesting processes, this program provides emphasis on technical aspects of logging, raw material transportation, and on the environmental effects of timber harvesting.

I. Minimum Background

We recommend that incoming students have completed courses or equivalent experience equal to one three credit course in each of the following areas: Differential calculus, integral calculus, engineering

statics, strength of materials, forest route surveying, harvesting processes, watershed management, and silviculture, and be computer literate. For roads-oriented students, courses or equivalent work experience equal to one

three-credit course in soil properties and soil mechanics are also recommended. Students lacking that background will need to develop a program with their committee that will sufficiently prepare them to reach their goals. A maximum of two 400/500 level courses taken to provide this background can count toward the 45 credits of graduate work needed for the degree.

II. Recommended Core Classes

Course	Title	Credits
FE 501	Research Paper	3
FE 507**	Forest Engineering Seminar	2
FE 515	Forest Road Engineering	3
FE 541	Production Planning	3
FE 552	Forest Transportation Systems	4
FE 560	Forest Operations Regulations & Policy Issues	3
FE 570	Logging Mechanics	4
FE 572	Advanced Logging Mechanics I	4
FE 573	Advanced Logging Mechanics II	3
FOR 534	Economics of the Forest Resource	3
Total Credits		30

**Students are also required to enroll in the departmental seminar each year of the program.

III. Recommended Elective Courses

This is not an exhaustive list. Courses from the Forest Operations MF electives list are also highly recommended. A total of 45 hours of graduate credit is required. Graduate courses are 500 level and above. Refer to the course catalog for necessary prerequisites.

At least two courses should be from Forest Engineering (FE).

Course	Title	Credits
Forest Engineering		
FE 516	Forest Road System Management	4
FE 532	Forest Hydrology	3
FE 533	Forest Hydrology Lab	1
FE 535	Water Quality and Forest Land Use	3
FE 571	Harvesting Management	3
FE 573	Advanced Logging Mechanics II	3
Forest Science		
FS 545	Advanced Forest Community Ecology	4
Soils		
CSS 575	Agricultural Management of Oregon Soil Resources	2
Statistics		
ST 511	Methods of Data Analysis (Simple Linear)	4
ST 512	Methods of Data Analysis (Multiple Linear)	4
Engineering		
ENGR 590	Engineering Economic Analysis	3
Geosciences		
GEO 444/544	Remote Sensing	3
GEO 465/565	Geographic Information Systems and Science	3
GEO 580	Advance GIS Applications in the Geosciences	4
Wood Science and Engineering		
WSE 441/541	Primary Wood Processing	4

MF Concentrations in Forest Hydrology

Forest Hydrology goal statement: intended to provide broad training in the principles of forest hydrology and to develop student skills for applying these principles to natural resource management.

I. Minimum Background

Applicants for the MF degree with concentrations in forest hydrology should have a minimum background **that** includes differential and

integral calculus, college-level statistics, general chemistry, and physics. A contextual background and exposure to soil science, atmospheric science, forest ecology, and forest management and operations are also required. Students without this background may require some make-up work within the MF program.

II. Recommended Core Classes

Course	Title	Credits
BRE 512	Physical Hydrology	3
FE 532	Forest Hydrology	3
FE 533	Forest Hydrology Lab	1
FE 535	Water Quality and Forest Land Use	3
FE 537	Hillslope Hydrology	4
ST 511*	Methods of Data Analysis (Simple Linear)	4
FE 507**	Forest Engineering Seminar	2
Total Credits		20

*Acceptable substitute is ST 521 or ST 551.

**Students are also required to enroll in the departmental seminar each year of their program.

If students have not had Fluid Mechanics in their undergraduate background, the course below is highly recommended for all students in the program.

FE 330	Fluid Mechanics and Hydraulics	(3 cr)
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III. Broadening Courses

The science of forest hydrology does not stand by itself. This is particularly true in professional practice. Forest hydrology often plays a supporting role in land management. Hence it is important to understand the context in which hydrology — really the hydrologic cycle — operates. Understanding the complex context of forest hydrology, including the stream system from a biological perspective, the soils that make up a watershed, and the impacts of forest operations on them, is an essential element of a strong graduate program. Acquiring a foundation in all of these areas would require more than the credit hours available to a Masters student, but we believe it is important to select coursework in several areas.

MF Concentrations in Forest Soil Science

Forest Soil Science goal statement: intended to provide broad training in the principles and practices of forest soil science and to develop student skills for applying these principles and practices to forest operations and natural resource management.

I. Minimum Background

Applicants for the MF degree with concentrations forest soil science should have a minimum background that includes differential and integral calculus, college-level statistics, general chemistry, and physics. A contextual background and exposure to soil science, atmospheric science, forest ecology, and forest management and operations are also required. Students without this background may require some make-up work within the MF program.

II. Recommended Core Classes

Course	Title	Credits
CSS 535	Physics of Soil Ecosystems	3
CSS545 or 555	Geochemistry of Soil Ecosystems or Biology of Soil Ecosystems	4
CSS 566	Soil Morphology and Classification	4
FE 535	Water Quality and Forest Land Use	3
FE 536	Forest Erosion Processes	3
FE 359X	Ecology and Management of Forest Soils	3
ST 511*	Methods of Data Analysis (Simple Linear)	4
FE 507**	Forest Engineering Seminar	2
Total Credits		26

*Acceptable substitute IS ST 521 or S% 551

**Students are also required to enroll in the departmental seminar each year of their program.

If students do not have background in soil science, the course below is highly recommended.

CSS 513	Properties, Processes and Functions of Soils	4 credits
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III. Recommended Broadening Courses

The Forest Soil Science MF requires students to take one course from (at least) two of the following four groups:

Course	Title	Credits
Forest Engineering		
FW 556	Limnology	5
FW 580	Stream Ecology	3
RNG 555	Riparian Ecology & Management	3
Hydrology Group		
BRE 512	Physical Hydrology	3
FE 532	Forest Hydrology	3
FE 533	Forest Hydrology Lab	1
FE 537	Hillslope and Watershed Hydrology	4
Operations and Harvesting Group		
FE 552	Forest Transportation Systems	4
FE 560	Forest Operations Regulations and Policy Issues	3
FE 571	Harvesting Management	3
Plant Ecology Group		
FS 561	Physiology of Woody Plants	3
GEO 548	Field Research in Geomorphology & Landscape Ecology	3
Total Credits		6—7

IV. Recommended Supporting Courses

If the non-minor option is selected, the student and program committee will select additional courses to further broaden the student's knowledge of forest soil science methods and context, specialize in a particular subject, or achieve a professional development objective. OSU offers a wealth of support courses in soil science. A subset of those courses is shown below. In some cases, there may be prerequisites that will necessitate additional coursework either at the graduate or undergraduate level.

Course	Title	Credits
Forest Engineering		
BRE 548	Non-point Source Pollution Assessment and Control	3
CE 514	Groundwater Hydraulics	3
CE 518	Groundwater Modeling	3
CE 540	Field & Laboratory Techniques in Subsurface Hydrology	1—3
CE 545	Sediment Transport	4
CE 548	Water Quality Dynamics	3
ENVE532	Aqueous Environmental Chemistry	4
CE 561	Photogrammetry	3
CE 572	In-Situ and Laboratory Testing of Soils	4
Forest Science		
FS 545	Advanced Forest Community Ecology	4
FS 564	Interactions of Vegetation and Atmosphere	3
FS 565	Forest Ecosystem Management	4
Forest Resources		
FOR 520	Advanced Aerial Photos and Remote Sensing	3
FOR 521	Advanced GIS Applications in Forestry	3
FOR 525	Forest Modeling	3
FOR 543	Silvicultural Practices	4
FOR 564	Private Forests in Society	4
Geosciences		
GEO 532	Applied Geomorphology	3
GEO 541	Spatial Variation in Ecology and Earth Science	3
GEO 563	Geophysics and Tectonics	4
GEO 579	Clay Mineralogy	3

Course	Title	Credits
Soils		
CSS 523	Principles of Stable Isotopes	3
CSS 536	Vadose Zone Hydrology Lab	1
CSS 546	Soil Geochemistry Lab	1
CSS 568	Soil Landscape Analysis	4
CSS 635	Chemical Processes in Soil Systems	3
CSS 645	Soil Biology and Biochemistry	3
CSS 665	Soil Genesis and Classification	3
Statistics		
ST 512	Methods of Data Analysis	4
ST 513	Methods of Data Analysis	4
ST 515	Design and Analysis of Planned Experiments	3
ST 531	Sampling Methods	3
ST 535	Quantitative Ecology	3

MASTER OF SCIENCE (MS) DEGREE

The degree of Master of Science is designed for students who want a year or more of formal graduate work and who wish to develop a research specialization. Designed primarily for persons pursuing careers in research or teaching, the MS program can be either a first step toward a doctorate or a final degree.

A student undertaking the MS degree in forest engineering first decides which MS concentration to pursue: Forest Operations, Forest Engineering, Forest Hydrology, or Forest Soil Science. **The MS degree shares the same minimum background and core courses as the selected MF degree.** However, the MS degree differs from the MF degree in three important ways:

- 1) The MS requires an independent research project to be reported in a formal thesis.
- 2) At least thirty credits must be in a major field of study. A minor field of study consisting of 15 credits of the needed 45 can be optionally declared, or the entire 45 credits can be an integrated program.
- 3) The MS faculty committee is more structured, as outlined below.

Major Professor and Program Committee

In most cases, prospective graduate students correspond with faculty members prior to acceptance into the Department. Through communication with Departmental faculty, the Department Head assigns a major professor for each MS student when admitted. The major professor serves as the student's primary advisor in developing a program of coursework, in selecting a thesis topic, and in other academic matters. During the student's first term, the major professor will help the student establish a program committee. It will consist of the **major professor**, at least **two other Graduate Faculty members** and a **Graduate School representative** (students select from a list provided by the Graduate School). At least one member of the committee (in addition to the Graduate School representative) should be from outside the College of Forestry. No later than the end of the student's second term of enrollment, the student will forward the committee's approved program of study to the Department Head.

Program of Study

The program of study is based on the student's educational background, professional experience, current interests, and future goals. The program is developed, documented, approved, and its progress is monitored by the program committee.

In addition, a department requirement states that not more than two courses (400/500 level) of those taken to meet the minimum background may be counted toward the minimum requirement of 45 credits earned in graduate level courses.

Graduate coursework is structured to meet all applicable regulations of the Graduate School, which in summary are:

- minimum of 45 credits of graduate coursework.
- 6 to 12 credits of thesis work [included in the required 45 credits].
- An approximate 2:1 balance of coursework between the major and minor if a minor is selected [a graduate minor is not required].
- No more than 6 blanket number credits [reading and conference. etc.] exclusive of thesis.

The structure of a graduate program in the Department of Forest Engineering, Resources and Management varies depending on whether an optional minor is selected. The non-minor and minor program outlines are shown below. The primary difference between the minor and non-minor program is the nature of the coordination in the minor coursework, and the approval of the minor professor in selecting that coursework.

The structure of the graduate program in the Department of Forest Engineering, Resources and Management varies depending on whether an optional minor is selected. The non-minor and minor program outlines are shown below. The primary difference between the minor and non-minor program is the nature of coordination in the minor coursework, and the approval of the minor professor in selecting that coursework.

The following is an example how a typical non-minor and minor program compare:

Typical Non-minor Program		Typical Minor Program	
Description	Credits	Description	Credits
Core Courses	19	Core Courses	19
Broadening Requirement	6	Broadening Requirement	6
Thesis	6	Thesis	6
Supporting Courses	14	Minor Courses	14

Thesis

The thesis follows the scientific procedure of hypothesis, test, and validation. The thesis subject should add to the current body of knowledge and the candidate is expected to collect original data or to develop original theory. It is strongly recommended that the student take FS 521 Natural Resource Research Planning prior to or during study plan preparation. The Graduate School prescribes that form of the thesis, as well as the timing and nature of the final oral examination. The student will present a summary of the thesis during an FE 507 seminar and will defend the thesis during the final examination. Upon completion of the thesis the student is strongly urged to prepare a journal manuscript to disseminate the results of the research.

Language Requirement

The MS program has no foreign language requirement unless the student's advisory committee stipulates otherwise.

Final Oral Examination

A final oral examination, chaired by the major professor with a subsequent evaluation chaired by the Graduate School Representative will be conducted. The candidate will present a summary of the thesis research and will defend research methods and conclusions to the satisfaction of the

student's committee. Questions relating to coursework may also be asked. The final oral examination is usually 2 hours in length. A written examination may precede the final oral examination if the candidate and the candidate's committee agree that the examination would be useful in providing a measure of the candidate's abilities.

DOCTOR OF PHILOSOPHY (PhD) DEGREE

The doctoral program, intended for persons seeking careers in teaching, research, or technical leadership within land management enterprises, emphasizes strong research specialization while maintaining an understanding and appreciation of broader engineering and resource use problems. The research and associated thesis in the doctoral program play a dual role by enabling the student to develop in-depth knowledge of specific technical areas, while at the same time gaining experience in conceptualizing, planning, conducting, and reporting a major research problem. Specialized areas for thesis research include harvest planning, analysis of forest operations, interactions between harvesting and silviculture, and forest hydrology. Doctoral concentrations are offered in Harvesting, Harvesting and Silviculture, Forest Hydrology, and Forest Soil Science.

Following is a general description of the procedures and requirements of doctoral programs in the Department. In all cases, University as well as Departmental requirements must be fulfilled. The OSU Graduate Catalog provides detailed discussion of course credit, residency, and other requirements not discussed here.

Admission to the Program

Applicants for the PhD degree must meet requirements of the Graduate School (see OSU Graduate Catalog) in addition to those of the Department. Students are encouraged to complete a master's degree before entering the program, but applicants may be accepted directly after completion of an undergraduate degree. Applicants are expected to have minimum coursework subject matter backgrounds as described for applicants seeking MF or MS degrees in the Department of Forest Engineering, Resources and Management. Furthermore, it is recommended that incoming students have completed courses equal to the graduate courses (or their equivalent) currently recommended for the MS degree in Forest Engineering.

Major Professor and Advisory Committee

In most cases, prospective graduate students correspond with faculty members prior to acceptance into the Department. Through communication with Departmental faculty, the Department Head assigns a major professor

for each PhD student when admitted; making every effort to accommodate the student's expressed interests within the limitations of faculty work load and research programs. The major professor serves as the student's primary advisor in developing a program of coursework, in selecting a thesis topic, and in other academic matters. As soon as possible after the student's arrival at OSU, but within no more than one year, a program committee is selected jointly by the major professor and the student. It will consist of the major professor, at least three other graduate faculty members, and a Graduate School representative (selected from a list provided by the Graduate School). At least one member should be from a department outside the College of Forestry. The Department Head is a de facto member of all doctoral committees. During the student's first year of enrollment the committee and the student will complete a program of study and submit it to the Department Head and Graduate School for approval.

PhD Broadening Requirements

A 6-credit broadening requirement is required by Forest Engineering, Resources and Management faculty to improve the student's understanding of the history and philosophy of science and increase exposure to the social-political environment.

This requirement can be met by successfully completing 6 credits from the following recommended courses:

Course	Title	Credits
HSTS 411/511	History of Science	3
HSTS 412/512	History of Science	3
HSTS 413/513	History of Science	3
HSTS 415/515	Theory of Evolution & Foundation of Modern Biology	3
PHL 421/521	Mathematical Logic	3
PHL 451/551	Knowledge and Reality	3
PHL 470/570	Philosophy of Science	3
PHL 440/540	Environmental Ethics	3
PS 474/574	Natural Resource Policy & Bureaucratic Politics	4
PS 475/575	Environmental Politics & Policy	4
AREC 432/532	Environmental Law	4
FOR 564	Private Forests In Society	4

The committee may require additional communication skill development.

Language Requirement

There is no stated language requirement. The student's committee has the option of requiring a language proficiency if that requirement serves a useful purpose for the student.

PhD Qualifying Examination for Advance to Candidacy

Written preliminary examination

Successful completion of a written preliminary examination is a prerequisite to the oral comprehensive examination. The written examination will consist of questions in each field of specialization and such additional questions as the student's committee deem appropriate. The examination must provide a comprehensive assessment of the student's competence in both the theory and research methods appropriate to the dissertation area and fields of specialization elected within that area.

General rules for taking a written qualifying exam for PhD in the Forest Engineering Department

The written exam contains questions submitted by the candidate's committee. The major professor coordinates the test. It is scheduled by the student's committee near the completion of the courses. The exam is intended to test the student's preparation to do graduate research and to determine the extent of the student's knowledge in the major and minor subject areas. The topics will be integrative in nature, requiring the student to demonstrate the ability to apply principles to current problems. Additional questions can be solicited from other faculty to completely cover the topics in the candidate's program.

Oral comprehensive examination

The oral comprehensive examination may cover the same area as the written examination, the prospective dissertation research, and other topics relevant to the student's preparation. The oral examination will be scheduled as soon as possible after the successful completion of the written examination. In all deliberations and decisions regarding the oral examination, the current rules of the Graduate School will apply. Upon successful completion of the oral examination, the student is advanced to candidacy for the doctorate.

Thesis and Final Oral Examination

The student and his/her major professor, in cooperation with the program committee, will select an appropriate topic for the thesis research. A formal

record of the proposed thesis is retained in the student's file. When the final examination is completed to the satisfaction of the committee, the candidate is certified for award of the PhD degree.

Doctor of Philosophy (PhD) — Harvesting

Program of Study

Any student entering this PhD program will be expected to complete (or have completed) the equivalent of the MS program in forest engineering, plus a set of PhD core courses, a minor, broadening requirements, and a thesis.

The thesis would count for 36 credits and the philosophy/broadening requirement would be an additional six credit hours. The minimum curriculum requires a total of 116 hours, including thesis requirements and seminars.

Furthermore, where a student's research involves a particular area of emphasis (e.g., structures, automotive systems, transportation systems), prerequisite courses in addition to those of the formal PhD program may be required.

I. Typical Curriculum

Title	Credits*
MS Equivalent Course Work (Engineering program option)	30
PhD Core Courses	41
Thesis	36
Seminar Requirements	3
Broadening Requirements	6
Prerequisite Emphasis Courses	as required

*Quarter term hours

II. Recommended Core Courses

The additional 41 credits of recommended "core courses" could be selected from among the following:

Course	Title	Credits
Engineering Science		
ENGR 590	Engineering Economic Analysis	3
Statistics		
ST 511	Methods of Data Analysis (Simple Linear)	4
ST 512	Methods of Data Analysis (Multiple Linear)	4
ST 513	Methods of Data Analysis (Experimental Design)	4
ST 515	Design and Analysis of Planned Experiments	3
Forest Engineering		
FE 535	Water Quality and Forest Land Use	3
Forest Science		
FS 521	Natural Resource Research Planning	2
FS 523	Natural Resource Data Analysis	4
FS 543	Advanced Silviculture	4
FS 545	Advanced Forest Community Ecology	4
Forest Resources		
FOR 557	Techniques for Forest Resource Analysis	4
FOR 561	Forest Policy Analysis	3
Industrial and Manufacturing Engineering		
IE 550	Total Quality Management	3
IE 551	Statistical Process Control	3
IE 561	Manufacturing Systems Engineering	3
IE 562	Manufacturing Systems Management	3
IE 563	Advanced Production Planning and Control	3
Or,		
IE 521	Industrial Systems Optimization I	3
IE 522	Industrial Systems Optimization II	3
Or,		
ST 581	Linear Programming	3
ST 583	Nonlinear Optimization	3

Doctor of Philosophy (PhD) — Harvesting and Silviculture

Program of Study

Any student entering this PhD concentration will be expected to complete a set of PhD core courses, broadening requirements, seminar requirements and a thesis.

The purpose of this joint degree is not simply to add silviculture onto an engineering degree or to make an engineer of a silviculturist. Rather, a student with a background in either silviculture or forest engineering would acquire expertise enabling him or her to operate professionally between the two disciplines. Background in both disciplines is necessary, but the graduate would not be expected to be able to design forest roads for example, or to know forest biology in depth. Instead, the systems approach integrating both silvicultural considerations and harvesting technology will be stressed.

The thesis will be administered by the Department of Forest Ecosystems and Society but will involve research emphasizing systems analysis of both engineering and silvicultural problems. The graduate committee for each student will be drawn from both departments.

The student's graduate committee will be responsible for formulating the program using the courses shown on the following pages as the recommended core. Some students may be required to complete background courses before embarking on the coursework listed in the core curriculum. A minimum of 36 credit hours is listed for the thesis, but students will probably complete more thesis hours. The minimum curriculum requires a total of 116 hours, including thesis requirements and seminars. The committee will work with the student to identify other courses appropriate for each student. The nature of these courses will depend upon the student's specialty within the degree.

I. Typical Curriculum

Title	Credits*
Core Courses	71
Thesis	36
Broadening Courses	6
Seminar	3
Prerequisite Courses	as required

*Quarter term hours

II. Recommended Core Courses

Course	Title	Credits
Forest Science		
FS 561	Physiology of Woody Plants	3
FS 543	Advanced Silviculture	4
FS 545	Advanced Forest Community Ecology	4
FS 521	Natural Resource Research Planning	2
Civil Engineering		
CE 548	Water Quality Dynamics	3
ENVE 532	Aqueous Environmental Chemistry	4
CE 556	Environmental Assessment	4
CE 561	Photogrammetry	3
CE 574	Engineering Properties of Soils	4
Forest Science		
FS 523	Natural Resource Data Analysis	4
FS 545	Advanced Forest Community Ecology	4
FS 564	Interactions of Vegetation and Atmosphere	3
FS 565	Forest Ecosystem Management	4
Forest Resources		
FOR 534	Economics of the Forest Resource	3
FOR 524	Forest Biometrics	3
FOR442/542	Silviculture Reforestation	4
Botany		
BOT 541	Plant Autecology	3
Forest Engineering		
FE 532	Forest Hydrology	3
FE 540	Forest Operations Analysis	3
FE 541	Production Planning	3
FE 552	Forest Transportation Systems	4

Course	Title	Credits
Soils		
CSS 555	Biology of Soil Ecosystems	4
CSS 535	Physics of Soil Ecosystems	3
Statistics		
ST 511	Methods of Data Analysis (Simple Linear)	4
ST 512	Methods of Data Analysis (Multiple Linear)	4
ST 513	Methods of Data Analysis (Experimental Design)	4
ST 515	Design and Analysis of Planned Experiments	3
Industrial and Manufacturing Engineering		
IE 550	Total Quality Management	3
IE 551	Statistical Process Control	3
IE 561	Manufacturing Systems Engineering	3
IE 562	Manufacturing Systems Management	3
IE 563	Advanced Production Planning and Control	3
Or,		
IE 521	Industrial Systems Optimization I	3
IE 522	Industrial Systems Optimization II	3
Or,		
ST 581	Linear Programming	3
ST 583	Nonlinear Optimization	3

Doctor of Philosophy (PhD) — Forest Hydrology

Hydrological Sciences is a thriving research area at Oregon State University. Relevant graduate courses, research and degrees cut across as many as 12 departments and 4 colleges at OSU. The student led Hydrophiles organization is one of the most active graduate-oriented programs in the nation (see <http://osu.orst.edu/groups/hydro>).

Graduate students and faculty associated with the Forest Hydrology program in the Department of Forest Engineering, Resources and Management maintain close ties with colleagues and students across campus. The hydrology of forested hill slopes and watersheds has been a historical focus at OSU. Much of the research ongoing in forest hydrology

seeks to understand and manage interactions among forest vegetation, soils, water, and aquatic communities, especially fish.

The doctoral program in Forest Hydrology, intended for persons seeking careers in teaching, research, or technical leadership within land management enterprises, emphasizes strong research specialization built on a foundation of basic science and engineering in combination with an understanding and appreciation of broader engineering and resource use problems. Forest Hydrology covers a very broad subject area, hence PhD programs will be quite varied depending on the particular objective of the candidate, and the focus of the thesis research. For those candidates interested in pursuing a teaching career, thought must be given to preparation for teaching assignments that can range from basic lower division courses through graduate courses. This may result in a course program that includes a significant amount of undergraduate material in elements of hydrology or allied disciplines. The program of a candidate interested in a career in research might be more focused on only the thesis research and narrowly define supporting subjects, perhaps all at the graduate level. Those individuals interested in technical leadership in the forest industry may include graduate material that covers greater breadth in forestry and its allied fields.

The research and associated thesis in the doctoral program play a dual role by enabling the student to develop in-depth knowledge of the specific technical areas, while at the same time pursuing fundamental new knowledge of Forest Hydrology.

Program of Study

I. Core Courses

While no core courses are specified, the PhD program in Forest Hydrology intends that every PhD be able to understand the forestry context of hydrology on wildlands, in addition to the biological, operations and wildlife interactions in watersheds. Therefore, students deficient in graduate level course work in forest ecology, harvesting, operations or watershed processes, will need to make up this background within their program of study.

II. Broadening Requirements

The PhD in Forest Hydrology requires 6 graduate credits of broadening, in the areas such as political science, philosophy of science, history of science, policy, environmental law or ethics (refer to list of recommended courses). These courses are selected by the PhD student in close consultation with his/her advisor and PhD committee.

Doctor of Philosophy (PhD) — Forest Soil Science

The student of forest soil science plays a critical role in relation to forest hydrology, forest management, and sustainable management of forest ecosystems in general. A strong background in forest soil sciences prepares students for a wide variety of career options in academia, government agencies, and private industry. The College of Forestry has a long tradition of innovative research in forest soil science and outstanding faculty within the College and across other College and Departments at Oregon State University provide an excellent complement to the forest soil science program in the Department of Forest Engineering, Resources and Management. In-depth technical knowledge of principles and practices of forest soil science are developed based on the student's specific career objectives and availability of specific research projects designed to enhance scholarly achievement.

Program of Study

I. Core Courses

While no core courses are specified, the PhD program in Forest Soil Science intends that every PhD be able to understand the context of forest soil science in relation to ecological processes and forest management activities. Therefore, students deficient in graduate level course work in forest ecology, harvesting, operations, or watershed processes, will need to supplement this background within their program of study.

II. Broadening Requirements

The PhD in Forest Soil Science requires 6 graduate credits of broadening, in the areas such as political science, philosophy of science, history of science, policy, environmental law or ethics (refer to the list of recommended courses). The PhD student in close consultation with his/her advisor and PhD committee selects these courses.

PROFESSIONAL CERTIFICATION AND LICENSING

The Department of Forest Engineering, Resources and Management faculty encourages properly qualified graduates to pursue professional credentials as engineers, hydrologists or foresters. In some states and professions, some kind of licensure is required for certain types of professional practice, especially consulting.

Graduates from an Accreditation Board for Engineering and Technology (ABET) accredited undergraduate engineering program are typically admitted to the national Fundamentals of Engineering examination as the first step towards professional licensing as an engineer. For those graduate students who did not graduate from an ABET-accredited undergraduate program, access to the exam may be available upon completion of a forest engineering graduate degree that contains the appropriate coursework, pursuant to Oregon Administrative Rule 820-010-0225 3(c). This rule states that applicants may be admitted to the examination upon *graduation from a Master's Degree Program in engineering at a college or university which has an EAC of ABET accredited undergraduate degree program in the same field as the Master's degree program and completion of a specified curriculum. The specified curriculum shall include 21 semester/32 quarter hours of engineering-related technical course work approved by the Board. The specified curriculum shall include courses in at least six of the following eight subjects: Differential Equations, Physics, Statistics, Dynamics, Thermodynamics, Fluid Mechanics, Electrical Fundamentals and Strength of Materials.* The administrative rule does not explicitly mention graduates from a PhD program.

In Oregon, questions regarding professional licensing as an engineer or land surveyor should be addressed to the Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS) (<http://www.osbeels.org/>).

The American Institute of Hydrology (<http://www.aihydro.org/>) provides registration for professional hydrologists who meet certain educational and experience requirements. Graduates with concentrations in forest hydrology may meet the educational requirements if their program of study is properly designed.

In the forestry area, the Society of American Foresters (<http://www.safnet.org/>) provides a certification for professional foresters who meet educational and experience requirements. Graduate students without an undergraduate forestry degree may be able to complete necessary educational requirements through a carefully designed program.

CONFERENCE TRAVEL FUND FOR GRADUATE STUDENTS

All graduate students in the FERM Department are strongly encouraged to present results of their research to colleagues at professional conferences. The goal of the FERM Department **Conference Travel Fund for Graduate Students** is to help partially fund graduate students in the Department to attend conferences. Students that are applying to this fund are strongly encouraged to seek other sources of funding (i.e., major professor, university, conference scholarships, etc.) to provide partial support. All students are eligible to receive funding once in a fiscal year (July-June).

Application for funding will be accepted and reviewed four times a year, i.e., at the start of each quarter. Approval will be given by the Department Head in consultation with the FE Graduate Committee. Amount of funds available per year is limited so priority will be placed on students that have yet to be supported from this fund.

The amount available to an individual student per year depends largely on the amount of exposure the department will receive from the student attending the conference and the amount of funds available. The following list provides guidelines for priority of travel fund allocations.

Role at the Conference	Priority Ranking	Approximate Maximum Funding Available per Student ¹
Keynote Speaker	1	\$800
Invited Speaker	2	\$600
Oral Presentation	3	\$300
Poster Presentation	4	\$300
Solely Attending	5	\$200

¹ Subject to availability of departmental travel funds.

Priority will also be given to students who can document that they are obtaining partial funding from other sources. Amount of funding will be determined by the Graduate Committee and the Department Head. The Department will make every effort to match any funding obtained from other sources. In rare cases, students may be awarded funding more than once in a fiscal year.

The student is required to provide the following information before being considered for funding:

- A short letter describing the conference/meeting and the student's role at the conference.
- A budget for attending the conference/meeting, this budget should be itemized.
- The agenda for the conference.
- Evidence of other funding such as a letter of support from major professor, etc.
- The student is also encouraged to submit any other support documentation such as a letter of invitation in the case of invited speaker and/or abstract for a poster or oral presentation the student is planning to present.

Application to the fund must be done before attending the conference and is due in the Departmental Office on the first day of classes in a given quarter.

Example Budget:

Items	No. Days/ Nights	\$ per Day/ Night	Total Cost
Conference Fees			\$ 300.00
Accommodation	4	\$60.00	\$ 240.00
Airfares			\$ —
Other Transportation (buses, taxis, etc)			\$ —
Rental Car	5	\$80.00	\$ 400.00
Other (Per Diem)	5	\$35.00	\$ 175.00
Other (Specify)			\$ —
Total Cost			\$ 1,115.00
Funding Requested from FERM			\$ 300.00
Funding Provided by Major Professor			\$ 815.00

FACULTY AND RESEARCH PROGRAMS

The strength of any graduate program depends on the quality of its faculty. Forest Engineering, Resources and Management has a continuing commitment to attract and hold distinguished teachers, researchers, and extension specialists. Members of the Graduate Faculty and their areas of teaching and research include:

Paul W. Adams

Professor and Extension Forest Watershed Specialist

Research Interests: forest soils, water quality, watershed characteristics and processes, effects of forest practices, extension education and related policies and programs for natural resource management.

Current Programs: extension education on forest watershed management and policy for landowners, operators, resource professionals, and decision makers; research on effects of timber harvesting and forest roads on soil and water resources, and related policies and management.



Kevin D. Boston, P.E., R.P.F.

Assistant Professor

Registered Professional Forester, California

Registered Professional Forester, Oregon

Research Interests: evaluation of alternative road construction practices on costs and environmental impacts and supply chain management and tactical harvest scheduling.

Current Programs: interaction between indigenous and plantation forests to improve biodiversity, the development of a supply chain model for plantation forest in New Zealand.



Loren D. Kellogg

Lematta Professor Forest Engineering

Research Interests: forest operations analysis, small-diameter timber harvesting mechanized logging systems, thinning and fuels reduction, harvesting methods for alternative silviculture systems, international forest engineering.

Current Programs: mechanized harvesting of small timber, harvesting economics of alternative silviculture systems for timber and mature forest wildlife species, harvesting to improve forest health, young stand management and skyline thinning.

Jeffrey McDonnell, P.H.

Professor, Richardson Chair in Forest Operations and Watershed Sciences

Research Interests: forest hydrology, hillslope processes, isotope tracing, snow hydrology, hydrological modeling. Conceptualization of streamflow generation processes in steep terrain; how water flowpaths on steep slopes affect slope stability; use of isotope tracers for determining water source, age and flowpath; study of forest road and logging effects on stream hydrology and water quality.

Current Programs: Quantifying aquatic habitat characteristics in western Oregon streams. Applying precision forestry techniques in western Oregon; using heuristics to improve the location of road networks in landslide prone terrain. DEM resolution influences on terrain modeling; visual aesthetics of forested areas.



Glen Murphy

Professor

Research Interests: harvesting system productivity, economic evaluation of environmental impacts caused by harvesting management.

Current Programs: production economics and impacts of alternative silvicultural systems, small timber harvesting systems, for improved wood utilization, scanning for value on mechanized harvesters.



Marvin R. Pyles, P.E.

Professor

Registered Professional Civil Engineer, California and Oregon

Research Interest: engineering properties of soils, groundwater, slope stability, hydraulics and hydrology, logging mechanics, logging roads.

Current Programs: fish passage at low volume road crossing, analytical modeling of tail spars and intermediate supports, failure mechanisms in shallow forest soils, peak flow hydrology.



John Sessions, P.E.

University Distinguished Professor

Faye and Lucille Stewart Professor of Forest Engineering

Registered Professional Civil Engineering, Washington and Colorado

Research Interests: transportation planning, forest planning, forest engineering.

Current Programs: developing techniques for transportation planning, tactical forest planning.



Arne K. Skaugset III, R.P.F.

Associate Professor

Registered Professional Forester, California

Research Interests: Root reinforcement of forest soils, intensive forest management and forest growth.

Current Programs: Modeling root reinforcement in shallow forest soils, role and management of large woody debris for fish habitat in Coast Range streams, and influence of woody debris piece size and orientation on function in small streams.



Michael G. Wing, P.L.S.

Associate Professor, Senior Research

Registered Professional Surveyor, Oregon

Certified Water Rights Examiner, Oregon

Research Interests: stream habitat, precision forestry, visualization and visibility analysis, slope stability, spatial statistics, geographic information systems (GIS), remote sensing, geographic information science.