FOREST & ECOLOGICAL ENGINEERING PROGRAM

SELF-STUDY QUESTIONNAIRE

2001-02 Visits

Engineering Accreditation Commission
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American Congress on Surveying and Mapping
American Industrial Hygiene Association
American Institute of Aeronautics and Astronautics
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American Society of Agricultural Engineers
American Society of Civil Engineers
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American Society of Heating, Refrigerating, and Air-Conditioning Engineers
American Society of Mechanical Engineers
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Institute of Industrial Engineers
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The Minerals, Metals, and Materials Society
National Council of Examiners for Engineering and Surveying
National Institute of Ceramic Engineers
National Society of Professional Engineers
Society of Automotive Engineers
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Program Self-Study Report
For Forest and Ecological Engineering Program

A. Background Information

1. Degree Titles

   Bachelor of Science in Forest Resources – Forest & Ecological Engineering

2. Program Modes

   Day Program

3. Actions to Correct Previous Deficiencies

   In the last review conducted (1995/1996) on the Forest and Ecological Engineering program (formally the Forest Engineering program) the ABET Final Statement required that a few minor actions needed to be clearly documented in an interim report to the ABET review board. ABET requested that we “clearly document the actions taken on the following:

   a) "Procedures implemented for advising students in the choice of elective courses should be described to assure that the program of graduates satisfies ABET engineering criteria and applicable program criteria

   b) "The report should include transcripts of the first five graduates of the forest engineering program, chosen in alphabetical order form the most recent graduating class, and an analysis showing how each graduate's course of study fulfills the curricular requirements of ABET engineering criteria and applicable program criteria.

   c) "The report should document the development of forest engineering program faculty salaries as compared with the development within other engineering programs."

   The following is from the Interim report sent to ABET in January 1999:

   "ACADEMIC ADVISING

   “Forest Engineering students are admitted to the program after about two years of pre-engineering study and typically begin seeking academic advising shortly before being admitted. Upon admittance they must meet with the advisors to determine exactly what course requirements remain to be fulfilled for graduation. The students receive formal academic advice from both the Forest Engineering Faculty Advisor and the College of Forest Resources' Office of Student Services (CFR Student Services) advisors."
The ABET engineering criteria for "one year of an appropriate combination of mathematics and basic sciences" are satisfied by 14 specifically required courses in:

- Calculus
- Linear Algebra
- Physics
- Differential Equations
- Engineering Statistics
- Chemistry

These required courses represent a total of 49 of the total of 192-quarter credits required for the degree.

The ABET engineering criteria for "one and one-half years of engineering topics" is satisfied by 19 specifically required courses in:

- Engineering Graphics
- Computer Programming
- Engineering Economics
- Ecological Basis for Forest Engineering
- Fluid Mechanics
- Forest Engineering Measurements
- Forest Engineering in Society
- Timber Harvesting
- Introduction to Forest Engineering Design
- Forest Engineering Design
- Engineering Statics
- Mechanics of Materials
- Kinematics and Dynamics
- Plane Surveying
- Low Volume Road Design
- Wildland Hydrology
- Soil Mechanics
- Silvicultural Engineering Systems
- Processing Wood

These required courses represent a total of 87 quarter credits, of the 192 required for graduation, which is over one and three-quarters years of forest engineering topics (one and one-half years is 72 credits).

The ABET engineering criteria for "one-half year of humanities and social sciences" is satisfied by meeting the University of Washington's requirements for study in the "Visual, Literary and Performing Arts" (VLPA) and in "Individuals and Societies" (I&S). Students must take a total of 30-quarter credits in these two categories (courses are designated to the categories by the University) with a minimum of ten credits from each.

The specific course requirements discussed above, along with the requirements for VLPA and I&S are enforced through routine degree audits. Academic advising is provided to students who attempt to obtain a requirement waiver through formal petition.

The Faculty Advisor, currently Professor Peter Schiess (replaced Professor Frank Greulich since last ABET accreditation visit), provides guidance on each student's selection of technical/professional electives and evaluates (with approval signature required) petitions regarding requests for substitutions of required courses. Students' individual situations and plans do change so they are expected to meet with the Faculty Advisor approximately once per quarter throughout their academic residency. Formally, the responsibility of making advising appointments belongs to the student. In practice, most of the majors see their advisor once or twice per quarter. Concern about satisfactorily meeting the prerequisites for the capstone design course (FE 450) provides substantial incentive for frequent academic advising. The Faculty Advisor maintains a quarter-by-quarter schedule of completed and planned engineering and professional coursework for every student in the program (an excel spreadsheet template is used for this purpose). The advisor routinely consults with the program's "Engineering Accreditation Coordinator" regarding any substitutions for required courses.

Each student elects to emphasize one of two areas; Environmental Analysis and Design or Industrial Operations. (Technically a third area exists, Remote Sensing and GIS, but the Civil and Environmental Engineering Department recently dropped several courses making this pathway intractable to offer at this time.) There are 14 quarter credits of technical/professional elective which must be selected, with the approval signature of the advisor, from one of the following lists of courses which has been previously approved by
2001-2002 Visit

the faculty:

<table>
<thead>
<tr>
<th>Environmental Analysis and Design</th>
<th>Industrial Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed Analysis</td>
<td>Management Science in Forest Engineering and nine credits from:</td>
</tr>
<tr>
<td>and ten credits from:</td>
<td>Introduction to Systems Engineering</td>
</tr>
<tr>
<td>Soil Physics</td>
<td>Engr. Applications of Linear Programming</td>
</tr>
<tr>
<td>Forestry-Fisheries Interactions</td>
<td>Nonlinear Programming and Stochastic Models</td>
</tr>
<tr>
<td>Geographic Information Systems</td>
<td>Methodology of Operations Research</td>
</tr>
<tr>
<td>Geology Geomorphology</td>
<td>Simulation</td>
</tr>
<tr>
<td>Groundwater Analysis</td>
<td></td>
</tr>
</tbody>
</table>

“All of the courses on the list are appropriate "forest engineering topics," and all satisfy accreditation requirements. Therefore any choice of the elective courses, will result in a program of study that satisfies the ABET engineering criteria as well as the criteria for programs in forest engineering. Therefore, petitions to substitute courses within the 14 credit technical elective areas are not normally reviewed by the program’s "Engineering Accreditation Coordinator."

“CFR Student Services advisors typically provide advice on courses needed to meet the University's general education requirements for "visual, literary and performing arts," and "individuals and societies." Courses meeting these requirements also satisfy the ABET engineering criteria for one-half year of humanities and social sciences. In addition, the CFR student services advisors participate in the process of checking that all University, College and Program requirements for graduation have been met by the individual student. That process proceeds as follows:

“Students make an appointment with a CFR Student Services advisor in order to complete a "UW Application for Bachelor's or Professional Degree" one to three quarters prior to graduation. The application includes the student's name and number, degree, major, college, credits completed and needed to graduate, and the expected month and year for graduation as well as each course (department, number and credits).

"Transcripts of Recent Graduates"

“Transcripts and supporting materials (documentation from advising sessions) for five students from the Spring 1998 graduating class are appended to this report. All but one of the five students received credit for classes that were taken at other colleges or universities. Routine (pre-approved by the University of Washington) transfers are indicated on the transcripts. Transfers that required petition by the student (and approval by the academic advisor) are additionally noted on a summary sheet prepared for this report. Two of the students also petitioned (and had approved) substitutions of University of Washington courses for specifically required (ENGR or FE) courses. These substitutions are also noted on the summary sheet prepared for this report. In these cases the advisor and the ABET accreditation coordinator determined that the material covered in the substituted courses was substantially equivalent to the material covered in the specifically required course. In general, these substitutions are only allowed in cases where the course was taken prior to the student's entry to the FE program. Additionally, substitutions for required courses do not exceed 15 credits so that even if none of the substituted courses were determined to have value as "engineering topics" the one and one-half year minimum would still be met.

"Faculty Salaries"

“There are nine engineering degree programs at the University of Washington (Aeronautical Engineering, Bioengineering, Civil and Environmental Engineering, Computer Science and Engineering, Electrical Engineering, Forest Engineering, Industrial Engineering, Materials Science and Engineering and Mechanical Engineering). All but forest engineering are in the College of Engineering. The College of Forest Resources and the College of Engineering jointly administer the forest engineering program although the FE faculty is fully housed within the College of Forest Resources. As a result, the FE
Faculty salaries are not typically compared to those of other engineering faculty. To make that comparison we have identified four -- Aeronautical, Civil & Environmental, Industrial and Mechanical -- as being a meaningful benchmark for Forest Engineering. Aeronautical Engineering was selected because it, like forest engineering, is an engineering field that focuses on an industry sector that is well known, reasonably mature and widely believed to be critically important to the economy of the State of Washington. Civil & Environmental, Industrial, and Mechanical Engineering were selected because of disciplinary considerations and program faculty background. We do not feel that comparing Forest Engineering to Bioengineering, Computer Engineering or Electrical Engineering is necessarily meaningful.”

**End of Interim Report**

The Interim report was submitted in January 1999 and the Forest Engineering program received an extension of accreditation to September 20, 2002.
B. Accreditation Summary

1. Students

ADVISING AND MONITORING

The Forest and Ecological Engineering (FEE) program attracts students with strong interest in forestry and the environment as well as in mathematics and engineering. They are typically some of the strongest students in the College of Forest Resources. Before applying to the FEE program, students finish prerequisite classes in math, science, writing and basic engineering from an approved list of classes and electives. During the time students are completing their prerequisite work they can seek advising from the Undergraduate Advising Center and the College of Forest Resources’ Office of Student Services (CFR Student Services). Many choose to formally identify themselves as Pre-FEE majors. The University’s Undergraduate Advising Center is responsible for the majority of all pre-major advising but refers potential FEE and Pre-FEE students to the CFR Student Services offices for more specific advising.

The CFR Student Services office is staffed with two full-time professional academic advisors – Russ Posten works with undergraduate students and Linda Hegrenes works with graduate students. The office also includes additional two full-time staff, Michelle Trudeau (Director) and Jeff Aken. The CFR Student Services advisors assist students with interpreting the College and University requirements and assisting with course selection and registration so the students will meet the graduation requirements in a timely manner. The primary Faculty Advisor for the FEE program is Professor Peter Schiess who provides guidance on each student’s selection of technical and professional electives and evaluates petitions for students requesting substitutions for required classes.

Students must apply for admission to the FEE Program by completing and submitting a FEE application that includes an essay and official transcript. The FEE Faculty Advisor reviews the application and the student is informed of acceptance or denial to the program. Upon admittance to the FEE program, each student must meet with advisors from the CFR Student Services offices and the FEE Faculty Advisor. At the meeting the advisors create and review the student’s file to determine the exact course requirements the student needs to fulfil for his or her graduation requirements. There is no mandatory ongoing advising policy within the University of Washington, so students must request advising at their own initiative. However, students’ individual situations and plans change and FEE students are expected to meet with the FEE Faculty Advisor approximately once per quarter though out their academic residency. It is the student’s responsibility to make advising appointments with the FEE Faculty Advisor.

EVALUATION

Course instructors assign each student decimal grades between a 0.0 and 4.0 in each course at the end of the quarter. Grades are recorded and archived by the University Office of the Registrar.
Each FEE student must maintain a 2.5 Grade Point Average. Each student must take a minimum of 12 credit hours of classes per quarter, or petition for an exception, to be a full time student.

**CURRICULUM REQUIREMENTS**

The FEE curriculum is one of several majors administered primarily within the College of Forest Resources (CFR). Distinct curriculum requirements exist for each major offered. The requirements are made available to all students in hardcopy paper (leaflet) format at the CFR Student Services office and available on the FEE web site. All undergraduate FEE students are advised regarding the specific curriculum requirements during an initial advising session. Shortly before graduation each student must again meet with a CFR Student Services advisor. During this meeting an audit is performed to ensure that the student has met all of the curriculum requirements for their major prior to graduation. The University of Washington uses a Degree Audit Reporting System (DARS) to track the student’s curriculum requirements. The DARS system outlines the curriculum for each major and is updated by the academic advisors.

**CURRICULUM REQUIREMENT INFORMATION**

The curriculum information available on leaflets and the program web site show students the curriculum requirements in a three-quarter system over the freshman, sophomore, junior and senior years. The curriculum leaflet indicates the courses that are required for the major as well as those in which the students have a choice. The sequence on the leaflets is a suggested sequencing for students to follow; however, it is not required. Each student must fulfill core course requirements, general education requirements, technical electives and free electives. Core requirements are the prescribed courses the student must take, generally no substitutions are allowed. The University determines the general education requirements. Within the FEE program these University general education requirements are integrated into the core requirements. Technical electives require the student to choose from a list provided on the curriculum leaflets. Core and technical elective are preprogrammed into DARS. Free electives are courses that students may choose to take from any department, at any level.

**PRE-APPROVED SUBSTITUTIONS**

The curriculum leaflets indicate all pre-approved substitutions for required courses, e.g. MATH 127, 128 and 129 are pre-approved substitution for MATH 124, 125 and 126 in the FEE program. Pre-approved substitutions help students progress in areas where courses tend to be over subscribed. Pre-approved substitutions are preprogrammed in the University of Washington’s Degree Audit Reporting System (DARS).

**CURRICULUM CHANGE POLICY**

The FEE program is subject to continuous improvement and consequently many students encounter changing curriculum requirements. The curriculum changes are noted and all leaflets made for each curriculum change are kept on file. Students must meet all of the curriculum requirements at the time of their entrance into the
FEE program or at the time of their graduation. Changes have included course name changes, course requirements, and course offerings. If a student needs to substitute a course in their curriculum because the original requirement is no longer offered the petition process outlined in the next sections is used.
COLLEGE OF FOREST RESOURCES PETITION FORMS

An internal petition form is used to request a course substitution that is not covered in any of the pre-approved substitutions or elective course lists. The Faculty Advisor approves or denies petitions. The form is obtained from CFR Student Services where an advisor will discuss with the student what might be an appropriate substitution for the required course. The student will complete the petition and return it to the advisor, who will in turn forward it to the Faculty Advisor (Peter Schiess) to determine if the requested substitution is suitable. Petition forms are also used for transfer students and post-baccalaureate students who have courses from other institutions that are being considered as substitutes for the offered courses. The petitions are tracked using an internal database and are recorded by DARS. The original petition form is filed in the student’s folder.

TRANSFER STUDENTS

When transfer students apply to the University of Washington they are accepted or denied by the Admissions Office. Once they are accepted to the UW, a student can declare several pre-majors, including Pre-Engineering and Pre-Forest and Ecological Engineering. The student can also directly apply into the FEE program at that time, which is coordinated through the Student Services Office. Once the transfer students application is received by the Student Services Office, it is sent to the Faculty Adviser for review. The Faculty Adviser will notify Student Services of the student’s acceptance or denial into the program. Once a transfer student is accepted a letter of acceptance is sent to the applicant.

When a transfer student applies to the UW the Admissions Office evaluates the transcript from the other institution. The credits are applied to appropriate courses that are approved by UW academic departments as transfer credits. In certain cases, students may not have courses that transferred into the FEE curriculum. Once a student is in the program, they can petition to have courses re-evaluated by the Faculty Advisor who also approves course equivalencies. When a student is petitioning the Faculty Advisory they are asked to write a petition and provide a syllabus for the course. The petition is then sent to the Faculty Adviser for review. If the petition is approved, the transfer course can be used as a substitution.

REFER TO APPENDIX II

GRADUATION REQUIREMENTS

Prior to graduation each student fills out a graduation application form with an academic advisor. The advisor compares the students academic record FEE curriculum requirements, notes all substitutions (CFR petitions or pre-approved), and records on the application all course work that is in progress and courses that are to be completed. The graduation application is submitted to the Graduation and Academic Records office and is also recorded in the CFR undergraduate database. A copy of the application is filed in the student’s folder and in a separate reference file. A student cannot graduate without the recommendation of the academic advisor.


2. Program Educational Objectives

PROGRAM OBJECTIVES

The Forest and Ecological Engineering (FEE) Program at the University of Washington has a mission to discover, adapt, and disseminate knowledge and technologies in the broadly defined area of forest and ecological engineering. The program focuses on engineering design for facilitating forest and forested watershed management, protection, harvest and transportation to meet the needs and constraints of society.

The overall goal of the FEE undergraduate program faculty is to offer the highest quality BS degree program in forest and ecological engineering. The FEE program objectives are published on the University of Washington’s academic programs web site http://depts.washington.edu/feweb/. The three specific objectives the program seeks to achieve are:

1. Insure students have essential knowledge and basic skills required for careers and/or postgraduate study in Forest and Ecological Engineering.

2. Develop the student’s ability to creatively resolve problems and exercise sound professional judgement in open-ended projects.

3. Provide students with a broad, general education that will promote their intellectual maturity and allow them to contribute to society at large.

CONSTITUENCIES

The primary constituencies involved in the FEE program are the FEE Faculty, the Advisory Board (which is a surrogate for many non-University of Washington interest groups), and the students within the program.

PROCESS TO ESTABLISH AND REVIEW PROGRAM OBJECTIVES

The current FEE Objectives were developed in 1999 along a revision of the FEE curriculum. The most recent revisions to the curriculum were driven by four factors: (1) to respond to a public need of educating and training professional engineers that can address public resource protection and resources utilization; (2) to respond to an internal push to bring curriculum requirements in line with University-wide credit requirements of 180 credits; (3) maximize teaching efficiencies by the limited faculty resources; and (4) respond to student interest to add an ecological engineering component.

Today's Forest and Ecological Engineering Program at the University of Washington has evolved, largely over the past decade, from a "Logging Engineering" program that was initiated in 1906 to the current program initiated in 1999. The program historically served a very small but critical role, providing entry-level engineering logging professionals to the Northwest Region's forest sector. Outcome assessment was informal, but through extremely close relationships between the faculty and the practicing professionals it was ongoing and central. Forest (Logging) Engineering faculty participated alongside practicing
professionals in a wide variety of activities ranging from public policy discourse to writing of the state's forest engineering licensing examination. The faculty was also actively involved in the entry-level professional employment placement process. The result was close, active and highly responsive management of a small, specialized and application focused program that addressed the needs of a specific economic sector.

In 1990, we were facing concerns from employers, students, and the State Board of Licensing about the role of logging engineers. Endangered species listings, biodiversity, visual aesthetic quality, riparian and upland habitat quality and stewardship philosophy were problems becoming more apparent and were front and center in local newspapers, legislative hearings and professional symposia. With the issues becoming more substantial, the Logging Engineering faculty began to formally discuss the implications of changes in the Northwest's forest sector and society's demands on it. We identified stakeholder groups, formed a Forest Engineering Program Advisory Board that met about three times a year, engaged students in curriculum related discussions, entered into a formal relationship with the College of Engineering, and adopted a substantially changed curriculum that included a new name (“Forest Engineering”) for the program.

Between 1993 and 2000 the program functioned as a true "Forest Engineering" (as opposed to Logging Engineering) Program. Our stated definition of forest engineering was "that profession in which knowledge of mathematics and the natural sciences gained by study and experience is applied, with judgement, to design systems and processes to meet society's many demands from forested landscapes.” The program's focus was engineering design for facilitating forest and forested watershed management, protection, harvest and transportation.

The Forest Engineering Program at the University of Washington was accredited by ABET for the first time in 1996. At that time the Educational Objectives of the Forest Engineering Program were:

1. Provide a broad education, including strong liberal arts background emphasizing life long learning, which will enable students to be informed, responsible and effective professionals in society;

2. Develop the students' written and oral communications skills so that they can organize and express information and ideas logically and convincingly;

3. Develop the students' understanding of fundamental scientific principles, including forest science and ecology, which serve as a sound basis for the synthesis of knowledge leading to rational problem solving;

4. Develop the students' knowledge and ability to employ engineering methods including analysis, computation, modeling, experimental techniques, and design to solve forest engineering problems; and

5. Develop the students' understanding of their legal, ethical, and professional relationships with society to prepare them for professional practice of forest engineering.
The process leading up to the engineering accreditation evoked conversations among the faculty that persisted, intensified (especially over the 1998-2000 time period), and eventually lead us to recognize a growing and important need for expanding Forest Engineering to substantially include aspects of "Ecological Engineering." We currently view ecological engineering as "the design of sustainable systems consistent with ecological principles that integrate human society with its natural environment for the benefit of both." We believe that the ecological engineering component of the FEE program should emphasize that the essence of its practice is engineering design; the practice is based on ecological science; it includes all type of ecosystems and potential interactions with ecosystems; and there is an acknowledged underlying value system.

In our conversations among the FEE faculty, which included discussions of the EC-2000 accreditation criteria, we re-examined our program objectives and realized that the program's intended outcomes (implied by the five objectives indicated above and/or expected by our stakeholder groups) should be expressed explicitly. The process for establishing the new objectives was as follows:

1. Mailings were sent to Forest Management and the Center for Streamside Studies advisory boards.

2. Forest Engineering and Hydrology held a pizza-dinner meeting for graduate students to discuss program objectives and curriculum.

3. Forest Engineering held a pizza-dinner meeting for undergraduate students to discuss program objectives and curriculum.


5. Final meeting between Forest Management Division faculty to finalize plans.

The current objectives for the Forest and Ecological Engineering program are:

1. Insure students have essential knowledge and basic skills required for careers and/or postgraduate study in Forest and Ecological Engineering.

2. Develop the students' ability to creatively resolve problems and exercise sound professional judgment in open-ended projects.

3. Provide students with a broad, general education that will promote their intellectual maturity and allow them to contribute to society at-large.

The curriculum changes that accompanied our explicit recognition of the desired outcomes for a program in forest and ecological engineering are discussed later in this section.
ACHIEVING PROGRAM EDUCATIONAL OBJECTIVES

With the recent change in Program Objectives, there has not been enough time to ensure that the new objectives are being achieved. However, the FEE program is putting into place mechanisms to ensure that the FEE program is achieving its objectives.

One mechanism that was created to ensure the achievement of the Program Objectives was an Alumni Census that was sent out to all the alumni from the last 6 years, the period of time since the program’s initial ABET accreditation. With the small size of alumni graduating from the FEE program, the questionnaires that are sent back will give us a census feedback rather than a sample. The questionnaire results from the census are shown below.
### Alumni Census Conducted 2002

<table>
<thead>
<tr>
<th>Question</th>
<th>Upon Graduation</th>
<th>Currently</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Please rate your overall satisfaction with your professional advancement to date</td>
<td>4.07</td>
<td>~</td>
</tr>
<tr>
<td>2. Assess your ability to apply knowledge of mathematics, science and engineering:</td>
<td>4.14</td>
<td>3.93</td>
</tr>
<tr>
<td>3. Assess your ability to apply knowledge of forest and ecological engineering</td>
<td>4.07</td>
<td>3.71</td>
</tr>
<tr>
<td>4. Assess your ability to formulate and design sampling schemes appropriate for ecosystems and to statistically analyze and interpret data:</td>
<td>3.07</td>
<td>2.5</td>
</tr>
<tr>
<td>5. Assess your ability to design a system, component, or process to meet desired needs:</td>
<td>3.86</td>
<td>3.93</td>
</tr>
<tr>
<td>6. Assess your ability to function on multidisciplinary teams:</td>
<td>4</td>
<td>4.29</td>
</tr>
<tr>
<td>7. Assess your ability to identify, formulate, and solve engineering problems</td>
<td>3.93</td>
<td>4.14</td>
</tr>
<tr>
<td>8. Assess your ability to pose well-defined, solvable problems from complicated and loosely defined scenarios found in ecosystems.</td>
<td>3.29</td>
<td>3.29</td>
</tr>
<tr>
<td>9. Assess your ability to apply scientific and engineering principles in open-ended types of projects:</td>
<td>3.36</td>
<td>3.36</td>
</tr>
<tr>
<td>10. Assess you ability to evaluate the results of completed tasks in open-ended projects</td>
<td>3.64</td>
<td>3.79</td>
</tr>
<tr>
<td>11. Assess your ability to generate alternative solutions and designs, and then use sound professional judgement to recommend alternatives in open-ended projects:</td>
<td>3.86</td>
<td>4.43</td>
</tr>
<tr>
<td>12. Assess your understanding of professional and ethical responsibilities</td>
<td>3.86</td>
<td>4.43</td>
</tr>
<tr>
<td>13. Assess your ability to communicate effectively, both orally and in writing:</td>
<td>4</td>
<td>4.29</td>
</tr>
<tr>
<td>14. Assess your ability to understand the impact of engineering solutions in a global and societal context:</td>
<td>3.71</td>
<td>4.07</td>
</tr>
<tr>
<td>15. How necessary do you believe life-long learning is for maintaining your professional competency?</td>
<td>4.21</td>
<td>4.71</td>
</tr>
<tr>
<td>16. Assess your knowledge of contemporary issues relevant to forestry and designed ecosystems</td>
<td>3.85</td>
<td>3.46</td>
</tr>
<tr>
<td>17. Assess your ability to use the techniques, skills, and modern engineering tools necessary for engineering practice:</td>
<td>3.71</td>
<td>4</td>
</tr>
</tbody>
</table>

*1 = Very weak
2 = Somewhat weak
3 = Neutral
4 = Somewhat Strong
5 = Very Strong*
Another mechanism to ensure the Program Objectives are met is the Advisory Board that was created in 1994 and substantially reformed in 2001. The Advisory Board has been selected from a broad base reflecting our outside constituencies’ interest in the programs and FEE faculty nomination. For that purpose a matrix was created to ensure an inclusive Board make-up reflecting a cross-section of discipline as well as advancement in professional stature. For example, the Board includes recent graduates as well as senior level management professionals. A meeting will be held at the beginning of fall quarter to introduce the board members to all of the program faculty and students and to provide the board with an overview of the program. There is continuity between the new board through members and those that participated on the old board. The goal of the Advisory Board is to provide feedback from various parts of industry and society in general about the future of forestry to help enable the FEE program to continue educating students to be professional engineers in the changing industry.
3. Program Outcomes and Assessment

FEE PROGRAM INTENDED OUTCOMES

The intended outcomes of the Forest and Ecological Engineering Program are organized under the three program objectives as follows:

Program Objective I: Insure students have essential knowledge and basic skills required for careers and/or postgraduate study in Forest and Ecological Engineering.

Outcomes

1A. Students will have the ability to apply knowledge of mathematics, science, and engineering.
1B. Students will have the ability to apply knowledge of forest and ecological engineering.
1C. Students will have the ability to formulate and design-sampling schemes appropriate for ecosystems, as well as, to statistically analyze and interpret data.
1D. Students will have the ability to design a system, component, or process to meet desired needs.
1E. Students will have the ability to communicate effectively, both orally and in writing.
1F. Students will have the ability to use the techniques, skills, and modern engineering tools necessary for forest and ecological engineering practice.

Program Objective II: Develop the students’ ability to creatively resolve problems and exercise sound professional judgment in open-ended projects.

Outcomes

2A. Students will have an ability to identify, formulate, and solve engineering problems.
2B. Students will be able to pose well-defined, solvable problems from complicated and loosely defined scenarios found in ecosystems.
2C. Students will be able to apply scientific and engineering principles in open-ended types of projects.
2D. Students will be able to evaluate the results of completed tasks in open-ended projects.
2E. Students will be able to generate alternative solutions and designs, and then use sound professional judgment to recommend alternatives in open-ended projects.
Program Objective III: Provide students with a broad, general education that will promote their intellectual maturity and allow them to contribute to society at-large.

Outcomes

3A. Students will have an ability to function on multidisciplinary teams.
3B. Students will have an understanding of professional and ethical responsibilities
3C. Students will have the broad education necessary to understand the impact of engineering solutions in a global and societal context.
3D. Students will understand that life-long learning is a necessity for maintenance of professional competency.
3E. Students will have knowledge of contemporary issues relevant to natural resources.

RELATION TO ABET ENGINEERING CRITERIA CRITERION 3 OUTCOMES

The program outcomes for the Forest and Ecological Engineering program are nearly identical to the ABET Engineering Criteria 2000 Criterion 3. Table 1 on the following page shows the relationship between the Forest and Ecological Engineering Program Outcomes and the ABET Engineering Criteria Criterion 3 Outcomes. As shown in the Table 1, the FEE Program Outcomes satisfy the ABET outcomes requirement.
Table 1

<table>
<thead>
<tr>
<th>Forest and Ecological Engineering Program Outcomes</th>
<th>ABET Engineering Criterion 3</th>
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<tr>
<td></td>
<td>A</td>
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<tr>
<td>1A. Students will have the ability to apply knowledge of mathematics, science, and engineering.</td>
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<td>1B. Students will have the ability to apply knowledge of forest and ecological engineering.</td>
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<td>1C. Students will have the ability to formulate and design-sampling schemes appropriate for ecosystems, as well as, to statistically analyze and interpret data.</td>
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<td>1D. Students will have the ability to design a system, component, or process to meet desired needs.</td>
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<td>1E. Students will have the ability to communicate effectively, both orally and in writing.</td>
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<td>1F. Students will have the ability to use the techniques, skills, and modern engineering tools necessary for forest and ecological engineering practice.</td>
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<td>2A. Students will have an ability to identify, formulate, and solve engineering problems</td>
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<td>2B. Students will be able to pose well-defined, solvable problems from complicated and loosely defined scenarios found in ecosystems.</td>
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<td>2C. Students will be able to apply scientific and engineering principles in open-ended types of projects.</td>
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<td>2D. Students will be able to evaluate the results of completed tasks in open-ended projects.</td>
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<tr>
<td>2E. Students will be able to generate alternative solutions and designs, and then use sound professional judgment to recommend alternatives in open-ended projects.</td>
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<tr>
<td>3A. Students will have an ability to function on multidisciplinary teams.</td>
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<tr>
<td>3B. Students will have an understanding of professional and ethical responsibilities</td>
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<td>3C. Students will have the broad education necessary to understand the impact of engineering solutions in a global and societal context.</td>
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<td>3D. Students will understand that life-long learning is a necessity for maintenance of professional competency.</td>
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<tr>
<td>3E. Students will have knowledge of contemporary issues relevant to natural resources.</td>
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</table>
ASSURING GRADUATES HAVE ACHieved the PROGRAM OUTCOMES

We think that our intended outcomes and educational objectives are being met largely through the students' coursework, which helps us successfully map contributing elements of each outcome to individual courses. We are confident in the FEE program's curriculum, that is based on a traditional college curriculum model where students take required classes, technical electives, and free electives. The FEE faculty has assumed the role of the curriculum committee that selects and approves required courses and technical electives. Recently, the FEE faculty has started working to formally acknowledge the nature of each course's contribution to each of the program's sixteen intended outcomes. To date we have concentrated only on those courses taught by the FEE faculty and results of this endeavor are shown in summary tables included in this section of our self-study and the individual course syllabi (Appendix B).

Throughout their four years of study the forest and ecological engineering students take courses involving large and small class lectures, problem solving sections, laboratory sections and design studios. We primarily rely on individual instructors throughout the university to set grading standards that consistently reflect individual student performance. The program has an academic continuation policy that establishes a minimum grade point average (2.5 on the 0.0 to 4.0 scale) and a minimum grade in select individual required courses (2.0).

We know that all of the intended outcomes are ultimately achieved over the integration of the students' education and life experiences; therefore, individual grades alone cannot assure the attainment of our intended outcomes and educational objectives. However, we believe that our outcomes are assessable and we are actively working to develop and implement a program for attaining the intended outcomes.

We expect that many of the outcomes under Objective 1 depend mostly on learning through traditional methods of instruction, i.e. lectures, laboratories, design studios, and seminars. Our program continuation and graduation requirements for meeting minimum individual course and cumulative average grade are probably most valid for these outcomes. Therefore, we intend to build on the mappings (tables on the syllabi in Appendix B) we have already developed by incorporating the mappings more fully into course syllabi and grading policies. We believe that course grades are the strongest indicators of student achievement in meeting the outcomes under Objective 1. We have recently started a process of identifying specific student activities (assigned student work such as design reports) and developing rubrics so that outcome assessment, especially as related to the students' broader ability to do engineering design and to communicate effectively, can be performed on a continuous and long term basis.

We expect that success in achieving the outcomes under Objective 2 depends to a great extent on elements in courses that are not easily addressed in an instructor's grading policy and are influenced to a larger extent on teaching and learning methods than on course content. We want the students to be able to cope with the myriad complexities and uncertainties of forests and other ecological systems as
they work to provide answers to questions or problems facing them as forest and ecological engineers. We think that to meet the outcomes under Objective 2 we must provide the students with opportunities to participate in activities where they will be required to formally define problems, select and implement plans of attack, and evaluate their proposed solutions the problem. We are already using a wide range of learning activities to accomplish this objective: small and open-ended homework problems, laboratory experiments, design exercises, substantial and significant required senior (team) design projects, and summer employment experiences.

We believe successfully achieving the outcomes under **Objective 3** depends on the foundation built in general education course requirements, the experiences accumulated throughout the students' technical courses, and the outside-of-the-classroom learning opportunities afforded by the atmosphere of the Colleges of Forest Resources and Engineering.

Our intent is to identify a small number of activities, such as the senior design projects, for which we can develop and employ ongoing assessment rubrics to gage the achievement of the outcomes under Objectives 2 and 3.

Real success in achieving many of the outcomes under Objectives 2 and 3 will only be determined after sufficient time has elapsed so that the program graduates have developed behavior patterns indicative of their beliefs as well as their knowledge. Therefore, we have begun to implement a census (our program is so small that a census is more appropriate than a survey) of graduates. We will, over the coming two years, develop a more formal employer survey. We hope that ultimately the program advisory board will participate in the ongoing development and administration of these instruments.

<table>
<thead>
<tr>
<th>Forest and Ecological Engineering Program Outcomes</th>
<th>FEE 341</th>
<th>FEE 430</th>
<th>FEE 346</th>
<th>FEE 368</th>
<th>FEE 425</th>
<th>FEE 480</th>
<th>FEE 444</th>
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</tbody>
</table>

1 = Students that have satisfied objective and beginning to progress towards program outcome
3 = Students that have satisfied objective and made substantial progress to achieving outcome
5 = Students that have satisfied objective and make enough progress to reach the desired outcome
CONTINUOUS IMPROVEMENT OF THE FOREST AND ECOLOGICAL ENGINEERING PROGRAM

Our continuous process of curriculum development, design and implementation is stakeholder based but driven by the FEE faculty. We emphasize collecting and utilizing input from the following stakeholder groups:

- Current Undergraduate Students
- Current Graduate Students
- Forest Management and Engineering Division Faculty
- College of Forest Resources Faculty
- College of Engineering Faculty
- Program Advisory Board (Alumni, Practicing Professionals, Managers & Executives, etc)

We are interested in expanding our acknowledged stakeholder group to include parents but we do not have immediate plans to do so.

As a faculty group we are an additional stakeholder with our own interests, knowledge, and experiences. Individually we are very active locally, regionally, nationally and internationally as participants in the debate surrounding the policy as well as the science and technology related to natural resources management and engineering. We participate in a wide variety of activities and organizations including: professional and learned societies, trade organizations, professional consulting, academic program review and accreditation, political and environmental activism, engineering licensing, and so on. Some of us are also involved in issues and research in engineering education reform. We have consistently remained well connected to our graduates and the challenges facing professionals in the early years of their careers. We have been, over the past decade, observing and participating in dramatic changes in society's demands for environmental stewardship, our region's population growth, and regional economic development and changes in the forest sector itself. The dynamic and politically charged atmosphere in the society has demanded constant re-examination of our academic programs.

The FEE faculty convenes as a committee to fulfill our responsibility for designing and implementing the undergraduate FEE program and its associated graduate program. We meet frequently (averaging at least ten meetings per academic year) but on an "as needed" basis. Our curriculum discussions are based on current issues and events related to the demands on and for natural resources professionals. Our emphasis as a group has been on the establishment and enforcement of graduation requirements. We are also exploring how we collectively engage in discussions about the appropriateness of, and success in, achieving learning objectives within individual courses.

Proposed changes to the FEE curriculum are vetted to the full Forest Management and Engineering Division faculty. The FME faculty meets about 20 times per academic year including an autumn retreat, to address the full spectrum of issues.
and responsibilities of an academic department that includes the discussion and approval of curriculum. The FME faculty members bring considerable breadth to the discussion since they are responsible for three undergraduate programs including FEE, Forest Management, and Paper Science and Engineering. With provisional approval by the FME division faculty, any proposed changes are then extensively discussed in three additional stakeholder forums: our undergraduate and graduate students and the program advisory board.

Our advisory board has, since 1994, consisted of professionals holding managerial positions in woods-operations related enterprises. However, we have recently expanded and redefined the advisory board to include individuals who bring the perspectives of small, medium and large organizations, private, public and non-profit sectors, a variety of levels of experience and responsibility, a wide spectrum of job functions and a range of policy perspectives from environmental conservation to resource utilization. Historically we have included our advisory board in wide ranging topics of conversation with the primary reason for the existence of the board has been for input to and review of curriculum.

Our current students are brought into the conversation in focus group like settings -- one for undergraduate students and one for graduate students. We typically present issues, solicit input on issues, present our proposed response to issues and engage the students in conversation about our proposed responses. We have found this approach to including our students in curriculum development and implementation to be helpful and effective.

Once we have integrated the input from our advisory board and student focus groups into our proposed curriculum changes we seek approval from the administration and faculty of the FME division, the College of Forest Resources, the College of Engineering, and finally the University as a whole. The College of Forest Resources and the College of Engineering have delegated most of their college-wide faculty responsibilities for curriculum discussion and approval of individual programs to faculty committees who represent the various programs in the respective colleges. The University-wide faculty has similarly delegated most of their responsibilities for the approval of individual program curricula to faculty councils within the Faculty Senate.

RECENT AND FUTURE CURRICULUM CHANGES

In 1999 the Forest and Ecological Engineering program underwent a major curriculum change. The change was driven by four factors:

1. A changing public need and student demand for educating and the training of professional engineers that can address a wide range of problems facing public resource conservation, protection and utilization;

2. An internal need to bring curriculum requirements in line with University-wide credit requirements of 180 credits; and

3. A desire to maximize teaching efficiencies of the very small number of faculty to allow more time devotion to graduate education and research.
4. An expressed student interest in opportunities to study ecological engineering.

The process outlined in the previous section was followed and we believe that the result substantially addresses the factors listed above. The process has also resulted in careful delineation of Program Objectives, Intended Outcomes, and Course Learning Objectives that have been clearly articulated and are understood by our administrators, our stakeholders, and ourselves. The curriculum change has allowed us to begin developing the formal continuous assessment process that will replace the longstanding informal assessment process that was appropriate for the small enrollment program yet unsuitable for the larger Forest and Ecological Engineering program we envision.

Currently, we are collecting and beginning to analyze data about the intended outcomes discussed earlier. We are completing a census to obtain graduates' perceptions of their achievement of the outcomes, collecting data on professional licensing of our graduates, and have participated in a College of Engineering developed assessment of writing skills. We are beginning to identify specific examples of student work to use for ongoing assessment of the program outcomes. Beginning autumn 2001 we intend to begin utilizing the results of efforts to assess success vis-a-vis achieving the intended outcomes in our curriculum refinement process. We think this process will be important to the ongoing success of the "Forest Engineering" aspect of the program but critical to the "Ecological Engineering" aspect of the program.
4. Professional Component

CURRICULUM

The curriculum for the Forest and Ecological Engineering undergraduate program is available on the FEE web site at http://depts.washington.edu/feweb/brochure.html

The mission of the FEE undergraduate program is to provide students with an education appropriate for embarking on professional engineering careers in a natural resources environment with an emphasis on engineering design to bridge stewardship in the natural resources environment with societies material needs.

The FEE curriculum is divided into the following areas:

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
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<tbody>
<tr>
<td>FEE Core Courses</td>
<td>34</td>
</tr>
<tr>
<td>FEE Technical Electives</td>
<td>25</td>
</tr>
<tr>
<td>Capstone Design Sequence</td>
<td>9</td>
</tr>
<tr>
<td>Basic Engineering and Computing Fundamentals</td>
<td>24</td>
</tr>
<tr>
<td>Mathematics</td>
<td>24</td>
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<tr>
<td>Natural Sciences</td>
<td>25</td>
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<tr>
<td>Written and Oral Communication</td>
<td>12</td>
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<tr>
<td>Visual, Literary, Performing Arts/Individuals &amp; Society (VLPA/L&amp;I)</td>
<td>21</td>
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<tr>
<td>Free Electives</td>
<td>6</td>
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</table>

The University of Washington uses the quarter system. One hundred eighty credits are required to graduate.

The FEE program requires a minimum of 24-credits of math courses, including calculus, differential equations, linear algebra and statistics. The 25-credits of Natural sciences include general chemistry and physics (with a lab), a course in Ecosystem Analysis, and 10-credits from an approved list of science classes are required (see web site stated above). The total credits meets the needs of Criterion 4A with one year of a combination of college level mathematics and basic sciences.

The FEE program also requires at least 24 credits of Basic Engineering and Computing Fundamentals, 34 credits of FEE Core Courses, and 9 credits of Capstone Design Sequence courses. The 25 credits of FEE electives provide at least 3 credits with engineering content. The total amount is 70 credits, which exceeds the Criterion 4b of one-half year of engineering topics totaling 67.5 credits.

The FEE program fulfills Criterion 4c by requiring students to take 21-credits of humanities (VLPA/L&I) courses & six credits of free electives.

DESIGN EXPERIENCE

Forest engineering design is emphasized throughout the program. However, design is a topic that is discussed more than it is exercised until the senior-year courses. While some students will encounter considerable design “fundamental” courses that are taught in other engineering departments, other students will not encounter significant attention to design until they begin taking the forest and ecological engineering program courses. Design is introduced in the FEE program with Low Volume Road Design (FEE 346) and Wildland Hydrology (FEE 425, winter quarter junior year).
By the students’ senior year he or she has had an opportunity to develop adequate knowledge of the constraints (i.e. economic, safety, reliability, aesthetics, ethics, and social) through their courses (especially CFR 400, ESC 322, FEE 346, 425, and 341 and CEE 342 and 366) and other educational experience to begin exploring more meaningful design issues and projects. In Silvicultural Engineering Systems (FE 480, autumn quarter senior year) they may create a set of plans for developing a tract of forest land into a forest to meet specific functional requirements. In Low Volume Road Design (FEE 346, winter quarter junior year) the students do detailed design, including extensive fieldwork in reconnaissance and layout.

The Forest and Ecological Engineering Capstone Design Sequence consists of two courses: Introduction to Forest and Ecological Engineering Design (FEE 444) is taught in the winter quarter and Advanced Forest Engineering Design (FEE 450) is taught in the spring quarter. Students always take the courses in consecutive quarters. During the first course they work on a team (target size is four students) to develop a very comprehensive design proposal for a real client. Emphasis is placed on problem definition including requirement and constraint identification, developing a sound rationale for solving their design problem and detailed planning of a ten week duration project to complete their proposed design.

During the second course (spring quarter) students work on teams to complete detailed plans (drawings, etc.) along with an implementation plan for their design. The spring quarter Capstone course taught in spring quarter only is 5 credits. Many students take course at the University of Washington’s experimental and teaching forest near Mt. Rainier National Park, C.L. Pack Forest, at the beginning of the Spring quarter during his or her senior year. Students live in a dormitory located at the forest and set up a “home office” in of the laboratory classrooms. Course enrollment, in recent years, has ranged from 3 to 15 students.

Students taking the “Pack Forest version” of the design-project course address a problem involving a tract of between 1,000 and 13,000 acres of forestland. The students, who act as a contracting firm, produce an engineered forest harvest and transportation plan. The sponsoring organization and the students operate within the client/contractor relationship for the duration of the quarter. The Washington Department of Natural Resources (DNR) has sponsored the course consecutively since 1982 and committed to another five-year term. .

The client works closely with the students who split their time between the “office” and the “field”, which may be anywhere in the state for the remainder of the quarter. A thorough design report is generated by the students and submitted at the end of the quarter.

Close guidance is necessary since the project deals with technically difficult problems and involves assessment of prototype technology for possible introduction to the client’s engineering staff. In recent years one faculty member has accompanied the class virtually 100% of the time. In addition, the sponsoring organization liaison person is available approximately 25% of the time.

A daily routine is established both for “office” days and “field” days. The “office” routine begins with a morning meeting to lay out the problem at hand, review
2001-2002 Visit

applicable theory and technology, and establish an activity plan for the day. Each
day ends with an evening meeting that is held to review the project status, the day’s
progress, and to identify necessary follow-up for the next day. The “field” routine is
similar but morning meets are not held, so evening sessions are expanded to include
the next day’s plans.

The course emphasizes long range planning for large tracts of forestland. A modern,
complete forest harvest design incorporates a transportation system design, time
frame for the harvest operation and an environmental impact assessment on water
and natural resources, which are all problems students address. The transportation
system design problem consists of specifying all landing locations (logging
settings), unit boundaries and the road system complete with specifications for new
roads, culverts and bridges. The time frame consists of a numbered sequence of
cutting blocks (i.e. blocks to be cut in year one, year two, etc.) that should
maximize the present value of the net revenues generated by harvesting and
meeting constraints for preserving visual and environmental values. The major
constraints manifest themselves as maximum cutting block size limits and a
requirement that adjacent blocks not be cut within the same on year period.
Environmental impact assessments include analysis of road construction impact on
streams (erosion, water quality impacts) and slope stability considerations for road
locations and harvest settings. Once the transportation system design and time
frame are established, a detailed design (for actual construction) of roads is required
in the first year (or first several years) and must be completed by student in the
course.

Recent projects have ranged from 1,000 to 13,000 acres and cost $20,000 to
$40,000. In recent years the client has reimbursed all transportation, lodging, and
meal expenses that are incurred throughout the course. The cost has been justified
by the student engineered harvest plan that is submitted to the client. Experience
indicates that a class of about eight students can thoroughly analyze, design, and
field verify a harvest and transportation plan for about 4,000 acres in a ten week
quarter.

The “on campus” pathway has only recently (Spring Quarter 2001) been made
available. Students taking the “on campus” version of the capstone course will be
assigned to student design teams (target team size is four students) to complete their
project (as proposed in FEE 444 the previous quarter). Only one student has opted
for this pathway (Spring 2001) and was placed on a project in Mechanical
Engineering 495 where the team was attempting to reduce manufacturing time and
cost for ELWd brand engineered habitat structures.

Eventually the FEE 444-FEE450 sequence for students remaining on campus will
be structured as follows:

**FEE 444 winter quarter**

Project “RFPs” solicited from local government agencies, community
organization and companies will be circulating to students early in the winter
quarter. Each student will select a set of “top 3” choice based on his or her
professional interests and technical skills. Instructors will assign teams (team
size = four people) and attempt to place every students on a project from their
“top 3” list. The teams will spend approximately eight weeks developing a proposal that covers three broad areas of design”

1. A stakeholder analysis based on formal problem definition.
2. An engineering rationale or approach to solving the problem.
3. A detailed project management plan for conducting the following quarters (FEE 450) project.

Deliverables include a written proposal and poster presentation.

**FEE 450 Spring Quarter**

With input from the “client” who supplied the original RFP, proposal feedback will be provided and teams restructured by the instructor, as needed. The students teams will spend approximately nine weeks developing a detailed design, performance analysis, and a plan to implement their design for the field. Deliverables include a detailed design report, plans (drawings), and an implementation project plan. A final poster presentation will also be required.

**ORAL AND WRITTEN COMMUNICATION**

The FEE program meets the (Criteria IV.V.3.i) Competence in written communication in the English language requirement through a combination of courses in English composition, technical communication, and forest engineering design.

The Forest and Ecological Engineering program graduation requirements include three courses that specifically intend to develop competence in oral and written communication. These include a five-credit English composition course (i.e. ENGL 111, 121, or 131) and two four-credit courses taught in the Technical Communication Department (TC231 Introduction to Technical Writing and TC333 Advanced Technical Writing and Oral Presentation). A student must receive a grade of at least 2.0 in English composition to be admitted into the FEE program. The English composition course must be taken early in the student’s program (suggested for the first quarter) to better prepare them for the courses that they will choose for satisfying the humanities and social sciences (VLPA and I&S) requirements. The two technical communication courses are suggested for the students’ junior year and provide a solid base in communication skills for students by the time they enter their senior year design courses.

The catalog description of TC 231 states, “Principles of organizing, developing, and writing technical information. Report forms and rhetorical patterns common too scientific and technical disciplines. Technical writing conventions such as headings, illustrations, style, and tone. Numerous written assignments required. Required for all engineering majors. Prerequisite: all required ESL course and one 5-credit composition course.”

The catalog description of TC 333 states, “Emphasis on the presentation of technical information to various audiences. Style of writing required for proposals, reports, and journal articles. Oral presentation principles, including use of visuals,
as well as organizing and presenting an effective talk. For engineering majors. Prerequisite: TC 231.”

Most of the FEE courses include some oral and written communication in the form of informal writing and presentation, laboratory reports, or paper. However, the single most significant reporting is done by the student when they prepare substantial proposals and written reports and orally present their work in meetings with the sponsor and other interested parties in the capstone course sequence (FEE 444 and 450). Each student is required to participate in both the written report presentation and the oral presentation. Many of the students’ presentations involve a formal (indoor) portion with appropriate visual as well as a less formal field session. Every student presents material.

Examples of student work will be provided for the review team during the visit.

**COMPUTER EXPERIENCE**

The Forest and Ecological Engineering students use computers in their daily campus life. Use of email and related computer network communication has become the expected standard behavior, even for communication between faculty and students involving instructional and academic advising information. Use of processing and spreadsheet application programs have become expected by most of the faculty for day-to-day student work including homework, laboratory reports, and term papers. A web-based communication and documentation system has recently been introduced into the Capstone design sequence. By the time the students have completed the Capstone design course sequence they are able to use a number of specialized application programs in an engineering design and analysis setting.

The development of competence in computer programming and application use occurs throughout the students’ education. Students must complete CSE 142 (Computer Programming) with a grade of at least 2.0 before applying to the Forest and Ecological Engineering Program, even though students have probably been introduced to application programs for word processing and numerical calculation using micro-computers of their own or in the University facilities. Once a student indicates intention to enroll in the program he or she is asked to establish an email account for advising purposes although most of the students are already using email by that time. Introduction to Visualization and Computer-Aided Design (ME 123) is not required for entry into the program but is required for graduation and is usually taken prior to applying. The course introduces the students to computer-aided drawing and drafting.

The majority of the FEE courses require some computer usage. Several students develop competency that goes considerably beyond documentation preparation, calculation, and correspondence. In Timber Harvesting (FEE 341) the students use programs that employ analysis concepts discussed in class, to analyze timber harvesting operation layout plans. In Low Volume Roads (FEE 346) students use road design programs in their laboratory and design products, some of which require producing full size computer generated engineering drawings. In Introduction to Forest Engineering Design (FEE 444) and Advanced Forest
Engineering Design (FEE 450) they often make extensive use of a Geographic Information System, optimization programs and other computer application in order to complete their design project work.

With the exception of CSE 142, most of the programming done by the students does not involve compiler languages. Rather, it involves programming in spreadsheets, and in application program macro languages (extensive programming in a GIS may be required for example).

LABORATORY EXPERIENCE

Supplemental tables 1 and 2 show the laboratory component of the Forest and Ecological Engineering program. There are approximately 28 credits of laboratory time distributed throughout the portion of the program that is required of every student. There are approximately 7 credits of laboratory instruction in the first two years, 6 credits in the upper two years excluding the final quarter, and 15 credits, representing 40-60 hours per week of “hands on” experience for ten weeks in the final quarter. An additional one-credit field seminar course, which is not included in the tally above and is highly recommended to all students every quarter except his or her last quarter, adds to the overall laboratory experience through all day field excursions per quarter.

The laboratory portions of courses in physics, chemistry, mechanics of materials, fluid mechanics, and soil mechanics emphasize experimental work. The laboratory portions of most of the forest and ecological engineering courses emphasize field measurements methodology with the exception that the measurement techniques learned will be relevant to the types of design problems most likely to face forest engineers. A limited portion of the forest engineering laboratory activity is more demonstrative in nature, although still hands-on, to develop greater understanding of natural phenomena or processes.

The Capstone design course sequence an intensive projects course that requires the students to employ many (if not all) of the hands-on methods that they have explored through his or her FEE studies. Students often spend long hours surveying land units and road location, sampling vegetation, measuring from aerial photography, mapping with GIS, designing with CAD, and so on.

Safety is important in the forest engineering profession (both to keep forest engineers alive as well as for the protection of the forest workers and the public). Therefore, it is emphasized throughout the curriculum. Handout material related to the safety of the forest engineer as well as at to worker and public health and safety are used in the field courses. Safety is included as part of any laboratory exercise procedural instruction. It is continually emphasized in the capstone course.
Supplemental Table 1 - Lower Division Courses with Laboratory Exercises

1A. Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Laboratory Time</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys 131 Physics Lab</td>
<td>3 hrs/wk (1 cr.)</td>
<td>Physics</td>
</tr>
<tr>
<td>Phys 132 Physics Lab</td>
<td>3 hrs/wk (1 cr.)</td>
<td>Physics</td>
</tr>
<tr>
<td>Phys 133 Physics Lab</td>
<td>3 hrs/wk (1 cr.)</td>
<td>Physics</td>
</tr>
</tbody>
</table>

1B. Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Laboratory Time</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 142 General Chemistry Lab</td>
<td>3 hrs/wk</td>
<td>Chemistry</td>
</tr>
<tr>
<td>CHEM 152 General Chemistry Lab</td>
<td>3 hrs/wk</td>
<td>Chemistry</td>
</tr>
<tr>
<td>ENGR 220 Mechanics of Materials</td>
<td>2 hrs/wk</td>
<td>Civil &amp; Environ. Engr</td>
</tr>
</tbody>
</table>

Supplemental Table 2 – Upper Division Courses with Laboratory Exercises

2A. Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Laboratory Time</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 142 or ME 333 Fluid Mechanics</td>
<td>2 hrs/wk</td>
<td>Civil Engr or Mech. Engr</td>
</tr>
<tr>
<td>CEE 366 Soil Mechanics</td>
<td>3 hrs/wk</td>
<td>Civil Engr</td>
</tr>
<tr>
<td>ESC 322 Ecological Basis for Forest Engineering</td>
<td>3 hrs/wk</td>
<td>Wash. Park Arboretum &amp; Field Trips</td>
</tr>
<tr>
<td>FE 425 Wildland Hydrology</td>
<td>2 hrs/wk</td>
<td>311 Bloedel Computer Lab</td>
</tr>
<tr>
<td>CEE 316 Plane Surveying</td>
<td>4 hrs/wk</td>
<td>Rainier Vista, 311 Bloedel Comp. Lab</td>
</tr>
<tr>
<td>FE 368 Forest Engineering</td>
<td>2 hrs/wk</td>
<td>Wash. Park Arboretum, Rainier Vista, Hamlin Park</td>
</tr>
<tr>
<td>FE 346 Low Volume Roads</td>
<td>2+ hrs/wk</td>
<td>St. Edwards State Park, 311 Bloedel Computer Lab, 389 Bloedel</td>
</tr>
</tbody>
</table>
### 2B. Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Laboratory Time</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE 341 Timber Harvesting</td>
<td>2 hr/wk</td>
<td>Classroom</td>
</tr>
<tr>
<td>FE 480/FM 424 Silvicultural Engr. Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFR 480</td>
<td>1 hr/wk</td>
<td>Field trips to mills</td>
</tr>
<tr>
<td>FE 444 Intor. Forest Engr Design</td>
<td></td>
<td>311 Bloedel</td>
</tr>
<tr>
<td>FE 450 Forest Engineering Design</td>
<td>40-60 hrs/wk</td>
<td>103 McBride Hall (Pack Forest), on location</td>
</tr>
</tbody>
</table>

### Supplemental Table 3 – Elective Forest Engineering Courses with Laboratory Exercises

<table>
<thead>
<tr>
<th>Course</th>
<th>Laboratory Time</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE 423 Watershed Analysis</td>
<td>2 hrs</td>
<td>Bloedel 261 &amp; OSB 101</td>
</tr>
<tr>
<td>FEE 451 GIS based language modeling</td>
<td>5 hrs/wk</td>
<td>Pack Forest</td>
</tr>
<tr>
<td>FEE 452 Stream-Road interactivities</td>
<td>5 hrs/wk</td>
<td>Pack Forest</td>
</tr>
</tbody>
</table>
5. Faculty

The FEE program has a core of five full-time faculty members: Susan Bolton, Jim Fridley, Bruce Larson, Peter Schiess, and Gerard Schreuder. Several others have limited undergraduate teaching responsibilities in the FEE program. There are also several adjunct and affiliate faculty members.

The Forest and Ecological Engineering program faculty is a diverse group by many measures. They share a broad definition of forest and ecological engineering and assume a similarly broad role for its contribution to society’s needs and wants, now and into the future.

Collectively, the faculty holds degrees from a large number of institutions and in a variety of subjects, for example: agriculture, civil, forest and mechanical engineering, as well as biology, forestry and mathematics. All hold Ph.D. degrees and some are licensed professional engineers. They are active in their professional communities through professional consulting, funded research, participation in symposia’s, conferences and workshops, scientific and professional publication, and active participation in a variety of professional and scientific societies. Susan Bolton and Jim Fridley have received degrees in engineering fields and are currently licensed professional engineers in the state of Washington. Peter Schiess received a degree in forest engineering and is certified in Switzerland. Gerard Schreuder and Bruce Larson hold degrees in Forestry.

The five core faculty members conduct the program’s main teaching and administration and have a primary responsibility for curriculum development, faculty advising and mentoring of the students. A substantial research and graduate program in forest and ecological engineering has led to several other in the “WOT”, “affiliate”, and “adjunct” faculty appointments.

The Forest and Ecological Engineering faculty composition has changed over time. Peter Schiess (hired in 1975) is now the sole logging engineering faculty expert. Logging Engineering has historically been the emphasis of the program and the number of LE faculty has ranged between two and four since the mid 1970’s. Jim Fridley (Engineering design) was hired in 1988; Susan Bolton (Hydrology) in 1992; Gerard Schreuder (Remote Sensing) in 1970 and Bruce Larson (Silviculture) in 2000 (as Acting Professor and Associate Dean of the CFR).

Teaching loads are consistent with, or only moderately higher than, those found elsewhere in the College of Forest resources and the College of Engineering.

The faculty is available, and frequently called upon, for academic and career guidance. One faculty member for all the FEE students conducts formal faculty advising.
6. Facilities

The facilities available for the Forest and Ecological Program originate from: the University, the College of Engineering and the College of Forest Resources. A brief discussion of a few of the more extensively used services are discussed below:

**UNIVERSITY LEVEL FACILITIES**

The University’s *Computing and Communication (C&C) Division* provides computer and network services to the campus as a whole. C&C offers an array of large multi-user computers. C&C computer labs, open to all students, faculty, and staff members, provide opportunities for use of Macintoshes, PCs and workstations, and many window system terminal for access to the computer network. In addition, electronic mail services and convenient access to resources throughout the world, such as supercomputing, library catalogues and other information resources are available on the campus networks. C&C provides many computer-associated services, such as individual consulting, microcomputer and workstation support, training, education, administrative systems support, publications and on-line documentation. All members of the University community are entitled to basic computer services at no charge under the C&C Uniform Assess system.

The *Health Sciences Center for Instructional Development* provides services for assistance in developing instructional manual. Included are technical services for computational, photographic, graphic arts, and video-related support. The close proximity to Bloedel Hall (home of the Forest & Ecological Program) makes these services particularly valuable to the forest engineering faculty.

The University’s *Center for Career Services* offers career information and services to assist undergraduates, graduate students, and degree- or certificate-holding alumni: (1) to make a viable connection between the students academic backgrounds and their career or long-range employment objective, (2) to develop effective job-seeking strategies and (3) to find suitable employment upon leaving the University or to change employment thereafter. Programs include individual and group career counseling, job search seminars, career-related internships, campus interviews, and summer employment listings. Also available is an interactive computer-assisted career guidance and information system. Workshops on special topics such as test anxiety, time management, and stress management are also available. Other support services provided by the University include financial aid, student health insurance, a childcare program, student legal services, and recreational sports.

The University’s *Office of Classroom Support Services* provides comprehensive media support and serves to faculty, staff and students, including educational media services, classroom maintenance and planning, equipment consultation, repair and maintenance and photography. Over 5,000 films and videotapes for classroom instruction, preview facilities and classroom operators and equipment to utilize these materials are available for use by the campus community. A complete photographic lab with studio services is also available.

**COLLEGE OF FOREST RESOURCES**
2001-2002 Visit

The College of Forest Resources manages two field stations Pack Forest, a teaching and demonstration forest encompassing 4000 acre, 68 miles south of campus near Mt. Rainier National Park and the Olympic Natural Resources Center (ONRC) in Forks, WA on the Olympic Peninsula. ONRC is involved with the State of Washington’s Department of Natural Resources (DNR) Olympic Experimental State Forest (OESF). The supported facilities include a campus-like setting with living quarters for 80+ persons, classrooms, shops, and offices. Pack Forest is supported with a full time residential staff. ONRC has similar, new facilities and is also supported by a full residential staff. Both facilities are utilized as part of the program’s Capstone Design course (FEE 450) plays a major role in developing design strategies for the operational management of the OESF and the State’s forests.

The Forest Resources (Forestry) Library is one of twenty-two branches of the University of Washington Library that has combined holdings of over 1.6 million catalogued titles. It is the largest libraries in the Northwest, specializing in basic forestry silviculture, forests products industry and trade, forest engineering, wood science and pulp and paper technology. Twenty-six thousand bound volumes, thirty three thousand pamphlets, reports and monographs, 2500 periodicals, and indexes to current literature on forestry and supporting science’s aid in academic research. In addition, the Forest Library collects foreign material published in these fields. Also available is Forest Service Information System Network Northwest (INFO NW) who provides library and information services to USDA Forest Service employees, AGRICOLA and other CD ROM programs, including Current Research Information System (CRIS). The Engineering Library has a vast collection of patents, books, periodicals, and technical reports specializing in the engineering disciplines, with emphasis on the areas represented by the College of Engineering. The University Library, and especially the Forest Resources and Engineering Libraries provide outstanding service to the program.

The College of Forest Resources maintains a computer laboratory that provides excellent support to the program. It is available to all the forestry students. In addition the Management & Engineering Division maintains its own computer teaching laboratory in 261 Bloedel. The College of Engineering maintains a computer laboratory that provides excellent support to students when they are enrolled in courses offered by that college.

The College of Forest Resources’ Office of Student Services is a fully staffed centralized office which is responsible for providing undergraduate and graduate students with career counseling, academic advising, personal counseling, and technical assistance regarding University requirements and policies. Michelle Trudeau is the Manager of Student Services and is assisted by Linda Hegrenes, Russ Posten and Jeff Aken. Stan Humann serves as director of professional opportunities and coordinates internships, summer jobs, and permanent placement for students. Academic advising is provided to students in the CFR (when students declare a major) through the coordination efforts of the Office of Student Services. Personal counseling is also conducted through this office, but more typically, students are referred to the University’s centralized Counseling Center if severe personal problems exist. The College’s overall recruitment effort is also
coordinated through this office. Career counseling has been offered on a part-time basis in the past due to unavailability of staff on a full-time basis. However, during 1994, a Career Development and Counseling Office is now in process of being equipped and staffed to provide career counseling and career preparation information to a broad audience, ranging from the prospective student population to College alumni. The Office will serve as a liaison between students, alumni and prospective employers while providing current information about career opportunities in all aspects of forest resources.

Facilities and equipment directly available to the FEE program are a design lab for the FEE program (Anderson Hall 302) which is equipped with computers and peripherals such as large digitizer, ink jet plotter and laser printer. The computing equipment is being provided in part from Divisional/College funds and from DNR as part of the on-going support for the FEE 450 capstone design sequence. The College has provided support to acquire the necessary computing and design hardware. The most recent purchase has been winter quarter of 2001 with the purchase of 8 high-powered PC’s. In the past (1997) excellent printing and plotting capabilities were provided that form the backbone of the FEE design space’s output capabilities.

The following table lists all the classrooms, labs, and external resources that the FEE program has access too.
<table>
<thead>
<tr>
<th>Facility</th>
<th>Purposes of Laboratory &amp; Courses Taught</th>
<th>Condition of Laboratory</th>
<th>Adequacy for Instruction</th>
<th>Number of Student Stations</th>
<th>Approx. Area (sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>302 Anderson Hall</td>
<td>Photogrammetry, Photo interpretation skills, General “project room” FEE 430 FEE undergraduate design space</td>
<td>Fair</td>
<td>Marginally adequate – lighting is poor for viewing photos, space is limited</td>
<td>16 comfortable, 20 in a pinch</td>
<td>800</td>
</tr>
<tr>
<td>108 Bloedel Hall</td>
<td>Electronic Shop, Instrument and computer fabrication, maint. &amp; repair</td>
<td>Good</td>
<td>N/A</td>
<td></td>
<td>575</td>
</tr>
<tr>
<td>110 Bloedel Hall</td>
<td>Wood Shop Specimen preparation Wood Machining FE 470</td>
<td>Good</td>
<td>Fair</td>
<td></td>
<td>1620</td>
</tr>
<tr>
<td>114 Bloedel Hall</td>
<td>Machine Shop Instrument and apparatus fabrication, maint. &amp; repair</td>
<td>Excellent</td>
<td>N/A</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td>Building</td>
<td>Course Description</td>
<td>Grade</td>
<td>Notes</td>
<td>Section</td>
<td>Budget</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-------</td>
<td>----------------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>178 Bloedel Hall</td>
<td>Wood Anatomy Moisture content and specific gravity determination. FEE 470</td>
<td>Good</td>
<td>Fair</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>238 Bloedel Hall</td>
<td>Hydrology, soil mechanics</td>
<td>Good</td>
<td>Good</td>
<td>25</td>
<td>600</td>
</tr>
<tr>
<td>261 Bloedel Hall</td>
<td>FE 341, FE 346, FE 423</td>
<td>Good</td>
<td>Good</td>
<td>16</td>
<td>600</td>
</tr>
<tr>
<td>311 Bloedel Hall</td>
<td>Computing Machinery, Practical application of GIS concepts FEE 340, FEE 346, FE 444</td>
<td>Excellent</td>
<td>Good</td>
<td>16+ Instructor</td>
<td>600</td>
</tr>
<tr>
<td>357 Bloedel Hall</td>
<td>Graduate Research Support of FEE 450</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>361 Bloedel Hall</td>
<td>Graduate Research, USFS, and Precision Forestry Support of FEE 450</td>
<td>Excellent</td>
<td>Not Available</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>Description</td>
<td>Rating</td>
<td>Availability</td>
<td>Capacity</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
<td>----------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>386 Bloedel Hall</td>
<td>Graduate Research, USFS, and Precision Forestry Support of FEE 450</td>
<td>Excellent</td>
<td>Not Available</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>389/357 Bloedel Hall</td>
<td>Graduate Space</td>
<td>Excellent</td>
<td>Not Available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainier Vista (UW)</td>
<td>Field skills for surveying Tree Measurement FEE 368</td>
<td>Excellent</td>
<td>Adequate</td>
<td>.5 or 6 crews @ 4-5 people per crew</td>
<td></td>
</tr>
<tr>
<td>102 McBride Hall (at Pack Forest)</td>
<td>FEE 345 (Transportation for non majors)</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Handles a design team of up to 15 students</td>
<td></td>
</tr>
<tr>
<td>103 &amp; 105 McBride Hall (at Pack Forest)</td>
<td>Computer aided Forest Engineering Design FEE 450, 451, 452</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Handles a design team of up to 15 students</td>
<td></td>
</tr>
<tr>
<td>Pack Forest (UW, near Mt. Rainier National Park)</td>
<td>Working Forest FEE 450, FEE 345 FEE 451, 452</td>
<td>Excellent</td>
<td>Good</td>
<td>4000 acres near Mt. Rainier National Park</td>
<td></td>
</tr>
<tr>
<td>“Planning Area” (varies year to year, provided by cooperating land owners)</td>
<td>On site forest engineering design FEE 450</td>
<td>Excellent</td>
<td>Excellent</td>
<td>4000-10000 acres</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>UW/Washington Park Arboretum</td>
<td>Plant Identification FEE 332, FEE 368</td>
<td>Excellent</td>
<td>Adequate</td>
<td>200 acres</td>
<td></td>
</tr>
<tr>
<td>St. Edwards Park (State, east side of Lake Washington)</td>
<td>Road Location FEE 346</td>
<td>Excellent</td>
<td>Excellent, varied topography with forest cover typical of remote Western Washington locations as one might encounter in situations for low volume road location, design and construction practices</td>
<td>300 acres</td>
<td></td>
</tr>
<tr>
<td>Hamlin Park (County, North Seattle)</td>
<td>Tree Measurement FEE 368</td>
<td>Excellent</td>
<td>Adequate, excessive dog feces is a safety issue. Thrifty young stand, good for timber inventory procedures demonstration</td>
<td>50 acres total approx. 25 acres wooded</td>
<td></td>
</tr>
</tbody>
</table>
7. Institutional Support and Financial Resources

Processes to Determine the Budget for the Program.

Support for the Forest and Ecological Engineering Program originates at four major sources: the University of Washington, the College of Engineering, the College of Forest Resources, and outside (non-UW) support.

The University of Washington operates on a biennial budgeting system to match the Washington State budgeting process. The current biennium began July 1, 1999 and continues through June 30, 2001.

Operating funds for the College of Forest Resources two academic divisions are provided by the University through the Dean of the College of Forest Resources. Before the biennium begins CFR submits a budget to the University based on previous biennium expenditures and any additional funds that are required to achieve objectives defined in the College's strategic plan. Within the College of Forest Resources, there are two main divisions: the Management and Engineering (ME) Division and the Ecological Sciences (ES) Division with the Forest and Ecological Engineering program falling under the ME Division. The two divisions are given the opportunity to input their budgetary needs to the College before the budget is submitted to the University. Historically, CFR’s Divisions were allocated operating funds from the College's budget based on a formula that included the number of faculty and the number of student credit hours generated. Special allocations to the Divisions could also be made at the discretion of the Dean.

In the future, the budgeting process is expected to follow a more traditional line. The two division chairs will submit their budgets to the Dean who will create a College budget to be submitted to the Office of the Provost office at the University. The College budget is based on requests from the faculty members to their division chair to ascertain their funding needs in relation to specific teaching needs and programmatic needs including: TA requirements, travel (for classes and professional development), and supplies and equipment. The CFR budget is developed to meet as many of the requests as possible.

Adequacy of Institutional Support, Financial Resources and Constructive Leadership

The general CFR support for the FEE program is intended to meet the program objectives. However, to completely meet our needs we have had to leverage funding from the College and University with outside money. Outside support has come from the Department of Natural Resources through its on-going funding of the FEE 450 Capstone Design course. This spring, the DNR has entered into another five-year agreement with the FEE program to provide annual support for the Capstone project of approximately 50 to 60,000 dollars per year. The funding from the DNR purchases supplies, travel arrangements for the students, new software programs, and equipment (i.e. computers, peripherals and survey equipment). The funding provided by the DNR allows for students to use state-of-
the-art equipment and technology used in the profession field and is therefore of critical importance to the student’s education. As part of this program substantial equipment acquisition has been possible for the program such as computer workstations, large blacklight digitizers and personal computers.

ADEQUACY OF FACULTY PROFESSIONAL DEVELOPMENT AND HOW IT IS PLANNED AND FUNDED

Faculty development within the College and Division starts with the work planning process. Every faculty member must meet every one to three years (depending on rank) with the Division chair. At that meeting, professional development issues are discussed and resources that may be needed are identified. Funding for the faculty members’ professional development will come from the Division budget. Junior faculty members’ are offered more support for professional development than their senior counterparts and assigned mentoring committees that facilitate their faculty development. New faculty members’ are provided start-up packages that include support for graduate students, equipment, and travel funds. Traveling to conferences and symposia are also facilitated by Division funds for all faculty and especially for junior faculty.

Outside the Division, the University also provides resources for faculty development. Within the University, the Center for Instructional Development Resources (CIDR) provides a free service that helps faculty to become better teachers. Use of resources such as CIDR can be initiated by the faculty unilaterally or often comes out of the work planning process.

SUFFICIENCIES OF RESOURCES TO ACQUIRE, MAINTAIN, AND OPERATE FACILITIES

Another source of indirect support is provided through the recently established Precision Forestry Cooperative (PFC) housed within the FEE program area. Through a combination of matching resources between the teaching program and the research program resources are made available that otherwise would not exist.

Alumni also provide an important level of support to the teaching program. One alumnus provided funds in 1999 to create an endowed professorship in Forest Engineering. The funds from that endowed professorship help finance TA support for the capstone program. The same donor committed now to the creation of an endowed chair in Forest Engineering over a five-year period.

ADEQUACY OF SUPPORT PERSONNEL AND INSTITUTIONAL SERVICES

Institutional support should be measured by the professed commitment in the Dean’s office. Support by the new Dean has been very strong and crucial, such as allowing the creation of a new, possibly two, position within the PFC, which is part of the FEE program.
Recent changes in Deans of the College of Forest Resources are resulting in some significant changes to the College that might have an impact on support allocation and budgeting, which can be expected under any new leadership. The current ABET review process falls into a period where specific results and programmatic support cannot yet be quantified based on the recent leadership changes. However, the current dean has indicated that the FEE program is an essential part of the college and should therefore receive appropriate support within the constraints that are placed on the College by the University administration.
8. **Forest and Ecological Engineering**

**CURRICULUM**

The undergraduate FEE program at the University of Washington satisfies the ABET program Criteria through the academic breadth and depth of the curriculum. The program provides breadth through the range of classes specifically required for graduation from the program. The course description of each required class is available on the web at [www.washington.edu/students/crscat/fore.html](http://www.washington.edu/students/crscat/fore.html).

The program provides depth through its three Technical Elective pathways: Environmental & Operational Analysis & Design, Geographic Information Systems & Remote Sensing, and Ecological Engineering. The lists of electives students take from each pathway are listed on the FEE web site [http://depts.washington.edu/feweb](http://depts.washington.edu/feweb).

Graduates of the program will have a proficiency in mathematics through differential equations. Upon entering the FEE program, students will have taken a Calculus series (MATH 124, MATH 125, and MATH 126), Differential Equations (MATH 307), and Matrix Algebra with Applications (MATH 308). Graduates will complete either Probability and Statistics for Engineers (IND E 315) or Introduction to Probability and Statistics (QSCI 381).

Graduates of the program will have finished relevant engineering science course consistent with the discipline. Students will have completed General Chemistry (CHEM 142) and Mechanics (PHYS 121/131) which also includes a lab. The students will finish their science requirements by taking two classes from the approved list of BIOL 201, BIOL 202, PHYS 122/132, PHYS 123/133, or CHEM 152.

After graduation students will have knowledge of all the appropriate forest science topics. The following table shows the required FEE classes and how they match up with the ABET Program Criteria. Each of the required classes covers multiple topics creating an overlapping of information that is beneficial for students.
### ABET Program Area Criteria – Forest and Ecological Engineering

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>FEE 341</td>
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<td>X</td>
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</tbody>
</table>

**FACULTY**

The faculty in the Forest and Ecological program who teach the design classes are qualified and meet the ABET criteria. Jim Fridley is a licensed Professional Engineer in the state of Washington, Susan Bolton is licensed in Washington and New Mexico, and Peter Schiess is certified in Switzerland.
Appendix I - Additional Program Information

A. Tabular Data for Program
   Table 1. Basic level Curriculum
   Table 2. Course and Section Size Summary
   Table 3. Faculty Workload Summary
   Table 4. Faculty Analysis
   Table 5. Support Expenditures

B. Course Syllabi

C. Faculty Curriculum Vitae
### Table 1. Basic-Level Curriculum

Forest and Ecological Engineering Program

<table>
<thead>
<tr>
<th>Year, Semester or Quarter</th>
<th>Course</th>
<th>Category (Credit Hours)</th>
</tr>
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<tbody>
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<td></td>
<td>Math &amp; Basic Sciences</td>
<td>Engineering Topics</td>
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<td></td>
</tr>
<tr>
<td>1st Yr/1st Qtr</td>
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<td>Physics 132, Exper. Physics</td>
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<td>English Composition</td>
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<td>Science Elective</td>
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<td>VLPA/I&amp;S</td>
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<tr>
<td>1st Yr/3rd Qtr</td>
<td>Math 126, Calc w/Analytic Geom. 3</td>
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<td></td>
<td>Chem 142, Gen. Chem w/Lab</td>
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<td>ME 123, Engineering Graphics</td>
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<td>AA 210, Engineering Statics</td>
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<td>CSE 142, Intro to Programming</td>
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<td>CEE 220, Mechanics of Materials</td>
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<td>2nd Yr/3rd Qtr</td>
<td>IND E 315, Probability &amp; Statistics</td>
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<td>IND E 250, Engineering Economics</td>
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<td>ME 230, Kinematics &amp; Dynamics</td>
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<td>TC 231, Technical Writing</td>
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(Continued on next page)
# Table 1. Basic-Level Curriculum (continued)
Forest and Ecological Engineering Program

<table>
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<th>Year; Semester or Quarter</th>
<th>Course</th>
<th>Category (Credit Hours)</th>
<th>Math &amp; Basic Science</th>
<th>Engineering Topics</th>
<th>General Education</th>
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<td>3rd Yr/2nd Qtr</td>
<td>FE 346, Low Volume Roads</td>
<td>4 (✓)</td>
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</tr>
<tr>
<td></td>
<td>FE 368, For Engr. Measurements</td>
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<tr>
<td></td>
<td>FE 425, Wildland Hydrology</td>
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<tr>
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<td>Forest Engineering Core</td>
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<td>TC 333, Advance Technical Writing</td>
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<td></td>
<td>FE 430, Aer Photo/Remote Sensing</td>
<td>3 (✓)</td>
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<tr>
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<td>FE Technical Elective</td>
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<tr>
<td></td>
<td>CFR 480, Wood Utilization</td>
<td>1 ( )</td>
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<tr>
<td>4th Yr/1st Qtr</td>
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<tr>
<td></td>
<td>FE 341, Timber Harvesting</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>FE Technical Elective</td>
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<tr>
<td>4th Yr/2nd Qtr</td>
<td>FE 444, Intro For Engr Design</td>
<td>4 (✓)</td>
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<tr>
<td></td>
<td>FE Technical Elective</td>
<td>( )</td>
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<td></td>
<td>5</td>
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<td></td>
<td>CFR 400, Conflict Management</td>
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<td></td>
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<tr>
<td></td>
<td>VLPA/I&amp;S</td>
<td>( )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th Yr/3rd Qtr</td>
<td>FE 450, Adv. For Engr Design</td>
<td>5 (✓)</td>
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<tr>
<td></td>
<td>FE Technical Elective</td>
<td>( )</td>
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<tr>
<td></td>
<td>FE Technical Elective</td>
<td>( )</td>
<td></td>
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</tr>
</tbody>
</table>

**TOTALS - ABET BASIC-LEVEL REQUIREMENTS**

|                          | 49 | 70 | 29 | 32 |

**OVERALL TOTAL FOR DEGREE**

|                          | 180 Credits |

**PERCENT OF TOTAL**

|                          | 27% | 39% | 16% | 18% |

**Totals must**

- Minimum semester credit hours: 32 hrs
- Minimum percentage: 25%

**Note that instructional material and student work verifying course compliance with ABET criteria for the categories indicated above will be required during the campus visit.**
Table 2. Course and Section Size Summary  
Forest and Ecological Program

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>No. of Sections</th>
<th>Avg. Section Enrollment</th>
<th>Type of Class (1)</th>
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</thead>
<tbody>
<tr>
<td>FE 341</td>
<td>Timber Harvesting</td>
<td>1</td>
<td>10</td>
<td>50% 40% 10%</td>
</tr>
<tr>
<td>FE 346</td>
<td>Low Volume Roads</td>
<td>1</td>
<td>10</td>
<td>40% 30% 30%</td>
</tr>
<tr>
<td>FE 368</td>
<td>For Engr. Measurements</td>
<td>1</td>
<td>10</td>
<td>75% 25%</td>
</tr>
<tr>
<td>FE 425</td>
<td>Wildland Hydrology</td>
<td>1</td>
<td>13</td>
<td>40% 60%</td>
</tr>
<tr>
<td>FE 430</td>
<td>Aer Photo/Remote Sensing</td>
<td>2</td>
<td>15</td>
<td>70% 30%</td>
</tr>
<tr>
<td>FE 444</td>
<td>Intro For Engr. Design</td>
<td>1</td>
<td>12</td>
<td>50% 50%</td>
</tr>
<tr>
<td>FE 450</td>
<td>Adv. For Engr. Design</td>
<td>1</td>
<td>10</td>
<td>10% 90%</td>
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<tr>
<td>FE 480</td>
<td>Silvicultural Engr. Sys.</td>
<td>1</td>
<td>9</td>
<td>60% 40%</td>
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<td>ESC 322</td>
<td>Forest Ecosystems</td>
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<td>60</td>
<td>80% 20%</td>
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<td>CFR 400</td>
<td>Natural Resource Conflict Mgmt.</td>
<td>1</td>
<td>40</td>
<td>60% 40%</td>
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</table>

1. Enter the appropriate percent for each type of class for each course (e.g., 75% lecture, 25% recitation).
## Table 3. Faculty Workload Summary
### Forest and Ecological Program

<table>
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<tr>
<th>Faculty Member</th>
<th>FT or pt</th>
<th>Classes Taught 2000-2001</th>
<th>Total Activity Distribution²</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Teaching</td>
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<tr>
<td>Susan Bolton</td>
<td>FT</td>
<td>FEE 425/525 (4 credits – Autumn)</td>
<td>30%</td>
</tr>
<tr>
<td>Jim Fridley</td>
<td>FT</td>
<td>FEE 404 (1 Credits – Spring)  FEE 444 (4 Credits – Winter) ME 495/499 (4 credits – Spring)</td>
<td>40%</td>
</tr>
<tr>
<td>Peter Schiess</td>
<td>FT</td>
<td>FEE 341 (4 credits – Autumn)  FEE 345 (5 credits – Spring) FEE 346 (4 credits – Winter) FEE 404 (1 credit – Autumn and Winter) FEE 423/523 (4 credits – Winter) FEE 451 (5 credits – Spring) FEE 452 (5 credits – Spring)</td>
<td>50%</td>
</tr>
<tr>
<td>Bruce Larson</td>
<td>FT</td>
<td>FEE 480 (3 credits – Autumn)  FM 328 (4 credits – Winter) FM 323 (3 credits – Spring)</td>
<td>30%</td>
</tr>
<tr>
<td>Gerard Schreuder</td>
<td>FT</td>
<td>FEE 430 (3 credits – Summer, Autumn, and Spring) QSCI 381 (5 credits – Winter)</td>
<td>30%</td>
</tr>
<tr>
<td>Eric Turnblom</td>
<td>FT</td>
<td>QS 486 (3 credits – Autumn)  FEE 368 (4 credits – Winter) QS 482 (5 credits – Winter) FM 362 (5 credits – Winter)</td>
<td>40%</td>
</tr>
</tbody>
</table>

1. Indicate Term and Year for which data apply.
2. Activity distribution should be in percent of effort. Members' activities should total 100%.
3. Indicate sabbatical leave, etc., under "Other."
### Table 4. Faculty Analysis
Forest and Ecological Engineering Program

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>FT or PT</th>
<th>Highest Degree</th>
<th>Institution from which Highest Degree Earned &amp; YY Year</th>
<th>Years of Experience</th>
<th>Professional Registration (in Indicate State)</th>
<th>Level of Activity (high, med, low, none) in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan Bolton</td>
<td>Associate</td>
<td>FT</td>
<td>Ph.D.</td>
<td>New Mexico State, U.</td>
<td>0</td>
<td>NM, WA (CE)</td>
<td>ASCE – Med</td>
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<tr>
<td>Jim Fridley</td>
<td>Professor</td>
<td>FT</td>
<td>Ph.D.</td>
<td>U. of Washington 1984</td>
<td>1</td>
<td>WA (ME)</td>
<td>ASAE – High, ASME, COFE Low</td>
</tr>
<tr>
<td>Peter Schiess</td>
<td>Professor</td>
<td>FT</td>
<td>Ph.D.</td>
<td>U. of Washington</td>
<td>3</td>
<td>Switzerland</td>
<td>COFE - Low, Med.</td>
</tr>
<tr>
<td>Bruce Larson</td>
<td>Professor</td>
<td>FT</td>
<td>Ph.D.</td>
<td>U. of Washington</td>
<td>0</td>
<td>None</td>
<td>SAF-Med, Med</td>
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<tr>
<td>Gerard Schreuder</td>
<td>Professor</td>
<td>FT</td>
<td>Ph.D.</td>
<td>Yale University</td>
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<td>None</td>
<td>SAF – Low, Med.</td>
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<tr>
<td>Eric Turnblom</td>
<td>Assistant</td>
<td>FT</td>
<td>Ph.D.</td>
<td>U. of Minnesota</td>
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<td>None</td>
<td>SAF – Low</td>
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</table>

*See below

The level of activity should reflect an average over the current year (year prior to visit) plus the two previous years.

### Table 5. Support Expenditures
Forest & Ecological Engineering Program

<table>
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<tbody>
<tr>
<td><strong>Operations (1)</strong></td>
<td>$78,973</td>
<td>$37,770</td>
<td>$49,832</td>
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<td>(not including staff)</td>
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<tr>
<td><strong>Travel (2)</strong></td>
<td>$1,882</td>
<td>$1,435</td>
<td>$2,106</td>
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<td><strong>Equipment (3)</strong></td>
<td>$605</td>
<td>$1,214</td>
<td>$14,042</td>
<td>$16,000</td>
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  (a) Institutional Funds
  (b) Grants and Gifts (4)

| Graduate Teaching Assistants | $8,375 | $13,584 | $4,200 | $5,200 |
| Part-time Assistance (5)     | $1,403 | $1,619  | $500   | $750   |
Appendix I
(Continued)

B. Course Syllabi
ABET Course Syllabus

Course: FEE 341 – Timber Harvesting

Course Coordinator: Peter Schiess

Catalog Description: Timber harvesting methods and planning procedures. Logging cost and production control. Environmental and safety considerations as related to logging and road construction.

Course Overview: Harvesting is the final phase as well as the beginning of a new forest or business cycle that usually extends over several decades. Forest harvest operations are usually the most expensive aspect in the forest business, both economically and environmentally.

A solid grounding in design principles, covering equipment and harvest operations, assessment of safety issues and environmental impact assessment are all part of the regular job when designing timber harvest operations. The forest engineer must clearly understand the objectives of the forest management plan and in the case of conflicting objectives and constraints, limits of acceptable performance must be established for environmental and other forest values. The forest engineer must then maximize the forest values within these constraints.

Course Prerequisites: FE 346 – Design of Low Volume Roads
FE 368 – Natural Resource Measurements

Textbook or other required material: Provided on the class web page:
http://courses.washington.edu/fe341/

Course Objectives: At the end of the course the student should be able to:
1. Explain the basic harvesting systems, its components and functions
2. select the appropriate timber harvesting systems based on the Silvicultural prescriptions
3. Analyze the forces acting in skyline cables, guy lines and tailholds in relation to wire properties, cable yarding systems, tree characteristics and ground profile
4. Calculate payloads and deflections as a function of cable yarding systems, wire properties and ground profiles.
5. Design an appropriate setting layout based on terrain features and equipment characteristics
6. Perform basic economic analysis for evaluating designs for a harvesting operation based on equipment and timber characteristics
7. Access and utilize variety of non-textbook information pertinent to design (e.g. codes/standards, government regulations, handbooks, computer-based resources, etc.).

Topics Covered:
1. Cable systems and cable system mechanics
2. Payload analysis for various skyline and carriage configurations
3. Forces in guylines and stump/tailhold anchoring
4. Production and cost analysis for various harvest systems
5. Mechanized operations
6. Loggers perceptions
7. Work safety and state regulations governing logging operations
8. Wire rope mechanics
9. Harvest setting design
10. Computer usage: Use of deflection and payload programs, production and cost algorithms, use of spreadsheets to solve harvesting design problems and perform economic analysis
11. Laboratory projects:
   - Landings, Anchors, Guy lines, Tail trees
   - Payload Analysis Assignment
   - Tail Tree Analysis Assignment
   - Cost-Production Analysis Assignment
   - Wire rope mechanics
   - Setting Analysis: Logger's Perception 6a
   - Logging Equipment Appraisal 6b
   - Yarding Production Estimation 6c

Class/Laboratory Schedule:
Class – Monday & Wednesday, 1:30-3:20pm
Lab – Friday 1:30-3:20pm

Contribution of Course to meeting the Professional Component:
An FEE Core Requirement

Relationship of Course to Program Objectives:

<table>
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<th>Class Objectives</th>
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<th>1B</th>
<th>1C</th>
<th>1D</th>
<th>1E</th>
<th>1F</th>
<th>2A</th>
<th>2B</th>
<th>2C</th>
<th>2D</th>
<th>2E</th>
<th>3A</th>
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<td>2. select the appropriate timber harvesting systems based on the Silvicultural prescriptions</td>
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<td>3. Analyze the forces acting in skyline cables, guy lines and tailholds in relation to wire properties, cable yarding systems, tree characteristics and ground profile</td>
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<td>4. Calculate payloads and deflections as a function of cable yarding systems, wire properties and ground profiles.</td>
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<td>5. Design an appropriate setting layout based on terrain features and equipment characteristics</td>
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<td>6. Perform basic economic analysis for evaluating designs for a harvesting operation based on equipment and timber characteristics</td>
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<td>7. Access and utilize variety of non-textbook information pertinent to design (e.g. codes/standards, government regulations, handbooks, computer-based resources, etc.)</td>
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1 = Students that have satisfied objective and beginning to progress towards program outcome
3 = Students that have satisfied objective and made substantial progress to achieving outcome
5 = Students that have satisfied objective and make enough progress to reach the desired outcome
ABET Course Syllabus

Course: FEE 346 - Design of Low Volume Roads

Course Coordinator: Peter Schiess

Catalog Description: Theory combined with field practice. Engineering activities from pre-reconnaissance, grade-line location through design and construction issues discussed in context of class field project. Topics covered include road geometry, construction costing, vehicle-road and road-stream interactions, road maintenance strategies to minimize environmental impacts, and road de-commissioning.

Course Overview: The course is designed to provide the necessary knowledge and skills to understand the fundamentals of road systems and vehicle interaction in low-volume road systems typical in forested watersheds and/or other, remote locations. FE 346 focuses on developing the analytical tools used in low volume road design (LVRD). The tools needed to cover LVRD cover a spectrum ranging from analytical and engineering –based principles (geometrics, force diagrams) to environmental-empirical assessment such as sediment generation from truck tire-surface interaction. The principles of LVRD are demonstrated by taking the students step-by-step through the design process from the initial map location to the final design project. (4 credits)

Course Prerequisites: CEE 316 – Surveying Engineering

Textbook or other required material: Provided on the class web page: http://courses.washington.edu/fe346/

Course Objectives: At the end of the course on LVRD the student should be able to:

1. Identify the controlling road design criteria governing a specific road design project
2. Calculate the necessary road design parameters such as alignment geometrics, earthwork and cost parameters
3. Take a road project from its inception (paper plan) through the various design phases (field location of gradeline, traversing of preliminary design line and final road design, including costing)
4. Synthesize appropriate road design objectives (e.g. truck performance requirement) with road alignment needs
5. Field locate appropriate gradelines, curves and stream crossings in relation to stated road design parameters such as governing road management objectives, vehicle characteristics, and topographic conditions

Topics Covered

1. Computer Usage: Use of road design software, truck simulation models, sedimentation generation models, and culvert design models, hydrologic models.
2. Laboratory Projects
3. Vehicle tracking characteristics. Students are instructed to identifying basic vehicle parameters that determine off-tracking
4. Road design: Designing the appropriate location lines based on user & construction costs.
5. Culvert design: Use of appropriate culvert design procedure
6. Ballast surfacing design: Use of appropriate ballast thickness designs algorithms
7. Grade line location procedure and Curve lay-out in the field
8. Preliminary line traverse in the field
9. Truck simulation model: Assessment of road alignment in relation to truck performance

Class/Laboratory Schedule:
Class – Wednesday & Friday, 2:30-4:20pm
Lab – Friday 4:20-6:20pm

Contribution of Course to meeting the Professional Component:
An FEE Core Requirement

Relationship of Course to Program Objectives:

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<td>3. Take a road project from its inception (paper plan) through the various design phases (field location of gradeline, traversing of preliminary design line and final road design, including costing)</td>
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<td>4. Synthesize appropriate road design objectives (e.g. truck performance requirement) with road alignment needs</td>
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<td>5. Field locate appropriate gradelines, curves and stream crossings in relation to stated road design parameters such as governing road management objectives, vehicle characteristics, and topographic conditions</td>
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ABET Course Syllabus

Course: FEE 368 - Natural Resource Measurements

Course Coordinator: Eric Turnblom

Catalog Description: Introduction to principles of measurement, basic field measurement skills, measurement of vegetation, including stand examination, timber cruising, size, weight, volume and biomass of trees, and stream flow. Laboratories include field exercises on sampling techniques for trees and lesser vegetation and linear regression modeling to predict quantities from basic measurements. (4 credits)

Course Overview: FE 368 gives students the basic skills in using the most relevant instruments for navigating through forests and measuring basic ecosystem components. The course introduces students to forest navigation to rough precision, to aerial photo interpretation, to the measurement of trees and forests, to the measurement of forests as ecosystems, and to forest inventory as a sampling process. The measurement of primary forest products is also covered as well as basic survey design.

Course Prerequisites: IND E 315 or Q SCI 381 or Equivalent


Also required: Sturdy waterproof or water resistant footwear, engineering paper, Rite-in-Rain surveying notebook, rain suit, 3.5” High Density diskette(s) or zip disks, hand compass (azimuth), hard hat.

Course Objectives: At the end of this course on natural resources measurements the student should be able to:
1. Navigate through any forest using simple instruments,
2. Analyze and interpret the inherent variation of natural resources,
3. Understand and apply log rules and conversion factors to features of the natural resource base in order to quantify primary forest products,
4. Use modern measurement devices for trees,
5. Characterize tree attributes and categorize tree populations for utilizing appropriate stem profile and volume equations,
6. Function as a competent member of an inventory crew,
7. Recognize the role of natural variation of resources in sample survey design,
8. Select appropriate sample units to maximize efficiency of a designed survey,
9. Use aerial photos as rough field navigation devices (maps)
10. Communicate effectively with foresters, scalars, biologists, and other natural resource measurement specialists.
Topics Covered:
1. Introduction to Plane Surveying
2. Brief Statistics Review
3. Contents of Logs & Scaling
4. Individual Tree measurements & Instrumentation
5. Volume / Taper equations/systems
6. Inventory Sampling units
7. Forest Inventory as sampling process
8. Aerial Photo Interpretation
9. Tree and Stand Growth & Yield

Class/Laboratory Schedule:
Class – Monday, Wednesday & Friday, 8:30-9:20am
Lab – Tuesday, 11:30-1:20pm

Contribution of Course to meeting the Professional Component:
An FEE Core Requirement

Relationship of Course to Program Objectives:

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<td>7. Recognize the role of natural variation of resources in sample survey design,</td>
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<td>8. Select appropriate sample units to maximize efficiency of a designed survey</td>
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<td>9. Use aerial photos as rough field navigation devices (maps)</td>
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<td>10. Communicate effectively with foresters, scalars, biologists, and other natural resource measurement specialists.</td>
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ABET Course Syllabus

Course: FE 425 – Wildland Hydrology

Course Coordinator: Susan Bolton

Catalog Description: Introduction to the hydrologic cycle and basic hydrologic methods as applied to wildlands. Effects of forest management activities on hydrologic processes. (4 credits)

Course Overview: FE 425 is designed to teach students the hydrologic cycle with an emphasis on wildland watershed and the management effects on various components within the cycle. Assignments are intended for students to gain knowledge on design and hydrologic analyses. Students will perform hydrologic measurement in the field and collect to data understand and interpret the hydrologic cycle.

Course Prerequisites: N/A

Textbook or other required material: Environmental Hydrology by Andy Ward and William Elliot

Course Objectives: At the end of FE 425/525 students will be able to conduct basic hydrologic research and compute basic watershed balances including:

1. Convert units for hydrologic analyses with respect to depth, area, and volume relationships.
2. Use methods to fill in missing precipitation data and change point data to real data.
3. Measure interception and throughfall components of the hydrologic cycle.
4. Measure infiltration rates.
5. Compute soil moisture and understand how soil moisture varies in space and time.
6. Understand basic groundwater principles and the relationship between precipitation, soil moisture, groundwater, and stream flow.
7. Calculate stream velocity and discharge using different techniques.
8. Compute return periods for hydrologic events and risk
9. Knowing how and when to use the Rational Formula and the SCS Curve Number method for computing runoff.
10. Understand common errors in hydrologic data collecting and how to account for the errors.

Topics Covered:
1. Components of the Hydrologic Cycle
2. Weather and Precipitation
3. Interception and Infiltration
4. Evapotranspiration
5. Groundwater
6. Runoff and Streamflow
7. Hydrographs and Frequency Analyses
8. Water quality
9. Sediment production and transport

Class/Laboratory Schedule:
Class – Monday, Wednesday & Thursday, 11:30-12:20pm
Lab – Thursday, 12:30-2:20pm

Contribution of Course to meeting the Professional Component:
An FEE Core Requirement

Relationship of Course to Program Objectives:

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<td>2. Use methods to fill in missing precipitation data and change point data to real data.</td>
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<td>3. Measure interception and throughfall components of the hydrologic cycle.</td>
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<td>4. Measure infiltration rates.</td>
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<td>5. Compute soil moisture and understand how soil moisture varies in space and time.</td>
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<td>7. Calculate measure stream velocity and discharge using different techniques.</td>
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<td>8. Computer return periods for hydrologic events and risk</td>
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<td>9. Knowing how and when to use the Rational Formula and the SCS Curve Number method for computing runoff.</td>
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<td>10. Understand common errors in hydrologic data collecting and accounting for the errors.</td>
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<td>11. Assess the hydrolyzed cycle of a watershed and interpret data.</td>
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ABET Course Syllabus

Course: FE 430 – Aerial Photos/Remote Sensing in Natural Resources

Course Coordinator: Gerard F. Schreuder

Catalog Description: Principles of photogrammetry, interpretation, and remote sensing; and their application to management of natural resources and wildlands. Uses for watersheds, forest resources, wildlife, point and nonpoint pollution, land-use planning, and outdoor recreation. (3 credits)

Course Overview: The students will be exposed to the principle of photogrammetry, interpretation and remote sensing. Working with the same set of aerial photographs throughout the course, the students have the opportunity to apply these principles and obtain hands-on experience.

Course Prerequisites: N/A

Textbook or other required material: The students purchase a complete set of lab exercises. The books *Aerial photography and image interpretation for resource management* by D.P. Paine and *Elements of photogrammetry (with air photo interpretation and remote sensing* by P.R. Wolf are highly recommended but not required.

Course Objectives: When the students are done with the class, they should have knowledge with the following topics:
1. Uses of aerial photos and remotely sensed information for watersheds, forest resources, wildlife, point and non-point pollution, environmental monitoring, land-use planning, urban-suburban-forestry interfaces, and outdoor recreation
2. Photogrammetry and remote sensing.
3. A mastery of a wide variety of interpretation, measurement, environmental monitoring, and map making skills.

Topics Covered:
1. History of aerial photography, photogrammetry versus photointerpretation, the electromagnetic spectrum, stereoscopy and depth perception, and working with photos.
2. Scale determination methods, horizontal, and area measurements.
3. Types of photos, errors in photos, displacement sources, acquisitions, and handling of aerial photos.
5. Map construction: projection of the earth and construction of a base map.
6. Interpreting details on the photos and delineation of the effective area.
7. Transfer of details from the photos to the basemap using, first, second, and third order instruments.
8. Accuracy of maps, Theory of color, Type of emulsions used and there advantage/disadvantage, and spectral signatures.
9. Uses of photos: construction of actual and potential land use maps, environmental monitoring, forest inventory, fire detection and control, road planning, insect and disease
survey, wildlife and fish habitat surveys, urban/suburban land use planning and monitoring.
10. Case studies of uses of photos by agencies and companies.

Class/Laboratory Schedule:
Fall and Spring Quarter
Class – Tuesday & Thursday 9:30-10:20am
Lab – Tuesday, 12:30-2:20pm

Contribution of Course to meeting the Professional Component:
An FEE Core Requirement

Relationship of Course to Program Objectives:

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ABET Course Syllabus

Course: FEE 444 - Introduction to Forest Engineering Design

Course Coordinator: Jim Fridley

Catalog Description: Design process and methodology; decision making; creativity; project planning and management; engineering economics; probabilistic and statistical aspects of forest engineering design; ethical and legal issues; presentation of design project results. (4 credits)

Course Overview: FEE 444 begins the two-quarter senior capstone design projects through the development of team written comprehensive design proposals. Developing the proposal entails problem formulation, creativity, concept generation, analysis and selection, design reviews, technical communications (oral, written and graphical) and contact with clients and other stakeholders.

Course Prerequisites: N/A

Textbook or other required material:

Course Objectives: By the end of this course, the student will be able to implement the following in the context of engineering design challenges:
1. Define and describe engineering design using a process model
2. Function as part of a design team.
3. Communicate design information.
4. Formulate design problems
5. Assess and explain the design needs for a specific project and identify objectives and constraints.
6. Generate alternative design concepts
7. Select (or eliminate) design concepts based on a rational decision model
8. Access and utilize variety of non-textbook information pertinent to design (e.g. codes/standards, government regulations, handbooks, computer-based resources, patents, etc.).
9. Evaluate design concepts for performance and cost.
10. Identify and address engineering and environmental ethics issues.
11. Propose a detailed design project plan including a schedule and a budget.
12. Communicate a design proposal using written, oral, and graphical communication tools.

Topics Covered:
1. Engineering versus science
2. Professional journals
3. Design process models
4. Decision making
5. Design proposal development
6. Teamwork
7. Formal problem definition
8. Stakeholder identification
9. Stakeholder analysis
10. Stakeholder expectations
11. Functional requirements
12. Design constraints
13. Conceptual design
14. Creative processes / idea generation
15. Design parameters
16. Specifications
17. Sources of design information
18. Gathering information
19. Benchmarking
20. Reliability, robustness and quality
21. Performance evaluation
22. Cost evaluation
23. Engineering and Environmental Ethics

24. Intellectual property
25. Task sequencing
26. Task scheduling
27. Project resource allocation
28. Project budget development
29. Design reviews
30. Technical and business communication (oral and written)

Class/Laboratory Schedule:
Class – Monday & Wednesday, 10:30-11:20am
Lab – Friday, 11:30-12:20pm

Contribution of Course to meeting the Professional Component:
Capstone Design Sequence Course

Relationship of Course to Program Objectives:

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<td>2. Function as part of a design team.</td>
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<td>5. Assess and explain the design needs for a specific project and identify objectives and constraints</td>
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<td>6. Generate alternative design concepts</td>
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<td>7. Select (or eliminate) design concepts based on a rational decision model</td>
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<td>9. Evaluate design concepts for performance and cost.</td>
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<td>11. Propose a detailed design project plan including a schedule and a budget.</td>
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<td>12. Communicate a design proposal using written, oral, and graphical communication tools</td>
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ABET Course Syllabus

Course: FEE 450 - Advanced Forest Engineering Design

Course Coordinator: Peter Schiess

Catalog Description: Capstone design course emphasizes application of forest engineering design principles. State-of-the-art methods and technology used to craft an implement a natural resource development plan. (15 credits)

Course Overview: This unique capstone design course allows the student to participate in a real-life, team-oriented design project combining most, if not all, aspects of their previous studies.

Cooperating closely with the sponsoring landowners, the seniors complete a watershed resource development and transportation plan for a large forested area with extensive exposure to computer technology, environmental assessment methods, road location and design and forest operations.

Course Prerequisites: FEE 341 – Timber Harvesting
FEE 346 – Design of Low Volume Roads
FEE 444 – Introduction to Forest Engineering Design

Textbook or other required material: Material is available of the web
http://courses.washington.edu/fe450/

Course Objectives: By the end of the course, the student will be able to implement the following in the context of forest engineering design challenges:
1. Assess and explain the design needs for a specific project and identify objectives and constraints
2. Gather problem-specific information and propose design plan/schedule
3. Create design alternatives
4. Model and analyze system performance
5. Select preferred options and develop final design
6. Explain design using written, oral, and graphical communication tools.
7. Access and utilize variety of non-textbook information pertinent to design (e.g. codes/standards, government regulations, handbooks, computer-based resources
8. Perform basic economic analysis for evaluating design alternatives
9. Function as part of a design team

Topics Covered: Dependent on the specific project provided by the client. However, the topics center on issues of access and management strategies to provide raw material flow from site to market under various constraints both physical and regulatory/political.

Class/Laboratory Schedule: Course meets at Pack Forest for the duration of the quarter. An office environment is created with work/office hours and work habits rather than traditional lecture style.
**Contribution of Course to meeting the Professional Component:**
Capstone Design Sequence Course

**Relationship of Course to Program Objectives:**

<table>
<thead>
<tr>
<th>FEE 450</th>
<th>Forest and Ecological Engineering Program Outcomes</th>
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<tbody>
<tr>
<td>1. Assess and explain the design needs for a specific project and identify objectives and constraints</td>
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ABET Course Syllabus

Course: FE 480 - Silvicultural Engineering Systems

Course Coordinator: Bruce Larson

Catalog Description: Engineering design of systems for establishing, nurturing, and culturing trees for eventual harvest and use as industrial feedstock. (3 credits)

Course Overview: Course considers the growth and development of forest stands. Emphasis is placed on repeatable patterns of stand structure over time. By understanding how the structure changes, students are able to understand how equipment and operations can be tailored the site conditions of each forest type. Course is taught from the perspective of understanding how manipulations can affect species and tree size.

Course Prerequisites: N/A


Course Objectives: By the end of the class, the students should be able to understand the following:
1. Forest and ecological processes.
2. How management and engineer activities affect forest and ecological processes.
3. The background to design forest and ecological systems and tools to implement them to achieve future desired condition.
4. Quantitative and analytical skills to enable them to practice forest and ecological engineering.
5. The ability to interpret past and future forest conditions given to field a situation with extremely many variables.
6. Local specific forest ecosystems and a global understanding through emphasizing uniformity of process.
7. The ability to continue developing their understanding of ecosystems as new situations and information arise.
8. Present and future issues related to forest ecosystems.

Topics Covered:
1. Stages of even-age stand development
2. Uneven-age stand development
3. Pure and mixed species stands
4. Role of disturbances (including management)
5. Regeneration mechanisms
6. Quantification of stand development

Class/Laboratory Schedule:
Class – Tuesday & Thursday, 8:30-9:20am
## Contribution of Course to meeting the Professional Component:

An FEE Core Requirement

### Relationship of Course to Program Objectives:

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<th>FEE 480</th>
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<td>5. To give students the ability to interpret past and future forest conditions given to field a situation with extremely many variables.</td>
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<td>6. To give students an understanding of both locally specific forest ecosystems and a global understanding through emphasizing uniformity of process</td>
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<td>7. To give students the ability to continue developing their understanding of ecosystems as new situations and information arise</td>
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<td>8. To give students and understanding of present and future issues related to forest ecosystems.</td>
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ABET Course Syllabus

Course: ESC 322 - Forest Ecosystems

Course Coordinator: J.K. Agee

Catalog Description: Introduction to forest ecosystems, principles of forest ecology, vegetation classification, history of development of Pacific Northwest vegetation, succession, competition, nutrient cycling, ecology and classification of decomposers and insects, use of ecological information in forest management. One Saturday field trip required. (3 credits)

Course Overview: This is a general introduction to forest community ecology, dealing primarily with function and levels of organization above the species (communities, ecosystems). ESC 322 is the lecture portion, ESC 323 is the lab (field portion).

Course Prerequisites: Junior standing and basic biology


Course Objectives: Students will understand the structure and function of forest ecosystems. Successional patterns, forest disturbances, and the context of forest ecology information in forest management are covered.

Topics Covered:
1. Introduction to Forest Ecosystems
2. Forest Biomes – Evolution
3. Forest Biomes - World and Northwest
4. Forest Biomes - Forest Classification
5. Forest Biomes - Productivity
6. Forest Biomes - Productivity
7. Decomposers and the Soil Ecosystem
8. Decomposers - Biogeochemical Cycles
9. Coarse Woody Debris
10. Forest Succession
11. Forest Succession
12. Forest Succession
13. Forest Succession
14. Wildlife as Consumers
15. Principles of Insect Ecology
16. Insects as Consumers
17. Introduction to Forest Insects
18. Introduction to Forest Insects
19. Forest Stand Dynamics
20. Forest Stand Dynamics
21. Forest Disturbance - Fire
22. Forest Disturbance - Fire
23. Forest Disturbance - Wind
24. Forest Disturbance – Water
25. Riparian Ecology and Management
27. Implications for Forest Management
28. Implications for Forest Management

Class/Laboratory Schedule:
  Class – Monday, Wednesday & Friday, 9:30-10:20am
  Lab – Three Thursday field trips + Lab Reports (one west Cascades trip, one east Cascades
            trip, one prairie/forest ecotone trip

Contribution of Course to meeting the Professional Component:
  An FEE Core Requirement

Relationship of Course to Program Objectives:
  This ecology class address Program Objective 1A—the students will have the ability to apply
  knowledge of mathematics, science and engineering—with an emphasis on science.
ABET Course Syllabus

Course: CFR 400 - Natural Resource Conflict Management

Course Coordinator: Clare Ryan

Catalog Description: Introduction to the causes, dynamics, and consequences of natural resource conflicts as well as the range of procedural interventions used to manage conflict. Specific cases of environmental conflict and alternative dispute resolution procedures are examined. Emphasis on developing skills to effectively analyze, manage, and resolve natural resource conflicts. (3 credits)

Course Overview: This course is designed to give students an introduction to the causes, dynamics, and consequences of natural resource conflicts, as well as an understanding of the range of possible intervention tools that can be used to manage conflict. The course will help students identify the range of skills necessary to effectively manage conflict, and strengthen their understanding of the possibilities offered by alternative means of dispute resolution methods, as well as some of the constraints on the use of the process. By applying concepts to actual cases, students will build a framework for analyzing and managing environmental and natural resource conflicts.

Course Prerequisites: N/A

Textbook or other required material:
3. Course reading pack (students have to purchase)
4. Role-play exercises.

Course Objectives: When the students are done with the class, they should have knowledge with the following topics:
1. Causes, dynamics and consequences of natural resource and environmental conflicts.
2. Understand the range of possible intervention tools traditionally used to manage disputes (regulation, litigation, etc.) and analyze why these mechanisms frequently fail when applied to natural resources and environmental disputes.
3. Identify the range of skills necessary to effectively manage natural resource and environmental conflicts, which strengthens their understanding of the possibilities and the constraints offered by collaboration, mediation and consensus building.

Topics Covered:
1. Conflict as a Resource
2. The Nature of Environmental Conflict
3. Theoretical Perspective on Conflict
4. Multi-party Collaboration and Mediation Processes
5. Culture and Negotiation/Environmental Justice
6. Organizational Structures/Capacity for Collaboration and Negotiation
7. Date, Science, and Technical Information

Class/Laboratory Schedule:
   Class – Wednesday & Friday, 8:00-9:20am

Contribution of Course to meeting the Professional Component:
   An FEE Core Requirement

Relationship of Course to Program Objectives:
   This course relates to Program Objective 3D—Students will understand that life-long learning is a necessity for maintenance of professional competency.
C. Faculty Resumes
1. **Name and Academic Rank:**
   Gerard F. Schreuder - Professor of Forest Statistics and Economics

2. **Degrees with fields, institutions, and date:**
   - **B.S. (Forestry)** 1958 Agricultural University, Wageningen, Holland
     1959 International Training Center for Aerial Survey, Delft, Holland, Certificate in Photogrammetry and Photo interpretation
   - **M.S. (Forestry)** 1960 Agricultural University, Wageningen, Holland; Major in Mensuration/Economics
   - **M.S. (Statistics)** 1967 North Carolina State University; Minor in Mathematics
   - **Ph.D. (Economics)** 1968 Yale University

3. **Number of years service on this faculty:** 31 years
   - 1970 Associate Professor
   - 1973 Director of Center for Resource Management
   - 1974 Professor
   - 1980 Department Chair
   - 1989 Professor

4. **Other related experience:**
   - 1974-present Professor of Forest Statistics and Economics, College of Forest Resources, University of Washington, Seattle, WA
   - 1980-1982 Acting Chairman of Physical Sciences Division, College of Forest Resources
   - 1980-1982 Chairman of Management and Social Sciences Division, College of Forest Resources
   - 1982-1992 Chairman of the Department of Forest Products and Engineering, College of Forest Resources
   - 1992-1997 Chairman of the Department of Forest Management and Engineering, College of Forest Resources
   - 1997 Acting Chair of Forest Management, Forest Engineering and Paper Science and Engineering

5. **Consulting/Patents:**
   - Evaluated a Forest Development project for USAID in Honduras. 1999
   - Appointed to Editorial Board of the Journal of Applied Earth Observation and Geoinformation. 1999-present
   - Evaluated the organization and function of the Forest Services in Argentina for the World Bank. 1999
   - Analyzed the training needs of the personnel in the Argentinean Forest Service for the World Bank 1999
   - Co-chair of the Synthesis team, set up to evaluate and summarize five years of activities in the College of Forest Resources. 2000
   - Chair - Search Committee for Director of the Center for International Trade in Forest Products 2000
   - Member of the World Bank evaluation team for Honduras. 2000
   - Chair for the Search Committee for Director and Professor of Precision Forestry Cooperative 2001
   - External assessor and evaluator for the University Putra in Selangor, Malaysia, Faculty of Forestry 2000-2003
6. **State(s) in which registered:**
   N/A

7. **Principal publications of last five years:**

8. **Scientific and Professional Societies:**
   Phi Kappa Phi, North Carolina State University
   Sigma Xi, Yale University
   Society of Dutch Agricultural Engineers
   Royal Academy of Agricultural Science (Dutch; nominated in 1982)
   Who's Who in American Science
   American Association for the Advancement of Science
   Society of American Foresters
   American Society of Photogrammetry
   American Statistical Association
   American Economic Association
   Forest Products Research Society
   Society of American Foresters

9. **Honors and Awards:**
   Lecturer of the Year (1986)
   Honorary Alumnus of the University of Washington (1992)

10. **Institutional and Professional Service in the last five years:**
    2000-present Leader Remote Sensing and Laser mapping research program, University of Washington
    Co-director Precision Forestry, an Advanced Technology Initiative, University of Washington

11. **Professional development activities in the last five years:**
    I am primarily active in analyzing the international trade of forest products, tariff and non-tariff barriers, econometric projections, and the role of forestry in economic development. I also do work in environmental monitoring with aerial photos and remotely sensed materials, and in the area of measurements using photogrammetric techniques as it relates to natural resources, including water.

Prepared by

Gerard Schreuder

Date
1. **Name and Academic Rank:**
   Peter Schiess – Professor of Forest Engineering

2. **Degrees with fields, institutions, and date:**
   - Dipl. Forest Eng. ETH, Swiss Federal Institute of Technology, Zuerich, Switzerland 1968
   - Ph.D. College of Forest Resources, University of Washington 1975

3. **Number of years service on this faculty:** 26 years
   - 1975 Research Assistant Professor
   - 1977 Assistant Professor
   - 1983 Associate Professor
   - 1989 Professor

4. **Other related experience:**
   - 1968-1969 Research Engineer, Federal Institute of Forest Research, CH-8903 Birmensdorf, Switzerland. Working on problems of saturated soil moisture movement and drainage of saturated soils
   - 1985-1987 Advisor to Department of Natural Resources
   - 1985-1988 Advisor to Food and Agriculture Organization, United Nations, Rome, Italy.
   - 1994- Scientific Advisor, Temperate Forest Foundation
   - 1992-2000 Forestry Training Center, Forks, WA
   - 2000- Program leader, Forest & Ecological Engineering

5. **Consulting/Patents:**
   - Road Issues 1993

6. **State(s) in which registered:**
   Switzerland

7. **Principal publications of last five years:**

8. Scientific and Professional Societies:
Council on Forest Engineering

9. Honors and Awards:
   1999 Recipient of McMc Resources endowed professorship in Forest Engineering
   1993 Recipient of the Burlington Northern Foundation's Faculty Achievement Award for excellence in teaching.

10. Institutional and Professional Service in the last five years:
   1996 Expert witness for Champion International, Inc
   1998 Chair, Council on Forest Engineering Symposium
   1989-1998 Chair, Promotion an d Tenure Committee M&E Division, CFR
   1998- Expert witness for the State of Washington Dept. of Nat. Ress
   1989-1999 Chair, Elected Faculty council, CFR
   2001 Chair, International Mountain Logging and 11th PNW Skyline Symposium

11. Professional development activities in the last five years:
   Current Research: timber harvest planning as a subset of landscape level analysis, road and transportation issues in relation to stream habitat conservation.

   • FAO, United Nations, Rome, Italy, August 1999. Road construction practices.
   • Int. Mountain Logging and 11th PNW Skyline Symposium, Corvallis, OR, 1999
   • NCASI, Nat. Council for Air & Stream improvements, Portland, 2000
   • 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4): Alberta, Canada, 2000
   • Mayr-Melnhof Forstbetriebe, Graz, Austria, 2000. Workshop on cable yarding
   • Transportation Planning & NETWORK-2000 Analysis Workshop, Pack Forest, 2001
   • Joint FAO/ECE/ILO Comm. on Forest Technology, Mgt. and Training, Austria

Prepared by _____________________________________________________________
Peter Schiess                                       Date
1. **Name and Academic Rank:**
   Jim Fridley – Professor of Forest Engineering

2. **Degrees with fields, institutions, and date:**
   - B.S. 1975-1979 University of California, Davis; Engineering
   - M.S. 1979-1981 Michigan State University; Agricultural Engineering
   - Ph.D. 1981-1984 University of Washington; Mechanical Engineering

3. **Number of year’s service on this faculty:** 12 years total
   - 1988 Original Appointment as Associate Professor with tenure
   - 1994 Promotion to Professor

4. **Other related experience:**
   - 1981 - 1984 Research Asst. - U. of Wash - 4 yrs
   - 1984 - 1988 Assistant Professor - Auburn University - 4 yrs
   - 1988 - Present Professor - Univ. of Wash. - 12 yrs

5. **Consulting/Patents:**
   - Mayer, Smith and Roberts, L.L.P. in Shreveport, Louisiana on behalf of a major logging equipment manufacturing company - Analyze and report on machine design and operational characteristics of a tree felling machine involved in an injury accident during a logging operation.

6. **State(s) in which registered:**
   - PE – Washington – 1990 to Present

7. **Principal publications of last five years:**
8. Scientific and Professional Societies:
   ASAE – 19 yrs – (joined 1981)
   ASME – 15 yrs (joined 1985)
   American Society for Engineering Education
   Council on Forest Engineering -- 18 years
   Society of American Foresters -- (not current)

9. Honors and Awards:
   N/A

10. Institutional and Professional Service in the last five years:
    Associate editor: for The Transactions of the ASAE and The Applied Journal for Engineering in Agriculture. 1996-present
    Chair, ASAE Engr. Accreditation Committee (P-204) 1998
    Chair, UW Faculty Council on Student Affairs 1999, 2000
    Chair, UW Faculty Council on Student Affairs 1999, 2000
    Member, City of Seattle Bicycle Advisory Board 1998 - present

11. Professional development activities in the last five years:
    Leadership Tomorrow class of 2001 (year-long community leadership development program.
    ABET accreditation workshops (on and off campus)
1. **Name and Academic Rank**
   Susan Bolton – Associate Professor

2. **Degrees with fields, institutions, and date:**
   - BS 1976 with Distinction, Organismic Biology, Univ. of Colorado, Boulder, CO.
   - MS 1979 Zoology, North Dakota State University, Fargo, ND
   - MS 1985 Civil Engineering, New Mexico State University, Las Cruces, NM.
   - Ph.D. 1991 Civil Engineering, New Mexico State University, Las Cruces, NM.

3. **Number of years service on this faculty:** 9 years
   - 1992 I.T.T. Rayonier Research Assistant Professor
   - 1994 Assistant Professor
   - 1996 Associate Professor

4. **Other related experience:**
   - 1985-1991 Engineer I-Dept. of Civil, Ag., and Geol. Engineering, New Mexico State University
   - 1991-1992 Engineer III - Dept. of Civil, Ag. and Geol. Engineering, New Mexico State University
   - 1991-1992 College Asst. Professor- Dept. of Civil, Ag. and Geol. Engineering, N.M. State University

5. **Consulting/Patents:**
   N/A

6. **State(s) in which registered:**
   Registered Professional Engineer (Washington No. 0031521); Registered Professional Engineer (NewMexico No. 11464); Engineering Intern Certification, 1984

7. **Principal publications of last five years:**

8. **Scientific and Professional Societies:**
   - American Society of Civil Engineers
   - International Assoc. of Hydrologic Sciences
   - American Water Resources Association
Watershed Management Council
American Geophysical Union

9. **Honors and Awards:**
   Chi Epsilon 1987, New Mexico State University
   Phi Kappa Phi Honor Society 1983, New Mexico State University
   Phi Beta Kappa Honor Society 1976, University of Colorado

10. **Institutional and Professional Service in the last five years:**
    Session moderator - ASCE Watershed Management Symposium, Fort Collins, CO 6/00; AWRA meetings Portland 9/00; Int’l Meeting on Wood in Rivers, Corvallis, OR 10/00
    Past Chair, Watershed Mgt. Tech. Committee, EWRI, Am. Soc. of Civil Engineers, Oct. 1999-present
    Vice-Chair, Watershed Management Technical Committee ASCE, Oct. 1995-1997
    Mentor, Humphrey Fellow Program, Sept 1995 to present
    Organizing Committees - ASCE Watershed Management Symposium August 1995
      Int’l Conference on Wood in Rivers, October 2000
    Advisory Boards - Western Washington Chapter, American Water Resources Association
    Creeks, Drainage and Watershed Committee for Seattle Public Utility
    Reviewer - New Mexico Water Resources Research Inst.; J. of Irrigation and Drainage (ASCE);
    USDA National Research Initiative; NSF/EPA Water and Watersheds Proposals; Water Resources Research; Northwest Science; Earth Surface Processes and Landforms; Ecological Engineering; AAAS Research Competitive Service
    UW Engineering College Committee on Technical Writing Evaluation
    CFR, Forest Management and Engineering Division, PMT Committee
    Graduate Program Leader, Forest Engineering and Hydrology

11. **Professional development activities in the last five years:**
    Process Based Channel Design, Short Course Oct. 9-13, 2000, Interfluve
    International Conference on Wood in Rivers, Oct. 2000, Corvallis, OR
    AWRA, Riparian Symposium, Portland, OR. August 2000.
    ASCE Watershed Management Symposium, June 2000, Fort Collins, CO.
    Summit 2000 March 29-30 Olympia, WA
    Soils for Salmon, Feb. 29, 2000, Vancouver, WA
    Workshop on WDFW Streambank Stability Guidelines, Lacey, WA Feb 16, 2000
    WFPF annual meeting, Oct. 28, 1999, Seattle WA
    NCASI Annual West Coast meeting, Sept. 30, 1999, Portland, OR
    Soils for Salmon, October 1999, Tacoma, WA
    Workshop on Ecological Considerations in Hydraulic Engineering Projects April 1999, Taichung, Taiwan
    Workshop on Soil Conservation and Stream Habitat Protection, April 1999, Taichung, Taiwan

Prepared by ____________________________
Susan Bolton                        Date
1. **Name and Academic Rank**  
Bruce Larson – Acting Professor

2. **Degrees with fields, institutions, and date:**  
   - **A.B.** 1976 Biology, Harvard University, Cambridge, Massachusetts  
     *Magna cum laude*  
   - **M.F.S.** 1978 Silviculture and Forest Genetics, School of Forestry and Environmental Studies, Yale University, New Haven, Connecticut  
   - **Ph.D.** 1982 College of Forest Resources, University of Washington, Seattle, Washington

3. **Number of year’s service on this faculty:** 1 year  
   2000 Acting Professor

4. **Other related experience:**  
   - 1982 Post-doctoral fellow, School of Forestry and Environmental Studies, Duke University, Durham North Carolina  
   - 1982-1987 Assistant Professor of Forest, Yale University  
   - 1987-1989 Associate Professor of Forestry, Yale University  
   - 1990-2000 Director of School Forests, Lecturer in Forest Management, School of Forestry and Environmental Studies, Yale University

5. **Consulting/Patents:**  
   N/A

6. **State(s) in which registered:**  
   N/A

7. **Principal publications of last five years:**  

8. **Scientific and Professional Societies:**
   - Society of American Foresters
   - Xi Sigma Pi (honorary forestry society)
   - Sigma Xi (honorary scientific research society)

9. **Honors and Awards:**
   - Inducted into Order of the Golden Bulldog (for exceptional service to Yale University)

10. **Institutional and Professional Service in the last five years:**
    1991 - Present Fellow of Barkley college
    1990 - 2000 Director of School Forests, Lecturer in Forest Management, School of Forestry and Environmental Studies, Yale University
    1999 - 2000 Co-Chair of Yale Forest Forum (YFF)
    1987 - 2000 Responsible for administration of Yale School’s Cooperative Agreement and Exchange Program with the University of Munich, Germany.

Yale Alumni Association
- 1982-Present: Executive Committee
- 1982-Present: Faculty Liaison
- 1985-Present: Treasurer
- Member of National Research Committee

11. **Professional development activities in the last five years:**
    - Member of Scientific Advisory Board to Mistik Management Ltd., Meadow Lake, Saskatchewan, Canada.
    - Consultant to Mistik Management Ltd.
    - Consultant to S.D. Warren Company
    - Senior Consultant for Interforest, LLC.
    - President of CONNWOOD, Inc.
    - Expert witness for Boston Law firm on forestry matters
    - Review of articles for *Forest Science & Environmental Management*

Prepared by: ____________________________ Date: ____________________________

Bruce Larson
1. **Name and Academic Rank**
   Eric Turnblom – Assistant Professor

2. **Degrees with fields, institutions, and date:**
   - BS 1983 (Honors) in Forest Science, University of Illinois
   - M.Sc. 1986 Forest Mensuration, University of British Columbia
   - Ph.D. 1994 Biometrics, University of Minnesota

3. **Number of years service on this faculty:** 7 years
   - 1994 Assistant Professor

4. **Other related experience:**
   - 1986 - 1990 Graduate Research/Teaching Assistant
     University of Minnesota, St. Paul, MN
   - 1990 - 1994 Assistant Specialist, Dept. Forest Science
     University of California, Berkeley, CA
   - 1994 - present Assistant Professor of Forest Mensuration
     College of Forest Resources, UW, Seattle, WA
   - 1994 - present Silviculture Project Leader, Stand Management Cooperative (SMC)
     College of Forest Resources, UW, Seattle, WA
   - 1996 Acting Director, Stand Management Cooperative
     College of Forest Resources, UW, Seattle, WA
   - 1997 Journey Silviculturist Certification Panel member
     USFS PNW Regional Office, Portland, OR

5. **Consulting/Patents:**
   - 1995: VESTRA Resources, Inc. Redding, CA
     Project involved analysis of the effects of relaxing stand attribute boundary conditions on accuracy of typing forest stands from GIS or aerial photo generated maps.
     Continuation of 1995 project. Produced many refinements to the methods and generated usable and extensible source code to produce map accuracy based on user defined “fuzz” boundary conditions.
     Provided expertise to Mr. Crimp who desired to update forest inventory DBH measurements to second inventory taken 11 years later.
   - 1999: USDA Forest Service, Wenatchee Forestry Sciences lab, Wenatchee, WA
     Provided statistical advice to scientists there on methods available for analyzing their complicated data set.
   - 2001: Northwest Indian Fisheries Commission, Olympia, WA
     Review proposed study design with focus on experimental design and sampling procedure. Critique procedures to determine site class and evaluate sample adequacy for overstory measurements. Identify areas that need to be revised, expanded or clarified. Provide written suggestions for addressing study design and sampling issues that are identified.

6. **State(s) in which registered:**
   N/A

7. **Principal publications of last five years:**

8. Scientific and Professional Societies:
1982 - present XI SIGMA PI (Forest Science Honorary)
1982 - present Society of American Foresters (SAF)

9. Honors and Awards:
1982 Meritorious Achievement Award, USFS
1984 – 86 University Graduate Fellowship, U.B.C.
1990 Exceptional Achievement Fellowship, University of Minnesota

10. Institutional and Professional Service in the last five years:
Invited Speaker/participant at the Multiple Species Initial Spacing Trial Workshop held in Maple Ridge, British Columbia, Canada, 6-7 Oct 1997. Spoke to several issues, including experimental design, logistical constraints, and existing trials and species mixes in the U.S. Approx. 30 participants, including University faculty, scientists, and professional foresters.

Invited participant at the Tree List Generation Workshop, University of British Columbia, Vancouver, B.C. Canada, 21 January 2000. Discussed why, when, and how to simulate tree lists with applications to inventory, monitoring, modeling, silviculture and management. Approx. 25 participants, including university faculty, research scientists, and professional biometricians.

11. Professional development activities in the last five years:
1996 Attended Western Mensurationists Conference, Welches, OR.
1998 Attended Western Mensurationists Conference, Port Ludlow, WA. Co-planned meetings and moderated a session.
Fall 1999 Attended Quarterly forum on Teaching and Learning. Sponsored by UW Center for Instructional Research and Development (CIDR).
Winter 1999 Attended Quarterly forum on Teaching and Learning. Sponsored by UW Center for Instructional Research and Development (CIDR).
Spring 1999 Attended Quarterly forum on Teaching and Learning. Sponsored by UW Center for Instructional Research and Development (CIDR).

Prepared by
Éric Turnblom

Date