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B. Accreditation Summary

Criterion 1. Students

Introduction

The Faculty[1] of Environmental Resources and Forest Engineering recognizes that a continual influx of capable, motivated students is in our best interest and the interest of the College. We also recognize that undergraduate recruitment and admissions is a dynamic process, and faculty have to be involved to assure the proper number of capable students enter our Forest Engineering Program. In this section, we document of activities in the College recruitment and admissions process.

Recruitment

The Faculty of Environmental Resources and Forest Engineering devotes considerable effort to attract high quality students to our program. We devoted a semester-end retreat to work with our External Advisory Council[2] to focus our 'marketing' message, and work closely with the Office of Undergraduate Admissions. We participate in all college wide open houses, and provide informational sessions for potential students and their families.

We decided upon the following messaging statements:

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[1] The State University of New York College of Environmental Science and Forestry (SUNY-ESF) does not have academic departments. Therefore, Faculty refers to an individual academic unit, while faculty refers to an individual or group of academic employees.
[2] We will address our relationship to our Advisory Council under a later criterion.

Acquire engineering skills today to meet tomorrow's environmental challenges

- *Affordable Excellence*: Small classes taught by experienced, committed faculty

- *Active Learning*: Hands-on design of innovative solutions to environmental challenges

- *Community Participation:* Students and faculty working to engineer a healthier world

- *Professional Life:* An accredited engineering program that meets national and international needs

We have worked as a Faculty and within the College to incorporate our messages consistently across the ways we communicate with potential students. We have, for example:

- Modified our website to include the messages, and images to support them.

- Created (with the help of the Office of News and Publications) departmental stationary with the messaging statements. We use it to communicate with potential students.

- Incorporated the statements into our program presentation the current issue of the College's Viewbook.

- Updated our Faculty PowerPoint presentation to include the statements and images to support them.

We participate in College Open Houses and other activities administered by the Admissions Staff. At the sessions, we provide information that includes:

- our mission statement and statement of educational objectives and outcomes

- alumni survey data,

- a description of the current implementation of our curriculum, and

- examples of undergraduate student work illustrating the 'hands-on' and project nature of some of our courses.

We have a strategy in place to communicate with potential students during the admissions process. The Faculty Chair has, via an internal web application, access to students at different stages in the application process. The strategy has evolved and currently consists of the following steps.

- A letter to all applicants, with the most recent copy of *ESF Engineer*[3], the Faculty Newsletter. We include a pen and a statement asking the applicant to use it to complete their application.

- A letter to all accepted students with an ESF t-shirt.

- A letter to all applicants who have paid a deposit and copy of Henry Petroski's book ***Invention By Design: How Engineers Get from Thought to Thing*** (Harvard University Press, 1996).

- Additional letters to students designated as potential Presidential Scholars.

These mailings are generated from our Faculty office[4], from our Faculty budget, and are in addition to any mailings the potential students receive from the admissions or any other office. We initially instituted this strategy in the recruiting year 1999-2000; our total student deposits increased from 7 in the summer of 1999 to 20 in the summer of 2000. We instituted our marketing messages during the recruiting year 2004-2005.

We have also reviewed the financial aid forms filed by potential students with the College Office of Financial Aid, and have discovered that our major competitors for students are (in no particular order) Clarkson University, the College of Agriculture and Life Sciences at Cornell University, and the University of Vermont. Interestingly, we do not compete for students with Syracuse University, although we occasionally accept a transfer student from there. We are pleased to be in such exalted company.

Assessment of Recruiting Activities

We use three indicators to assess the quality of our recruiting efforts: admissions data, feedback from parents and potential students, and feedback (quantitative and informal) from the admissions office.

[3] Copies of ESF Engineer can be seen at http://www.esf.edu/newspubs/eng/. We developed the newsletter as a way to communicate with alumni, parents, prospective students, and friends of our program.

[4] As will be discussed later, there are no academic deans at ESF: Each Faculty Chair reports directly to the Provost. Each Faculty office therefore performs tasks that would be shared with a Dean's office on larger campuses.

ADMISSIONS DATA:

Our accepted students have increased as shown in the data below (July data):

- 2003 – 18 paid deposits
  2004 – 25 paid deposits
  2005 – 30 paid deposits
  2006 – 21 paid deposits (as of May 10)

FEEDBACK FROM PARENTS AND POTENTIAL STUDENTS

Our informal assessment is that our marketing messages resonate with potential students and parents. This has been apparent from informal discussions with newly admitted students, who have mentioned how our willingness to communicate directly with students played an important part in their decision to attend SUNY ESF.

FEEDBACK FROM OFFICE OF ADMISSIONS

The Admissions staff administers a survey instrument after each Open House event, and the ERFEG faculty chair reviews the data with that office. The results of the surveys indicate a much better than average to excellent audience appreciation of the ERFEG informational sessions and presentations. The overall involvement of the Faculty in connecting with prospective students, applicants and admitted students has strengthened the yield rate at each level.

The next table shows some quantitative feedback form recent ERFEG presentations at College admissions functions.

Table B1-1. Feedback from Office of Admissions Surveys
Rating ERFEG Presentations

Session	Average Rating (1 = Poor to 5 = Excellent)
Fall 2002	4.29
Spring 2003	4.14
Fall 2003	4.16
Spring 2004	4.50
Fall 2004	4.50
Spring 2005	4.38
Fall 2005	4.50
Spring 2006	4.00

Admissions Process

The College of Environmental Science and Forestry accepts undergraduate students directly from high school, and as transfer students from other institutions of higher learning. Summary statistics as to numbers of students from whom the College received deposits as a result of the 2005-2006 recruiting season are presented in Table B1-2.

Table B1-2. Summary Admissions Statistics (as of May 10, 2006)
College of Environmental Science and Forestry

	Paid Deposits by Entry Level			
Unit	Freshman	Transfer Freshman(*)	Sophomores	Juniors
Entire College	252	25	108	22
Three engineering units	45	1	13	1
Environmental Resources and Forest Engineering	19	0	2	0

(*) Transfer freshman refers to a student who enters with less than 30 transfer credits, and who has been a resident student at another college or university.

The College operated on an upper division, transfer mode during the late 1980's. The College reverted to a freshman admission mode in 1990, and, as the data in Table B1-1 suggest, the College is becoming both a four year and transfer institution, with a higher percentage of students entering as true freshmen.

The fact that we admit students at different entry points means we have to pay careful attention to issues of advanced placement and evaluation of transfer credits. Fortunately, our experience as an upper division school has given us considerable experience with these issues.

We work closely with the Office of Undergraduate Admissions to evaluate both true freshmen and transfer students. The Office of Undergraduate Admissions implements admissions criteria developed in cooperation with each Faculty. College admissions standards and data are summarized in Volume II of this report.

[6] Each Faculty is free to conduct advising as they see fit. For example, the Faculty of Landscape Architecture has a professional, non-faculty advisor for all first and second year students. We like our model in that we feel it allows us to 'connect' with our students early in their career here.

Admission of freshmen applicants is based on the review of their high school transcript, results of either the SAT or ACT examination, information provided on the State University of New York application and the ESF Supplemental Application and their response to an essay question regarding their interest in the College and their intended program of study. Freshmen admission is based on selective criteria with emphasis placed on the rigor of their high school program, especially in the areas of mathematics and science. The SUNY-wide Mission Review process includes an Undergraduate Admissions Selectivity component for first time, full-time students (freshman). ESF is classified as a group 2 campus, the second most selective level in the matrix. This matrix guides our review of freshmen applications.

Transfer students may enter the College as sophomores and juniors based on the review of post-secondary transcripts, the SUNY application, and the ESF supplemental application. Transfer admission is based on a review of the student's performance in all previous post-secondary work and the compatibility of the course work with the requirements of their intended program of study at ESF. The overall performance criteria are classified as selective, with emphasis on areas most important to the foundation needed for their program of study.

Each Faculty establishes criteria for evaluation of transfer credit for freshman and transfer students. These criteria are used to guide the preparation of Transfer/Articulation Guidelines for each of the cooperative colleges with which ESF has a transfer agreement. The staff of the Office of Undergraduate Admission is responsible for interpreting the criteria in preparation of the Transfer/Articulation Guidelines and in reviewing course work from colleges with which we have no formal transfer agreement. The Faculties are consulted on individual course content equivalency as needed.

The Faculty and the Office of Undergraduate Admissions work very closely in establishing the admission criteria for freshmen and transfer applicants to the forest engineering program. Additionally, the Faculty Chair is consulted on individual applications as needed. Table B1-3 shows data as to admissions and acceptances for the academic programs at ESF. It is clear that the ERFEG program is the most selective among the ESF programs.

Table B1-3. Admissions and Percentage Accepted by ESF Academic Program, as of April 15, 2006				
Program	Applications (2006)	Applications (2005)	Per Cent Accepted (2006)	Per Cent Accepted (2006)
Chemistry	54	50	70	66
Environmental and Forest Biology (all majors)	555	554	64	64
Environmental Resources and Forest Engineering	**107**	**109**	**55**	**59**
Environmental Science	114	99	70	71
Environmental Studies	110	96	67	71
Forest and Natural Resources Management (all majors)	107	90	61	67
Landscape Architecture	106	88	66	66
Paper Science and Engineering (all majors)	34	29	62	59

Advisement and Progress Towards Degree Completion

ACADEMIC ADVISING

The term academic advising conveys multiple meanings. We limit the discussion of academic advisement in this section to the limited sense of choosing appropriate courses so as to graduate from the forest engineering program. Broader issues associated with academic advising (e.g., pre-professional activities) are discussed in other sections.

Once admitted, the Office of Undergraduate Admissions cooperates with the Registrar's Office to produce a SUNY-ESF Curriculum Plan Sheet. The Plan Sheet includes the 8 semesters of course work (for true freshmen) and generic underclass requirements (for transfer students). Transfer credits granted at the time of admissions, or by petition after admission, are indicated on the transfer student version of the Curriculum Plan Sheet, with reference to the institution where the student obtained the credits.

The Registrar provides the Faculty Chair with a copy of the curriculum plan sheet for each incoming student prior to their first semester, and the Chair works with the Registrar's Office to create a class schedule for each student. During this process, the Faculty Chair assigns an academic advisor to each incoming student on a more or less random basis. Every faculty member[6] thus participates in academic advising, and it is typically the case that a student stays with one advisor until degree completion. The following table shows faculty members and number of advisees, current as of the Spring 2006 semester.

Table B1-4. Advising Load per ERFEG Faculty Member

Faculty Member	Freshman	Sophomore	Junior	Senior
Daley	2	4	3	3
Endreny	5	6	1	1
Hassett	5	8	9	8
Kroll	1	6	3	4
Quackenbush	5	3	2	4
Sheng	3			
Mountrakis				

Note: Data accessed from college intranet on March 7, 2006. Note further that Hassett advises 19 students in the environmental science program. Dr. Mountrakis joined our Faculty in October 2005, and will be assigned advisees starting Fall 2006.

The ERFEG faculty have agreed upon a general strategy with respect to academic advising, and that strategy is made known to the forest engineering students via an Advising Handbook[7]. The Handbook identifies advisee responsibilities and is distributed during a freshman orientation session. Basically, we ask that student's take responsibility for their progress through the program. We require that they come to academic advising with a current copy of their curriculum plan sheet, and to come with a suggested schedule for the next semester. The advisor thus has a clear picture as to how the student is progressing towards completion of degree requirements. In addition, the academic advisor can review the details of a student's admissions portfolio by accessing an electronic folder via the Registrar's page on the college web site. The portfolio is password-protected and can be accessed only by the faculty advisor and Faculty Chair.

The Faculty Chair requests from the Registrar current grade reports for every student at the end of each semester[8], and reviews them to detect issues and trends (e.g., downward trend in a student's GPA, etc.). The Chair communicates these with each student and faculty advisor by email before the beginning of the next semester.

[7] A pdf of the Advising Handbook is included on the CD attachment to this document. It should be noted that, as a result of a campus-wide discussion of advising issues during the Fall 2006 semester, members of two other Faculties asked for electronic copies of our Handbook.
[8] To our knowledge, Chair Hassett is the only Faculty Chair who avails himself of this opportunity.

ASSESSMENT OF ADVISING

It has proven difficult to obtain assessment data related to academic advising. The College participates in a SUNY-mandated Student Opinion Survey[9], which generates data about a variety of issues (e.g., satisfaction with bookstore, etc.), but the data are reported for the institution as a whole and not by student home faculty. Example data from the Student Opinion Survey for the most recent offering is presented in the Table B1-5.

A review of the data in Table B1-5 shows that the survey results, while of institutional interest, are of little utility in terms of program level assessment.

[9] The Student Opinion Survey is given every three years. The College decided to add optional items about academic advising for the Spring 2006 administration. In addition, data will be provided by academic major. We do not have access to these data at the time of this writing.

Table B1-5. Student Opinion Survey Subscales Analysis - Spring 2003 ESF Ratings in Comparison to All SUNY Institutions Descending Order		
Item Number	Item	Ranking
A.1.	Academic Experience	Extremely High
A.5.	Overall Satisfaction	Extremely High
C.5.	Student Harmony	Extremely High
C.7.	Student Voice	Extremely High
B.2.	Campus Computing	Very High
C.3	Personal Integration	Very High
C.11.	Campus Security	Very High
A.2.	Academic Skill Development	High
B.1.	Student-Faculty & Staff Relations	High
C.2.	Financial Aid Services	High
C.9.	Career Planning & Placement	High
A.3.	Classroom Experience	Average Plus
A.4.	Life Skill Development	Average Plus
B.3.	Academic Facilities & Grounds	Average Plus
B.4.	Course Availability/Registration	Average Plus
B.6.	Library Services & Facilities	Average Plus
C.1.	Social Environment & Services	Average Plus
C.6.	Athletic & Recreation Programs	Average Plus
C.8.	Residence Halls	Average Plus
C.10.	Ancillary Campus Services	Average Plus
B.5.	Academic Advising	Average
C.4.	Health Services	Average

The Faculty Chair discusses academic advising issues on an as needed basis with the Dean of Students, the Registrar, and other college officials in a position to hear student concerns. The consensus from these college officials is that, although academic advising is an area of concern on campus, the comments do not come from forest engineering students.

PROGRESS TOWARDS DEGREE COMPLETION

The College's Academic Standards Committee reviews every ESF student whose cumulative Grade Point Average falls below the 2.000 required for graduation. That committee decides on whether a student is placed on academic probation or dismissed. A student dismissed for poor academic performance has the right to appeal the decision. If the student elects to appeal, an expanded version of the committee hears and decides on the appeal. In any case, the Faculty Chair and academic advisor are apprised of the decisions, and the student is required to meet with his or her academic advisor to discuss ways to improve the student's academic performance.

Copies of the two forms of the Curriculum Plan Sheet are included at the end of this section. The first two pages show a Curriculum Plan Sheet for a student admitted as a freshman, while the next three pages show a Curriculum Plan Sheet generated for a transfer student. The Curriculum Plan Sheet is updated every time the program is modified.

The Curriculum Plan Sheet provides a semester by semester check against which a student can gauge his or her progress towards the Bachelor of Science degree. The student and advisor can identify and rectify any issues related to progress towards the degree.

There are in addition some further checks. The Registrar has to certify that students who apply to take the Fundamentals of Engineering Examination are within one year of completing all degree requirements. The Registrar also reviews all senior engineering students in anticipation of their graduation, and alerts the Faculty Chair of any potential discrepancies. The Faculty Chair confers with the advisor and/or student to understand and, if possible, work towards resolving the issue.

After Fall or Spring Commencement, the Faculty Chair and Registrar review the academic records of all potential graduates. A Diploma is generated if and only if both the Faculty Chair and Registrar agree that all published degree requirements have been met. The Registrar and Faculty Chair both certify the completion of all degree requirements by their signatures.

Retention Data

The College has adopted several initiatives to improve retention as a whole. In particular, the establishment of dormitory-based Learning Centers has had a positive effect on retention and academic achievement. In addition, a formal Retention Committee, with representatives from each Faculty unit was established. Their charge is to consider all issues affecting student performance and retention.

The retention data in any one Faculty unit therefore reflect both College and Faculty policies and initiatives. The retention and persistence data presented in the next table indicate that, of the 1997 to 2001 freshman cohorts, 32 of 52 (62%) graduated from the forest engineering program, and all within five years of entry. The persistence data for the 2002 to 2005 cohorts is even more encouraging, with 83% of the freshman admits still in the program. Table B1-6 provides similar data for ESF and all baccalaureate programs in SUNY.

Table B1-6. Retention and Persistence Data for Forest Engineering Students – 1997 to Present
(Data as of March 2006)

Date of Admission	Entering Cohort	Degree Recipients	Dates of Degrees	Persisters
1997	13	7	May 2001 (7)	0
1998	8	5	Dec 2001 (1), May 2002 (3) May 2003 (1)	0
1999	5	3	May 2003 (3)	0
2000	14	11	May 2004 (10) May 2005 (1)	0
2001	12	6	May 2005 (4) May 2006 (2)	1
2002	18			13
2003	8			5
2004	22			18
2005	21			21

Note: Data in table is for true freshmen only. Transfer students enter as freshmen, sophomores, or juniors and are thus more difficult to track in this fashion.

Table B1-7. Retention and Persistence Data for ESF and All SUNY Baccalaureate Programs – 1998 to 2000
(Status as of Fall 2004)

Date of Admission	Entering Cohort	4-Year Degree Recipients	6-Year Degree Recipients	Persisters
1998 (ESF)	142	58 (41%)	93 (65%)	1
1998 (SUNY)	21,987	8,951 (41%)	12,960 (59%)	388
1999 (ESF)	131	57 (44%)	80 (61%)	3
1999 (SUNY)	23,288	9,517 (41%)	13,005 (56%)	1,010
2000 (ESF)	181	73 (40%)	-	38
2000 (SUNY)	23,188	9,286 (40%)	-	4,876

Note: ESF 4-year degree data are somewhat misleading in that one program (Bachelor of Landscape Architecture) is a five year program. Data provided from SUNY central administration.

Curriculum Plan Sheets

The next several pages show Curriculum Plan Sheets for first a freshman and then a transfer student. The plan sheets are updated within 24 hours of a course action (e.g., drop, add, grade posting, addition of transfer credits) and so the student and advisor both have access to a near-real time display of a student's progress towards the degree.

The Plan Sheets are updated by the Registrar's Office as curriculum changes are approved by Faculty governance.

Printed: May 1, 2006

Advisor:
Entered: 2005 as a Freshman

LOWER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Program of Study:Forest Engineering

Freshman Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
EFB226	General Botany	4						
PHY211	General Physics I	3						
PHY221	General Physics Lab I	1						
MAT295	Calculus I	4						
CLL190	Writing And The Environment	3						
FEG132	Orientation Seminar: FEG	1						

Freshman Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
PHY212	General Physics II	3						
PHY222	General Physics Lab II	1						
MAT296	Calculus II	4						
APM153	Computing Methods	3						
GENEDU	General Education Courses	6						
GENEDU	General Education Courses							

Sophomore Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FCH150	General Chemistry Lec I	3						
FCH151	General Chemistry Lab I	1						
ERE221	Engineering Mechanics-Statics	3						
ERE225	Engineering Graphics	1						
MAT397	Calculus III	4						
FOR207	Introduction to Economics	3						

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering
Advisor:
Entered: 2005 as a Freshman

Printed: May 1, 2006

LOWER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Sophomore Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FCH152	General Chemistry Lec II	3						
FCH153	General Chemistry Lab II	1						
ERE362	Mechanics Of Materials	3						
ERE222	Engineering Mechanics-Dynamics	2						
MAT485	Differential Equations & Matrix Algebra	3						
ELE231	Elec Engineering Funda	3						
CLL290	Writing, Humanities & Envrn	3						

Admission Officer: Date: This date indicates that all Admissions requirements have been satisfied.

UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Junior Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
ERE371	Surveying For Engineers	3						
FOR321	Forest Ecology & Silviculture	3						
MAE341	Fluid Mechanics	4						
EFB335	Dendrology	2						
FEG300	Engineering Design	1						
GENEDU	General Education Course	3						

Junior Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FEG340	Engineering Hydrology & Hydraulics	4						
FEG350	Introduction to Remote Sensing	2						
FEG363	Photogrammetry I	3						
APM395	Probability & Statistics for Engineers	3						
GENEDU	General Education Course	3						
ERE351	Basic Engineering Thermodynamics	2						

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering
Printed: May 1, 2006
Advisor:
Entered: 2005 as a Freshman

UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Senior Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	ESF Semester	ESF Grade	Type
FEG410	Structures I	4						
FEG420	Harvest Systems Analysis	1						
FEG430	Engineering Decision Analysis	3						
CIE337	Soil Mechanics & Foundations I	4						
FOR360	Principles of Management	3						
ERE440	Water Pollution Engineering	3						

Senior Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	ESF Semester	ESF Grade	Type
FEG454	Power Systems	2						
FEG437	Transportation Systems	3						
FEG489	Forest Engineering Planning & Design	3						
ELEEDS	Elective in Engineering Design Sequence	6						
ELEEDS	Elective in Engineering Design Sequence							

SUMMARIES

Lower Division Credit Hours		Upper Division Credit Hours		Grand Summary Credit Hours	
Required:	66	Required:	65	Required:	131
Earned:		Earned:		Earned:	
In Progess:		In Progess:		In Progess:	
Deficient:		Deficient:		Deficient:	

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering
Advisor:
Entered: 2005 as a Freshman

Printed: May 1, 2006

General Educational Requirements

You must complete one course per category.

Categories	ID	Name	Credits	Transfer College	----- ESF ----- Sem	Grade	Type

MATHEMATICS

MAT295	MAT296	MAT397	MAT485
CALCAB1	CALCAB2	CALCBC1	CALCBC2

NATURAL SCIENCES

EFB226	FCH150	FCH152	PHY211
PHY212	BOTBIO	ZOOBIO	GENCHE1
GENCHE2	GENPHY1	GENPHY2	ENGPHY1
ENGPHY2			

SOCIAL SCIENCES

FOR207	MICECON	MACECON

AMERICAN HISTORY

Available for all students:

EST201	USHIS1	USHIS2	FOR204

For students scoring above 84 on the US History Regents:

EST361

WESTERN CIVILIZATION

EIN471	FOR203	EURHIS1	EURHIS2

OTHER WORLD CIVILIZATIONS

EST200

HUMANITIES

CLL290	LANCOM1	LITCOMP

THE ARTS

EFB215	LSA205	LSA206	LSA182
ARTHIS1	MUSTH1	ARTHIS2	MUSTH2

BASIC COMMUNICATION

CLL190

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering
Advisor:
Entered: 2005 as a Freshman

Printed: May 1, 2006

INFORMATION ON HOW TO READ THIS PLAN SHEET

Student must match "required courses" with "earned courses" in order to satisfy curriculum requirements. Required courses are derived from the SUNY- ESF Course Catalog for the appropriate year. Earned courses May be a combination of ESF courses and transfer courses, including advanced placement credit. The

"ID" refers to the Course ID, which my be an official College course ID or an abbreviation for a transfer course or course requirement.

Transfer courses will refer to the number of a transfer college identified at the top of the plan sheet.

Courses taken at ESF will display the semester taken and the grade recieved.

"Semester" - term and year in
which course was taken:
FA - Fall term
SP - Spring tem
SU - Summer term

"Type" of Course
IP - course in
Memo - Credit added via memo
Petn - credit added via petition

This report has been prepared to assist you in determining your academic progress at SUNY College of Environmental Science and Forestry. If this report does not appear to be accurate, contact your academic advisor and bring this report with you. Please be advised that final confirmation that you have met all degree requirements is subject to approval by your Faculty Chair and the Registrar.

CERTIFIED FOR

Hours: __________ GPA: __________

______________________ Registrar ______________ Date

______________________ Faculty Chair/ Designee ______________ Date

End of Curriculum Plan Sheet

Program of Study:Forest Engineering
Advisor:
Entered: 2005 as a Transfer

Printed: May 1, 2006

LOWER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES			EARNED COURSES					
ID	Name	Credits	ID	Credits	Transfer College	ESF Semester	ESF Grade	Type
BIOL	General Biology	4						
CHEM1	General Chemistry w/Laboratory I	4						
CHEM2	General Chemistry w/Laboratory II	4						
ENGPH1	Engineering Physics w/Laboratory I	4						
ENGPH2	Engineering Physics w/Laboratory II	4						
CALC1	Calculus I	4						
CALC2	Calculus II	4						
CALC3	Calculus III	4						
DIFEQ	Differential Equations	3						
COMP1	English with a Focus on Writing	3						
COMP2	English with a Focus on Literature	3						
ECON	Economics	3						
ENGDRW	Engineering Drawing (Graphics)	1						
COMSCI	Computer Programming	3						
ENGMEC	Engineering Mechanics (Statics and Dynamics)	5						
ELESCI	Electrical Science	3						
GENED	General Education Electives (one course from each of the the following areas: American History, Western Civilization, Other World Civilization, The Arts)	9						
GENED	General Education Electives (one course from each of the the following areas: American History, Western Civilization, Other World Civilization, The Arts)							
GENED	General Education Electives (one course from each of the the following areas: American History, Western Civilization, Other World Civilization, The Arts)							

Admission Officer: Date: This date indicates that all Admissions requirements have been satisfied.

UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering Printed: May 1, 2006
Advisor:
Entered: 2005 as a Transfer

UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES | EARNED COURSES

Junior Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
ESF332	Seminar for New Transfer Students	0						
ERE362	Mechanics Of Materials	3						
ERE371	Surveying For Engineers	3						
FOR321	Forest Ecology & Silviculture	3						
MAE341	Fluid Mechanics	4						
EFB335	Dendrology	2						
FEG300	Engineering Design	1						

Junior Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FEG340	Engineering Hydrology & Hydraulics	4						
FEG350	Introduction to Remote Sensing	2						
FEG363	Photogrammetry I	3						
APM395	Probability & Statistics for Engineers	3						
ERE351	Basic Engineering Thermodynamics	2						
GENED	General Education Electives (one course from each of the the following areas: American History, Western Civilization, Other World Civilation, The Arts)	3						

Senior Year - Fall Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FEG410	Structures I	4						
FEG420	Harvest Systems Analysis	1						
FEG430	Engineering Decision Analysis	3						
CIE337	Soil Mechanics & Foundations I	4						
FOR360	Principles of Management	3						
ERE440	Water Pollution Engineering	3						

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Program of Study:Forest Engineering Printed: May 1, 2006
Advisor:
Entered: 2005 as a Transfer

UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES / EARNED COURSES

Senior Year - Spring Semester

ID	Name	Credits	ID	Credits	Transfer College	- - - ESF - - Semester	Grade	Type
FEG454	Power Systems	2						
FEG437	Transportation Systems	3						
FEG489	Forest Engineering Planning & Design	3						
ELEEDS	Elective in Engineering Design Sequence *	6						
ELEEDS	Elective in Engineering Design Sequence *							

SUMMARIES

Lower Division Credit Hours		Upper Division Credit Hours		Grand Summary Credit Hours	
Required:	65	Required:	65	Required:	130
Earned:		Earned:		Earned:	
In Progess:		In Progess:		In Progess:	
Deficient:		Deficient:		Deficient:	

Curriculum Plan Sheet continued on next page

Program of Study:Forest Engineering
Printed: May 1, 2006
Advisor:
Entered: 2005 as a Transfer

General Educational Requirements

You must complete one course per category.

Categories	ID	Name	Credits	Transfer College	----- ESF ----- Sem	Grade	Type

MATHEMATICS

MAT295	MAT296	MAT397	MAT485
CALCAB1	CALCAB2	CALCBC1	CALCBC2

NATURAL SCIENCES

EFB226	FCH150	FCH152	PHY211
PHY212	BOTBIO	ZOOBIO	GENCHE1
GENCHE2	GENPHY1	GENPHY2	ENGPHY1
ENGPHY2			

SOCIAL SCIENCES

FOR207	MICECON	MACECON

AMERICAN HISTORY

Available for all students:

EST201	USHIS1	USHIS2	FOR204

For students scoring above 84 on the US History Regents:

EST361

WESTERN CIVILIZATION

EIN471	FOR203	EURHIS1	EURHIS2

OTHER WORLD CIVILIZATIONS

EST200

HUMANITIES

CLL290	LANCOM1	LITCOMP

THE ARTS

EFB215	LSA205	LSA206	LSA182
ARTHIS1	MUSTH1	ARTHIS2	MUSTH2

BASIC COMMUNICATION

CLL190

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Program of Study:Forest Engineering Printed: May 1, 2006

Advisor:

Entered: 2005 as a Transfer

INFORMATION ON HOW TO READ THIS PLAN SHEET

Student must match "required courses" with "earned courses" in order to satisfy curriculum requirements. Required courses are derived from the SUNY- ESF Course Catalog for the appropriate year. Earned courses May be a combination of ESF courses and transfer courses, including advanced placement credit. The

"ID" refers to the Course ID, which my be an official College course ID or an abbreviation for a transfer course or course requirement.

Transfer courses will refer to the number of a transfer college identified at the top of the plan sheet.

Courses taken at ESF will display the semester taken and the grade recieved.

"Semester" - term and year in
which course was taken:
- FA - Fall term
- SP - Spring tem
- SU - Summer term

"Type" of Course
- IP - course in
- Memo - Credit added via memo
- Petn - credit added via petition

This report has been prepared to assist you in determining your academic progress at SUNY College of Environmental Science and Forestry. If this report does not appear to be accurate, contact your academic advisor and bring this report with you. Please be advised that final confirmation that you have met all degree requirements is subject to approval by your Faculty Chair and the Registrar.

CERTIFIED FOR

Hours: ________ GPA: ________

________________ Registrar ________ Date

________________ Faculty Chair/ Designee ________ Date

End of Curriculum Plan Sheet

Summary

The ERFEG faculty are actively engaged in recruiting, retention and academic advising. In fact, the ERFEG unit is frequently cited as a model of 'best practices' on the campus.

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Criterion 2. Program Educational Objectives

College and Program Mission

The College, as a specialized College within the State University system, has its own legislative Charter. The Charter presents the foundation on which the College's mission is constructed. The Charter is enacted into law by the New York Legislature, as required by Article 121 of the New York State Education Law. Article 121 prescribes the College shall direct its efforts towards the following:

1. Teaching in the science and practice of environmental science and forestry in its several branches, including landscape architecture; environmental design; environmental and resource engineering; environmental and resource management; wildlife studies; biology, chemistry, ecology; the manufacture and marketing of forest products; and the technologies appropriate to these branches of environmental science and forestry.

2. The conduct of research, investigation, and experimentation relating to such studies whenever appropriate, including suburban or urban areas, and in commercial or industrial facilities.

3. The conduct of experiments in forest and related development and management for public, commercial, recreational and aesthetic purposes

and generally the giving of popular instruction and information concerning the elements of environmental science and forestry.

4. The operation of demonstration and public service programs with a view to acquiring, transmitting and applying knowledge concerning the scientific management and use of forest and related natural resources for human benefit.

The Mission of the State University of New York College of Environmental Science and Forestry, which is based on the Charter, is to be a world leader in instruction, research, and public service related to:

- Understanding the structure and function of the world's ecosystems;
- Developing, managing and use of renewable natural resources;
- Improving outdoor environments ranging from wilderness to managed forests to urban landscapes; and
- Maintaining and enhancing biological diversity, environmental quality and resource options.

The Forest Engineering Program evolved from within the forestry program of the College of Forestry (as it was known then) during the mid 1970s, and first attained ABET accreditation under Agriculture Engineering program criteria in 1982. The program is unique in that it evolved within a College of Forestry and not from a College of Agriculture. The College of Forestry was not (and is not) a land grant institution – Cornell University is the land grant institution in New York State. Further, the Forest Engineering Program has been closely associated with the L. C. Smith College of Engineering at Syracuse University since its creation. The relationship between Syracuse University and the State University of New York College of Environmental Science and Forestry represents a unique public – private partnership, and has worked to the advantage of both parties. All of this is to explain the unique history and nature of the current Forest Engineering program.

During the mid 1990's, the Faculty worked with various constituencies to develop a statement of mission, goals, and objectives.

The Faculty's mission statement is:

The Faculty of Environmental Resources and Forest Engineering performs teaching, research and public service activities to promote engineering practices

to meet the needs of present and future generations of New Yorkers and other citizens of the world.

The current mission statement was reviewed by ERFEG's[1] external Advisory Council in 1999, and was deemed appropriate for the unit. In 2000-01, the Faculty went through, with the rest of the College, a strategic planning exercise[2], where the mission statement was shared with the College. Again, the mission statement was deemed appropriate.

Program Educational Objectives

The educational objectives of the Faculty are to produce graduates who:

- will engage in professional engineering practice while employed by government agencies, industry or private consulting that specialize in public works and the inventory, management, design, use, restoration and protection of natural and cultural resources,

- are prepared to enter advanced academic studies involved with natural resources engineering, mapping sciences and water resources, and

- will continue to develop the knowledge and skills needed to adapt to changing technological, environmental and business conditions to the benefit of society, employer and self.

The Program Objectives were developed by the Faculty with input from its constituent groups over a number of years. The Program Objectives support the College's Charter and Mission in becoming a world leader in natural resources instruction. In reference to the Charter, the Program offers instruction in environmental design and environmental and resource engineering. Our graduates are prepared to work in rural, suburban and urban areas. The development and management of natural resources is an integral part of the Forest Engineering program. Finally, the integration of mapping sciences in Forest Engineering supports the scientific management and use of natural resources for human benefit.

The Forest Engineering program is an integral part of the College's Mission related to the development, management, use and improvement of renewable resources and outdoor environments. Notably, the Program's first objective is to produce graduates that will contribute in a professional

[1] ERFEG is a locally generated acronym for Environmental Resources and Forest Engineering.
[2] A copy of our unit's Strategic Plan is included as a pdf file on the enclosed CD.

engineering environment to the maintenance and enhancement of environmental quality and resource options, as declared in the College's mission statement.

Process By Which Objectives Are Determined And Evaluated

The general preparation of the program objectives is a coordinating process guided by the Faculty Chair. The Faculty developed the Program Objectives by engaging in review and evaluation of alumni surveys, employer surveys, and student exit surveys over the last three EAC/ABET accreditation cycles. The Program Objectives continue to evolve over time as feedback from constituent groups is evaluated.

The process of setting and evaluating objectives is continuous, although the cycle may take 4 to 6 years to complete. The steps in the process include:

1. Determine Constituency Needs
2. Establish Composite Needs
3. Select Program Objectives
4. Set Program Outcomes
5. Evaluate Program Objectives
6. Improve Program Objectives

DETERMINE CONSTITUENCY NEEDS

The program recognizes that the following constituent groups offer significant opportunity for continuous program improvement:

- Current undergraduate students;
- Graduating students;
- ERFEG[3] Advisory Council;
- Forest Engineering Alumni;
- Faculty of Environmental Resources and Forest Engineering;
- Prospective high school students;
- Parents of prospective high school students; and
- Employers

CURRENT UNDERGRADUATE STUDENTS:

Current students often provide informal, anecdotal feedback to faculty regarding the program. Taken individually, this is an imprecise method of evaluating program objectives. However, the Faculty uses this method to identify areas for further evaluation by other methods. The Exit Survey also provides information that we use to evaluate our Program Objectives.

Beginning with the Class of 1999, graduating students have been requested to complete an exit survey on their curriculum and College experience. While this survey is generally more appropriate to assess the program outcomes, some of the information regarding career plans is suitable for evaluating whether program objectives are consistent with the needs of this constituent group.

ERFEG ADVISORY COUNCIL:

The ERFEG Advisory Council meets approximately yearly to provide advice and guidance to the Faculty. Planning for the formation of the Advisory Council started in 1997, and the Council met formally for the first time in 1998. Originally comprised primarily of ERFEG alumni, the Council provides the Faculty with insight into needs of employers and engineers in today's economy[4]. A recent reconfiguration of the Council resulted in a greater percentage of non-alumni. The current composition is as listed in Table B2-1.

[4] As one example of their input, the members of the Advisory Council, in reviewing an early draft of our Objectives and Outcomes, suggested we incorporate a statement about the importance of teamwork, which we did.

Table B2-1. Composition of ERFEG Advisory Council (as of January 2006)		
Name	Affiliation	Alumnus (Yes/no)
Scott Wheeler (Chair)	Owner, Strategy Arts, Inc. 447 Beaumont Circle, West Chester, PA 19380	Yes
John Thonet, P.E.	Owner, Thonet Associates 14 Upper Kingtown Road, Pittstown, NJ 08867	Yes
Terry Madden, P.E.	Vice President, O'Brien & Gere Limited 5000 Brittonfield Parkway, Syracuse, NY 13224	No
Eric Lui, P.E.	Associate Professor and Chair Dept of Civil and Environmental Engineering Syracuse University , Syracuse, NY 13210	No
Al LaBuz, P.E.	Honeywell 5000 Brittonfield Parkway, E. Syracuse, NY 13057	No
Stan Hovey	Mapping Consultant, PB Facilities, Inc. 800 E. Leigh Street Ste. 113/20, Richmond, VA 23219	Yes
David Gerber, P.E.	VP – Blasland, Bouck & Lee 6723 Towpath Road, POB 66, Syracuse, NY 13214	Yes
Alan Galson	Retired Owner. Galson and Galson Environmental Consultants	No
Peter Gabrielsen	Regional Hydrologist National Weather Service Eastern Region 630 Johnson Avenue, PO Box 11716, Bohemia, NY 11716	Yes
Richard Elander, P.E.	Commissioner Onondaga County Water Environment Protection, 650 Hiawatha West, Syracuse, NY 13204	No
Kris Dimmick, P.E.	VP – Bernier Carr Associates 172 Clinton Street, Watertown, NY 13601	Yes
Chris Denfeld	High School Science Teacher, Hartford, CT 06101	Yes
Dan Davis, P.E.	Brown and Caldwell, 5710 Commons Park, Syracuse, NY 13214	Yes
Richard Chamberlain	Resource Manager, Plum Creek Timber POB 646, Bingham, ME 04920	Yes

ALUMNI:

The Forest Engineering alumni are important resources to the program. Faculty members will often receive informal feedback from alumni regarding skills and knowledge that could be integrated in to the program. Alumni surveys are used about every 3 years to obtain information about alumni careers and education, and to obtain feedback on career choices and development. The most recent surveys include those completed in 2002 and 2006. The survey data are discussed later in this section.

POTENTIAL STUDENTS AND THEIR PARENTS:

Prospective high school students and their parents provide informal anecdotal feedback regarding their needs. We host information sessions for prospective and accepted students at College Open House events. These events occur twice or three times each semester and provide prospective students and parents an opportunity to meet with program faculty. During these sessions, faculty will often receive feedback and questions about skills and knowledge that these students feel they need to be able to pursue their chosen fields.

EMPLOYERS:

Employers have always provided feedback to the Program on an ad hoc basis. Frequent contact between Faculty and the primary employers of graduates, along with review of current higher education literature and professional engineering literature, generally yielded a reasonable view of employer needs. However, in response to a need for a formalized process of evaluating the needs of employers, and in response to a suggestion from the Advisory Council, the Faculty conducted its first formal employer survey in 1999. A survey instrument was proposed by the Advisory Council, and modified by the Faculty of Environmental Resources and Forest Engineering. The results of the survey are discussed in Section 3.

In April 2001, the ERFEG faculty, in conjunction with the Advisory Council, invited employers to a workshop in which two questions were posed:

- What are the attributes of an ideal entry level engineer?
- How do your recent hires from our program compare to this ideal?

The results of this discussion led to several efforts to improve our program, and these efforts and their assessment are discussed in Section 3.

ESTABLISH COMPOSITE NEEDS

Semi-monthly faculty meetings are used throughout the semester to discuss administrative and programmatic issues. For two years prior to this visit, ABET-related topics have been discussed regularly at these meetings. In addition, semi-annual Faculty retreats are used as a forum to discuss accreditation-related issues. The program objectives have been regularly evaluated at these Retreats.

SELECT PROGRAM OBJECTIVES

The Program Objectives are selected based on review of constituent needs by the Faculty, as facilitated by the Faculty Chair.

SET PROGRAM OUTCOMES

The Faculty actually began its review of program objectives and outcomes in 1990 at its first Faculty Retreat. This retreat formed the basis for the stated program outcomes by identifying desirable attributes of the Forest Engineering graduate. These attributes, which pre-dated publication of the ABET EC2000, were used as the basis for the Faculty to determine the program outcomes[5]. Further detail on program outcomes is provided in Section 3.

EVALUATE PROGRAM OBJECTIVES

The analysis of alumni surveys is the most important source of information regarding how graduates are performing in the workplace. Comments from alumni regarding the program, skills and training they received are important sources for Faculty to determine areas for improvement. Survey analysis includes a determination of career specialty, employer, and career position with regard to time since graduation. Generally, the analysis by the Faculty look for trends in professional registration, advanced degrees and career specialty to indicate whether program objectives are being met.

IMPROVE PROGRAM OBJECTIVES

The greatest source of information has traditionally been the alumni survey. The constituent needs evolve gradually over time. The Program Objectives have been sufficiently broad, yet specific enough to the program, that they have not been revised since the last accreditation visit. Most of the effort in establishing the current objectives has been to clearly state the three objectives of the program and to publish these consistently worded objectives in course catalogs, on the College Web site and in other program literature.

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[5] Our original statements, as generated at the 1990 retreat, were cast in the form of Mission, Goals, and Objectives. We have had a continuing, and often lively, internal discussion as to the relationship between that format, and the ABET description of Program Objectives and Outcomes.

Attainment of Program Objectives

The Program relies primarily on alumni survey results to demonstrate that program objectives are being met. Rather than rely on specific performance measures, the Faculty uses the survey results to indicate trends over time.

SUMMARY OF 2006 ALUMNI SURVEY

The Faculty conducted a survey of Forest Engineering alumni in Spring 2006. Responses were received from 215 alumni representing approximately a 25% response rate. The surveys generally covered employment status, advanced degrees, career specialty, professional registration and professional associations. Recent graduates (classes of 2000 to 2005) were asked for input regarding the program's outcomes and objectives. Alumni were asked for voluntary comments regarding the program.

Survey responses were tabulated to aid the Faculty in assessing the success of the program in satisfying its objectives. Survey responses were grouped by decade (e.g. 2000s, 1990s, 1980s, 1970s and 1960s) to discern trends (see Table B2-2).

We consider the number of registered professional engineers to be an important indicator of alumni success and alumni awareness of professional obligations. Most significantly, 62% of alumni graduating since 2000 indicated that they have Intern Engineer status, while 52% responded that they have or intend to obtain Professional Engineer licensing. This is consistent with trends seen in the older alumni classes, where up to 74% of 1990s alumni hold a PE license. Approximately 68% of all respondents indicated that they hold, or will hold within five years, a PE license. These responses are reasonably consistent with the 1999 and 2002 alumni surveys.

Over the last two decades, we have observed a substantial increase in the number of alumni employed in private practice with consulting engineering firms. On average, 47% of all respondents reported working in private practice, but a much greater proportion (69%) of recent graduates (00-05) are employed in private consulting.

Table B2-2. Summary of 2006 Alumni Survey Response Rates (%)					
	Year of Graduation				
	1970-1979	1980-1989	1990-1999	2000-2005	Total
Number of responses =	44	60	74	29	215

Employment Status					
Full-Time Graduate Study	0	0	0	14	2
Full-Time employment	75	93	97	86	89
Position/Job Title in Previous Three Years					
Engineer	32	47	66	83	55
Manager	43	17	28	7	24
Executive/ Owner	23	10	7	0	10
Research Assistant	0	0	0	14	2
Business Classification					
Private Consulting Engineering	32	45	50	69	47
State or Federal	30	18	15	7	18
Municipal	9	8	11	3	8
Area of Concentration					
Civil Engineering	25	30	31	34	30
Environmental Engineering	14	12	20	28	18
Water Resources Management	2	17	11	21	13
Hazardous and Solid Waste Management	9	7	11	10	9
Construction Management	7	10	8	7	8
Environmental Management	7	2	8	17	7
Mapping Sciences	2	2	1	3	2
Surveying	7	3	4	0	4
Some respondents indicated more than one area of concentration					
Certification (Held or Intend to Hold within 5 years)					
Intern Engineer	0	10	24	62	20
Professional Engineer	68	67	74	52	68

Professional Organization Activity					
NSPE	23	12	15	3	15
ASCE	45	38	27	14	33
WEF	18	13	14	3	13
AWWA	18	15	16	3	14
Other	36	32	35	10	32
Professional Development and Continuing Education (Annual)					
Up to 10 hours	23	17	11	10	16
10 to 40 hours	48	57	38	34	45
Over 40 hours	7	5	16	31	13
Total Count includes alumni from 1960-1969					

These survey results (and previously examined results from 1999 and 2002) illustrate the diversity of career specialties that our graduates are capable of undertaking. Forest Engineering graduates are engaged in a number of specialized engineering disciplines, from the broad category of "Civil Engineering" to the more specific "Waste Management." Table B2-2 also illustrates how Forest Engineering graduates have shifted career specialties over the last 30 years in response to both society's needs and personal career paths. The changing face of the Forest Engineering program over the last three decades is reflected in the changes in career specialties. For example, a dramatically greater number of 2000s graduates align themselves with special fields such as Environmental Management, Water Resources Management and Hazardous/Solid Waste Management as contrasted with graduates from the 1980s or 1970s. The relative distribution of those who characterize their specialty area as civil engineering, environmental engineering, wastewater engineering, transportation engineering, and geotechnical engineering are relatively consistent across the 40 years of program graduates.

Table B2-2 illustrates the shift towards consulting engineering amongst the 1990s and 2000s graduates. Consulting engineers represent a significant constituency of our program, and will be instrumental in helping the Faculty to set objectives and outcomes in the next decade. In contrast to graduates from the 1980s and 1970s, fewer of our recent alumni are employed in state, federal or municipal government agencies. While these and the non-manufacturing commercial businesses represent a increasingly smaller percentage of our program's constituency over the last decade, they remain an important constituent group, nonetheless.

FIRST OBJECTIVE: WILL ENGAGE IN PROFESSIONAL ENGINEERING PRACTICE . . .

We consider that the Program is satisfying this Objective based on the following results:

- Nearly 70% of the 2000-2005 graduates are employed in consulting engineering.
- Approximately 73% of all alumni are employed by private firms or public sector agencies involved with engineering in the built and natural environments.
- Eighty-three percent (83%) of the 2000-2005 alumni reported that they have a job title of "Project Engineer" or equivalent.
- Twenty-eight percent (28%) of the 1990-1999 alumni indicated they have a job title of "Manager" or equivalent, while 66% are listed as a "Project Engineer".
- Sixty-eight percent (68%) of all respondents have a Professional Engineer license or are pursuing a license
- Over 80% of our alumni are aligned with principal engineering practices or engineering support related to environmental and cultural resources.
- Thirty percent (30%) of alumni indicate they are engaged in civil engineering; 18% in environmental engineering; 13% in water resources management. Many of the respondents indicated that they were involved in more than one sub-specialty in these fields.

The 2006 Alumni Survey results are somewhat similar to previous (2002 and 1999) survey results, although changes in formatting and questions make direct comparison difficult. As reported in our last Self-Study, we found that the 1999 Alumni Survey indicated that:

- Over 75% of the graduates in the 1980s and 1990s hold a Professional Engineer registration or are in the process of obtaining one.
- Nearly 90% of 1990s graduates are involved in engineering practice; 29% are engaged in civil practice, while 50% are engaged in natural resources fields.

- Sixty one percent (61%) of all respondents are engaged in engineering practice.

- Twenty-four percent (24%) characterize their area of concentration as civil practice.

SECOND OBJECTIVE: ARE PREPARED TO ENTER ADVANCED ACADEMIC STUDIES . . .

Fourteen percent (14%) of recent graduates (2000s) reported that they are currently engaged in full-time graduate study. This response is consistent with our empirical evidence that approximately 25% (4 of 15) of each class continues directly into a graduate degree program. Anecdotally, through continued communication with alumni, we are aware of 4 alumni from the last four graduating classes that are currently pursuing a PhD.

Due to a computer error that underreported graduate degrees for a subset of respondents, we were only able to determine advanced degree status for approximately 180 respondents. Of these respondents:

- 78 reported that they obtained at least one additional degree after obtaining the B.S. in Forest Engineering.

- Seven (7) reported obtaining PhD degree.

- Seven (7) obtained a B.S. Civil Engineering degree. These alumni graduated from the program prior to our first program accreditation in 1982, so they represent individuals that took advantage of 4+1 program with Syracuse University in the 1970s and early 1980s.

Of the 85 degrees that were reported, the program areas include:

- Civil and Environmental Engineering (31)

- Construction Management (3)

- Engineering/Engineering Management (4)

- Environmental Resources /Forest Engineering (10)

- Geotechnical Engineering (7)
- MBA (5)

- Water Resources Engineering (3)
- Various, including Finance, Law, Structural, Transportation, and Behavioral Science

THIRD OBJECTIVE: WILL CONTINUE TO DEVELOP THE KNOWLEDGE AND SKILLS . . .

Our graduates are demonstrating a commitment to lifelong learning and professional duty in a number of ways.

- Many of our alumni belong to at least one professional organization. The most common professional associations include National Society for Professional Engineers (15%); American Society of Civil Engineers (33%); Water Environment Federation (13%) and American Water Works Association (14%). Thirty percent (30%) of the respondents belonged to one or more associations that were not on our "short list," including AWRA, ASABE, ACEC, ASPRS, AGU, AWMA, ASHRAE, and SAF.
- Forty five percent (45%) of respondents spend between 10 and 40 hours annually engaged in continuing education and/or professional development activities.

Table B2-3.Survey of Recent Forest Engineering Graduates (2000-2005)

Program Outcome Statement	Average Response	Standard Deviation	Number of Responses
I was prepared to perform competently in an engineering environment	4.1	.64	15
I entered my job with sufficient background and tools to function effectively	4.2	.75	16
I demonstrated the ability to conceptualize problems in terms of unifying principles	4.0	.63	16
I was capable of utilizing an engineering approach to problem solving	4.2	.66	16
I was able to communicate my ideas and expectations effectively	4.1	.57	16

I was able to function effectively in a multidisciplinary teams	4.3	.60	16
I understood the need for life long learning	4.3	.88	15
(For those who went directly to graduate school): I was well prepared for graduate school	4.2	.96	4
Response Value: 5= Strongly Agree 4= Agree 3= Neutral 2= Disagree 1= Strongly Disagree			

The number of responses represents approximately 20% of the program graduates between 2000 and 2005.

There are no reported ratings of less than 3.0. Results may be influenced by the fact that the survey was not anonymous. Although respondents were given the opportunity to remain anonymous, most self-reported their name. The responses indicate a reasonably strong declaration that our alumni were well prepared to work on multidisciplinary teams, and understand the need for lifelong learning. Other areas were also reasonably strong, as well. Although the responses indicate general agreement that students felt they were able to conceptualize problems in terms of unifying principles, we suspect that there remains some confusion in students' minds about what performance criteria are associated with this outcome.

Recent alumni from the graduating classes 2000 to 2005 were asked to rate the relative importance of certain skills or knowledge for entry-level engineers during the first year of employment after graduation. Those responses are summarized in Table B2-4.

Table B2-4 Relative Importance of Selected Skills and Knowledge in 12 Months following graduation (Class of 2000-2005 Alumni)		
Number of Responses = 21	Average Rating 1 = Not important 2 = Neutral 3 = Somewhat Important 4= Very Important	Program Outcome

Technical writing	3.76	5 - Communication
Teamwork	3.52	7 – Teamwork
Public Speaking	3.43	5 - Communication
Project Management	3.38	1 – Competent in engineering environment
Ethics	3.29	6c - Attitude
Internship Experience	3.24	1 - Competent
Pursuit of continuing Education	3.24	8- Lifelong Learning
General Education	3.19	2- Sufficient background
Policy and Regulations	3.10	2 – Sufficient Background
Fiscal Management	3.10	2 – Sufficient background
CADD Skills	2.86	2 – Engineering tools
GIS	2.67	2 – Engineering tools
Part. in Prof. Org.	2.57	8 – Lifelong Learning
Computer programming	2.29	2 – Tools
Thermodynamics	1.86	6a - Knowledge

As readily seen from these results, recent graduates rate certain abilities, such as communication, professional ethics and teamwork, as being very important to their early success in an engineering environment. These abilities are consistent with our program outcomes as noted in the table. Many of the recent alumni felt that internship experience is somewhat important to have during the first 12 months of employment. There is little doubt that internship experience certainly helps with job placement and with assimilating into an engineering environment. At this time, we have no plans to institute a formal internship program. We will, however, continue to use our industry network to assist students in the efforts to obtain relevant internship or similar work experience.

Several alumni from pre-2000 graduating classes opted to respond to this question and rated entry-level engineering skills as well. Table B2-xyz summarizes those results. There is a slight difference in these ratings compared to the recent alumni, with teamwork getting unanimously nominated by these older alumni as the most important skill to possess. Technical writing follows closely, along with a knowledge of ethics, policies and regulations, project management and public speaking.

Table B2-5 Relative Importance of Selected Skills and Knowledge in 12 Months following graduation (pre-2000 Alumni)

Number of Responses = 21	Average Rating	Program Outcome

	1 = Not important 2 = Neutral 3 = Somewhat Important 4= Very Important	
Teamwork	4.00	7 – Teamwork
Technical writing	3.81	5 - Communication
Ethics	3.67	6c - Attitude
Policy and Regulations	3.50	2 – Sufficient Background
Project Management	3.36	1 - Competent
Public Speaking	3.31	5 - Communication
Pursuit of continuing Education	3.20	8- Lifelong Learning
General Education	3.19	2- Sufficient background
Fiscal Management	3.13	2 – Sufficient background
CADD Skills	2.75	2 – Engineering tools
Internship Experience	2.60	1 - Competent
GIS	2.53	2 – Engineering tools
Professional Organization	2.44	8 – Lifelong Learning
Computer programming	2.06	2 – Tools
Thermodynamics	1.63	6a - Knowledge

Criterion 3. Program Outcomes

Introduction

As described in the previous section, the Faculty developed a Mission, Goals and Objectives statement at a Faculty Retreat in May 1990. The current Program Outcomes have evolved from that original exercise. In this section, the Forest Engineering Program Outcomes are first discussed in comparison to the appropriate ABET criteria and then our Program Objectives.

Statement of Program Outcomes

Current Program Outcomes for the Forest Engineering curriculum delivered by the Faculty of Environmental Resources and Forest Engineering are to produce graduates who:

1) Are competent to perform in an engineering environment
2) Have sufficient backgrounds/tools to function effectively
3) Have the ability to conceptualize problems in terms of unifying principles
4) Are capable of utilizing an engineering approach to problem solving
5) Can communicate their ideas and expectations effectively
6) Exhibit the following attributes of a competent engineer:
   (a) Knowledge - both in understanding basic principles and in creativity in problem solving
   (b) Skills - originality and method of problem solving
   (c) Attitude - professional ethics, self-disciples, and perseverance
7) Can function effectively in a multidisciplinary team/environment
8) Understand the need for life-long learning

Relationship of Program Outcomes to Criterion 3.

The Program Outcomes listed above provide good agreement with 2006-2007 Criteria for Accrediting Engineering Programs: Criterion 3. Table B.3-1 maps the Forest Engineering Program Outcomes to the 2006-2007 Criterion 3 (a) - (k). The (a) – (k) statements are

a. an ability to apply knowledge of mathematics, science and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to met desired needs within realistic constraints such as economic, environmental,

social, political, ethical, health and safety, manufacturability, and sustainability

d. an ability to function on multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

It should be noted that many of our outcomes coincide with multiple Criterion 3 statements. We believe that "utilizing an engineering approach to problem solving" includes, in a broad sense, "engineering design."

Table B.3-1: Mapping of Forest Engineering Program Outcomes to 2006-2007 Statement of Criterion 3 (P = Primary; S = Secondary											
Forest Engineering Program Outcome	**2006 – 2007 Criterion 3**										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
1. Competent Engineer										P	S
2. Sufficient Background/Tools	S							P		S	P
3. Unifying Principles					P						
4. Engineering Approach			P								
5. Communication							P				
6. Attributes:											
6a. Knowledge	P							P			
6b. Skills		P									
6c. Attitude						P					
7. Team Worker				P							
8. Life-Long Learner									P		

Relationship of Program Outcomes to Program Educational Objectives

The Forest Engineering Program Outcomes were designed to allow us to observe and assess our Program Educational Objectives. Each of the outcomes captures some essence of a competent, successful engineer. Table B.3-2 maps the Program Outcomes and Objectives.

Table B.3-2: Mapping of Forest Engineering Program Outcomes to Program Objectives			
Program Outcome	**Forest Engineering Program Objectives**		
	Professional Engineering Success	**Academic Advancement**	**Professional Growth**
1. Competent Engineer	x		x
2. Sufficient Background	x	x	
3. Unifying Principles	x	x	
4. Engineering Approach	x	x	
5. Communications	x	x	x
6. Attributes			
6a. Knowledge	x	x	
6b. Skills	x	x	
6c. Attitude	x	x	x
7. Team Worker	x		x
8. Life-Long Learner	x	x	x

Curriculum Design and Program Outcomes

Explanation and Performance Measures

The Faculty has agreed on the following explanations of the Program Outcomes in order to:

- facilitate the internal outcome assessment process
- ease coordination with and "mapping" to the ABET Criterion 3 outcomes "a-k."
- enable discussions of curriculum and course revisions.
- promote instructor understanding of relationship between course objectives and program outcomes.

1. Are competent to perform in an engineering environment

- This outcome is intentionally broadly stated to express the desire that each graduate is capable of entering and performing expected duties within a professional engineering workplace upon completion of the degree requirements.

- Students should demonstrate that they understand the effects of engineering decisions on contemporary society (ABET Criterion 3j), and how engineering decisions can be implemented given society's needs and feedback.

    - Students should be able to describe and discuss the influence of technology on public policy and decisionmaking.
    - Courses are selected that provide broader perspective for the application of knowledge gained from math, science and engineering courses considered relevant to engineering professionals, such as the engineering sciences, engineering design.
    - The ability to perform in an engineering environment extends beyond the cognitive domain. Courses that develop the students' affective domain, reaching understanding and empathy, help the students understand how to apply appropriate engineering practices in the modern world (ABET Criterion 3k).
- Courses that support student development of this outcome will have an engineering-related focus (e.g. fundamental engineering science/design) or a broader perspective on the social sciences or ecological systems.

2. Have sufficient backgrounds/tools to function effectively.

- This outcome is addressed by considering the two areas of engineering education: background and tools.
- The first area, background, is addressed by providing a sufficiently broad education that includes what are considered "general education" or "social sciences and humanities" courses such that the engineer can understand the of engineered solutions from a variety of viewpoints and contexts, including global and local, societal, economic and environmental (ABET Criterion 3h).
- The second area, tools, is addressed by teaching techniques, skills and effective use of the tools that are commonly found in the modern practice of forest/environmental resources engineering (ABET Criterion 3 k), including:

    - Use of hardware and software tools for research, communication and data analysis, especially software to facilitate:
        - Word processing (e.g. MS Word)
        - Database (e.g. MS Excel)
        - Computation (e.g. MathCad)
        - Computer-aided drawing and design (e.g. AutoCAD)

        - Oral Presentation (e.g. MS PowerPoint)
        - Programming (e.g. Fortran, MathCAD, Basic)
    - Technical graphics tools, such as engineer's scale, straight edge, pencil and paper, for freehand sketching and mapmaking
    - Spatial measurement tools such as survey instrumentation, photogrammetry, maps, GPS
    - Environmental measurement tools, such as flow meters and soil sampling equipment
    - Research tools and methods such as accessing and summarizing new information from a variety of sources, including:
        - Library database
        - Technical journal
        - Codes and regulations
        - World Wide Web

- Proficiency in using these techniques, skills and tools needed for practicing engineering is inextricably linked to other program outcomes, notably an ability to apply knowledge of math, science and engineering (ABET Criterion 3a).
- Courses that support student development of this outcome will have an engineering technology-related focus or component.

3. Have the ability to conceptualize problems in terms of unifying principles

- We consider this outcome to be the foundation for students to demonstrate that they have the ability to identify, formulate and solve engineering problems (ABET Criterion 3e).
- Curriculum is developed to expose and familiarize students with unifying principles of basic sciences, notably Newtonian principles, conservation of mass and energy principles, etc. and their application in engineering sciences (e.g. thermodynamics, fluid mechanics, electrical science).
- The ability to solve engineering problems is fundamental to success in the "testing and analysis" of alternative solutions during the design process.
- Students should be able to identify engineering problems (as opposed to medical, legal or *wardrobe malfunction* problems). Students should be able to apply a methodical process of developing the framework for solving the problem.
- Students should be able to define and describe the relevant principles and appropriate assumptions, as well as describe the relevant theories and formulas.
- Students should apply these principles to solving "closed-ended" engineering problems, which entails

  - Defining problem
  - Stating assumptions
  - Defining system boundaries
  - Describing known inputs and desired output
  - Defining unknown conditions
  - Preparing visual models, such as diagrams, charts, tables, to aid in the analysis
  - Applying appropriate analytical formulae and principles
- Use of Dimensional Analysis
  - Fundamental quantities of a system (e.g. mass, length, time
  - Relative importance of parameters
  - Interpreting model data
- Note there is a distinction here between what we call problem-solving and what we call design. Design is an open-ended, iterative process characterized by the application of constraints and design criteria to a complex problem where the constraints extend beyond the minimal ones imposed by fundamental principles.
- We can also distinguish "design" in that it also entails optimization, whereas engineering "problem solving" implies that there is one satisfactory output for a given set of input conditions.
- "Design" also considers multiple alternative solutions that all satisfy project requirements and a process of determining which alternative will be deemed "best" for the given conditions.
- Courses that support student development of this outcome will have an engineering science-related focus that applies fundamental knowledge.

4. Are capable of utilizing an engineering approach to problem solving

- The distinction we make here is that this outcome expressing the ability of Forest Engineering students to use an "engineering approach to problem solving" is most closely aligned with the "engineering design" process.
- The engineering design process is commonly expressed as an iterative process that culminates in a solution that satisfies the stated need within the constraints applied to the system, process or component (ABET Criterion 3c). The process may include:
  - Identify the problem
    - Define Present State
    - Define Desired State
  - Define the problem
    - identify constraints, key issues, variables, opportunities
    - collect and assess information

        - identify assumptions
        - break the problem into subproblems
        - determine design life and production volume
    - Develop alternative solutions
        - define decision criteria
    - Analyze and compare alternative solutions
        - test and validate against decision criteria and constraints
    - Select the best alternative
        - integrate solutions
    - Implement the solution
        - communicate the solution
    - Evaluate the results
- Students should be able to demonstrate that they understand and use the engineering design process in solving open-ended, complex problems.
    - Students can define the steps in the process
    - Students plan their approach, including required knowledge and schedule
    - Students follow the process to arrive at a solution
    - Stduetns communicate solution
    - Students implement solution and assess performance
- Courses that support student development of this outcome will have an engineering design component or focus.

5. Can communicate their ideas and expectations effectively

- Students can satisfy this outcome if they demonstrate throughout the curriculum that they are able to communicate effectively in a variety of contexts and through a variety of media.
- This Program Outcome satisfies ABET Criterion 3g.
- We consider that students should be able to communicate effectively in three forms:
    1. ORAL:
        a. Speaks clearly; makes eye contact; appropriately uses language; is organized
    2. WRITTEN:
        a. Organized logically; uses proper grammar; written for appropriate audience
    3. GRAPHIC:
        a. Visual aids follow accepted convention and approved standards; support text and oral statements

- The emphasis is on communication, assuming that the technical content is sufficiently robust and appropriate to the subject of discussion.
- Courses that support student development of this outcome will have an explicit communication objective, or will have expressly integrated development of communication skills into the course.

6. Exhibit the following attributes of a competent engineer:

6a.Knowledge – both in understanding basic principles and in creativity in problem solving.

- The appearance of "problem solving" in this outcome is related to the ability of the student to apply their knowledge of the basic principles of math, science and engineering (ABET Criterion 3a), as well as enhanced creativity brought about by their broad education and understanding how they function in modern culture (ABET Criterion 3h).
- We expect that students can apply mathematical principles to obtain analytical solution
    - For example, students can apply concepts of linear algebra to solve complex problems in the context of photogrammetry

6b.Skills – originality and method of problem solving

- Students satisfying this outcome will have an ability to design and conduct experiments as well as analyze and interpret data (ABET Criterion 3b).
    - Students perform experiments following standard procedures
    - Students use appropriate data collection methods
    - Students use appropriate tools to analyze data
    - Students apply appropriate statistical procedures
    - Students analyze and interpret data using robust techniques

6c. Attitude – professional ethics, self-discipline, perseverance

- We find that this Program Outcome relates directly to ABET Criterion 3f: "an understanding of professional and ethical responsibility."
- Students are self-motivated to participate in professional development activities, rather than required as part of a course grade.
- For example, we encourage students to take the FE exam in their final semester. We provide reminders and logistical support.

- We encourage participation in the Order of the Engineer.
- We embed exposure to and discussion of engineering ethics in courses. Students are encouraged to use the NSPE Code of Ethics as guidance beginning as early as ERE 225 in the Student Workbook.
    - Reading and Discussion in FEG 300
    - Discussion and assessment in FEG 489.
- Students should be able to describe their personal views on ethical decisions made in case studies and in dealing with classmates.
- Teamwork situations create conditions that test students' ability to persevere in the face of demanding and challenging decisions and teammates.
- Courses that support student development of this outcome will have an embedded course objective and activities that develop an understanding of engineering ethics and professional practice.

7. Can function effectively in a multidisciplinary team/environment

- Students will be able to explain the functional roles and responsibilities of team members.
- Students will be able to demonstrate that they are capable of functioning in an assigned role within a team.
- Students will be able to assess the performance of themselves and other team members to improve the effectiveness of individual and team performance.
- Students will engage in behavior that demonstrates respect of team members and their functional roles.
- Courses that support student development of this outcome will have an embedded objective that directly develops teamwork abilities.

8. Understand the need for life-long learning.

- ABET Outcome: 3i. a recognition of the need for, and an ability to engage in life-long learning
- Students that satisfy this outcome will be able to:
    - List examples of significant technological changes over the last 20 years in environmental resources engineering that have influenced how engineers perform their jobs, and the types of problems that engineers have to address.
    - identify the continuing education requirements for licensed engineers
    - describe various opportunities for engineers to continue their education while engaged in professional practice

- appraise their own learned knowledge while enrolled in Forest Engineering,
  - create a plan for post-graduation continuing education.
- Courses that support student development of this outcome will have an integrated objective that addresses the need for lifelong learning, as well as a focus on changes in society and/or the engineering profession.

HIERARCHY OF LEARNING OUTCOMES

Learning occurs in all courses, but to different degrees. We categorize some courses as Exposure courses, in that a student is exposed to material to be used in subsequent courses. We categorize other courses as Familiarity, in that an instructor can reasonably expect that students enter the course with some background information. Finally, we categorize some courses as In-Depth in that students are expected to apply material from previous courses. We present a summary of our categorization in the next table.

Table B.3-3: Hierarchy of Learning Outcomes in Forest Engineering Curriculum (E = Exposure; F = Familiarity; D = Depth)

Semester	Course	ERFEG Program Outcome									
		1	2	3	4	5	6a	6b	6c	7	8
Fall - I	Calc I						E				
	Physics						E	E			
	Botany						E	E			
	Writing		E			E	E		E	E	
	Orientation										
Spring - I	Calc II						E				
	Physics						E	E			
	Compt. Methods		F			E	F	E	E		
	Gen Ed		E								E
	Gen Ed		E								E
Fall-II	Calc III						F				
	Gen Chem					E	E				
	Statics	F		E							
	Eng. Graphics	E	E			E					
	Economics		E			E	E	E			
Spring II	Diff Eqns	D	D	D			D				
	Dynamics	F		E			F				

	Elec Sci	F		E	E		F				
	Gen Chem					E	E				
	Mech Materials	F		E	E		F				
	Presp. Env.		E			D	F	E	F		
Fall-III	Surveying	F	D			D	F	F	F	F	
	Fluid Mech	F		F							
	Dendrol		F				F				
	For Ecol/ Silvic					D	F	E	E		F
	Engr Design	F			F				F	F	E
	Gen Ed		E								E
Spring-III	Engr Hydrol	D	F	F	F	F					
	Remot Sens	F	F	F			F				
	Photogr	D	F		E		D	F	F	F	E
	Prob & Stats	D	F				D	D			
	Eng Thermo	F		F			F				
	Gen Ed		E								E
Fall-IV	Structures	D		D	D						
	Harv Sys	F		F				F			
	Eng Dec Analysis	D			D		D				
	Soil Mechanics	D		D		F		D			
	Res Policy/ Manage	F	F						F	F	
	Water Poll Eng	D	D	D	D	F	D				
Spring-IV	Transpo Sys	D		D	D		D				D
	Power Sys	F		F	F		D				
	Plan Design	D			D	D			D	D	
	Design Elective	D			D						
	Design Elective	D			D						

Notes: See Table B3-1 for numerical key to Forest Engineering Program Outcomes. See discussion in Criterion One for key to formal course names and numbers.

The information in Table B3.3 is essentially a simplified version of Bloom's Taxonomy, with Exposure roughly equivalent to the first two levels (Knowledge and Comprehension), Familiarity roughly equivalent to the third level (Application), and Depth roughly equivalent to Analysis, Synthesis and

Evaluation. It can be seen that Table B3.3 shows a logical flow of expectations throughout the Forest Engineering curriculum. Assessment activities are generally associated with the Depth courses.

ILLUSTRATIVE LEARNING ACTIVITIES

The following table shows the relationship between program outcomes and instructional activities in specific courses. Please note that the information in the table is for the instructional activities in *engineering* courses only and excludes, for example, activities in the Writing and the Environment course. Please note that, while all of these activities could be monitored as a part of our on-going assessment program, we have been strategic and selective in targeting specific activities for assessment purposes, as will be discussed later in this section.

Table B3-4. Forest Engineering Program Outcomes and Illustrations of Specific Course/Instructional Activities to Achieve Outcomes

Program Outcome	Course(s)/Instructional Activity
1. Are competent to perform in an engineering environment.	FEG 132 Orientation: Discussion of differences between science and engineering FEG 300 Engineering Design: Students learn formal engineering methodology **FEG 489 Planning and Design: Semester long design project with formal oral presentation, written report, and class discussions related to professional behavior and expectations.**

2. Have sufficient back-ground/tools to function effectively	The Math and Science and Engineering Science courses are intended to provide technical background, while the General Education courses are intended to place technical activities in a broader social context. Some engineering courses provide tools to be used in other courses. APM 153 Computing Methods: Students introduced to Mathcad ERE 225 Engineering Graphics: Students display engineering data. **ERE 371 Surveying: Mapping activities assist in visualizing topographic and spatial information.** **ERE 440 Water Pollution Engineering. Students use Mathcad in design problems**
3. Have the ability to conceptualize problems in terms of unifying principles	The curriculum includes theory-rich courses followed by applications courses that reinforce fundamental principles. Examples: MAE 341 Fluid Mechanics followed by FEG 340 Engineering Hydrology, which includes hydraulics. ERE 351 Thermodynamics followed by FEG 454 Power Systems.
4. Are capable of utilizing an engineering approach to problem solving	FEG 300 Engineering Design: Students are introduced to formal engineering design process. ERE 440 Water Pollution Engineering: Students apply design process to two design problems **FEG 489 Planning and Design: Formal design process is applied to semester long project.**

5. Can communicate their ideas and expectations effectively	ERE 225 Engineering Graphics: Preparation of engineering drawings FEG 300: Engineering Design: Oral and written report of class design project ERE 371 Surveying: Design and preparation of topographic map **FEG 340 Engineering Hydrology: Poster presentation of design project.** CIE 337 Soil Mechanics: Formal, written laboratory reports **ERE 440 Water Pollution Engineering: Preparation of engineering drawing to document design** **FEG 489 Engineering Planning and Design: Formal oral presentation and written report of semester long design project**
6a. Exhibit attributes of a competent engineer: Knowledge	Math and Science, Engineering Science, and Engineering Science and Design courses
6b. Exhibit attributes of a competent engineer: Skills	APM 153 Computing Methods for Engineers and Physical Scientists: Students write and document several computer programs. ERE 225 Engineering Drawing: Students create engineering drawings using appropriate software. FOR 360 Principles of Management: Students discuss management styles. ERE 371 Surveying for Engineers: Students plan and create a topographic map. FEG 430 Engineering Decision Analysis: Students analyze and interpret data for a water resources project. **APM 395 Engineering Statistics: Students analyze data to determine significance of data.**
6c. Exhibit attributes of a competent engineer: Professional ethics	FEG 132 Orientation: Introduction to Professional Licensure FEG 489 Planning and Design: Class discussion led by guest lecturer (a lawyer) on professional responsibilities and potential sanctions for misconduct.
7. Can function effectively in a team environment	ERE 225 Engineering Graphics: Students work on project as a team FEG 300 Engineering Design: Students work on project as a team

	ERE 371 Surveying: Teams of students plan and execute a survey, and generate a topographic map based on their survey design. FEG 363 Photogrammetry: Students work on final design project as a team FEG 340 Engineering Hydrology: Students work on final design project as a team. CIE 337 Soil Mechanics: Students work on final laboratory assignments and generate reports as a team. **FEG 489 Planning and Design: Students work on semester design project as a team. Guest instructor discusses group dynamics and effective strategies for teamwork.**
8. Understand the need for life-long learning	**FEG 300 Introduction to Engineering Design. Review of recent technological developments**

Steps to Ensure Program Outcomes Are Achieved

EFFECTIVENESS OF INSTRUCTION

Individual Course Assessment Techniques

Many faculty elect to use informal instructional assessment techniques. These might include early course surveys, one-minute assessments, or other instruments. One example of the use of an in-class assessment technique is given in the information pertaining to FEG 489 Engineering Planning and Design provided in the discussion of Criterion 4 of this report.

Formal Evaluation Processes

The SUNY-ESF Faculty Governance Committee on Instruction has adopted a semester end survey form for use in the improvement of instruction. The summary data from the survey, as well as the responses from the open-ended items, are returned to the instructor; the Faculty Chair receives a statistical summary of all courses. While not particularly useful in program assessment, the data are designed to be useful in terms of improving instruction, which is of course related to achievement of outcomes.

Table B.3-5. Summary of Selected Items from SUNY-ESF End-of-Course Student Questionnaire For Courses Taught by Faculty of Environmental Resources and Forest Engineering, Fall 2005 and Spring 2005			
Courses Fall 2005 (except as noted)	**Item (Scale is 1 Strongly Disagree to 5 Strongly Agree)**		
	Course and subject matter were well organized	**Instructor communicated effectively**	**Instructor Enthusiastic about teaching**
FEG 132 (Fall 2004)	4.1	4.6	4.7
ERE 225	4.1	3.8	3.7
FEG 300	4.0	4.3	4.3
ERE 371 (Fall 2004)	4.4	4.1	4.2
FEG 420	4.7	4.6	4.4
FEG 430	4.7	4.6	4.9
ERE 440 (Fall 2004)	4.2	4.7	4.8
ERE 596 (1)	4.6	4.6	4.9
Overall Forest Engineering Average	**4.35**	**4.36**	**4.49**
Overall ESF Average (Typical)	**4.1**	**4.0**	**4.3**
Courses Spring 2005			
FEG 340	4.1	4.2	4.7
FEG 350	4.7	4.5	4.6
ERE 351	2.8	2.5	3.2
FEG 363	4.2	3.3	4.1
APM 395	4.7	4.5	4.9
FEG 437	3.7	4.3	4.6
FEG 448	4.3	4.5	4.8
FEG 454	4.3	4.2	4.4
FEG 489	4.3	4.5	4.4
Overall Forest Engineering Average	**4.12**	**4.06**	**4.41**
Overall ESF Average (Typical	**4.0**	**4.0**	**4.3**

The data in Table B.3-4 indicate that, in general, the Forest Engineering students feel they are well served by their instructors. It is of note that the students rate highly the item related to 'enthusiasm for teaching'. This gratifying result is a reflection of the ERFEG's commitment to teaching excellence.

The faculty use the End-of-Course Questionnaire data for their own efforts to improve instruction. The Faculty Chair can (and does) consult with individual faculty to discuss issues raised in the data and to suggest opportunities to further improve instruction delivered by the Faculty.

Assessment Tools/Program Assessment

A variety of tools have been developed to aid in the assessment of the Forest Engineering Program Outcomes. We use both direct and indirect measures in our assessment program. We monitor the number of students who choose to take the Fundamentals of Engineering Examination, and their performance on certain sub-sections of the examination. In addition, exit surveys, employer surveys, analysis of activities embedded within courses, and other methods are used as appropriate. These are discussed in terms of the assessment of each Program Outcome. We discuss our assessment techniques, when appropriate, in terms of Metric, Trigger, Analysis, Response, Discussion, and Changes Implemented. As will be seen, we our assessment program involves different cycles, with some activities occurring annually, and others (e.g., employer surveys) at less frequent but regular intervals.

Assessment data are shared by the Faculty Chair with the rest of the Faculty as they become available, and at semester end retreats.

Table B3-6 shows the range of assessment techniques currently employed.

Table B3-6. Forest Engineering Program Outcomes and Methods Used in Outcome Assessment

Program Outcome	Assessment Technique	Type of Measure	Frequency	Comment
1. Competent Engineer	FE Exam	Direct	Yearly	Overall pass rate
	Exit Survey	Indirect	Yearly	Student self assessment
	Alumni Survey	Indirect	3 to 6 years	Analysis of items directed at recent graduate
2. Sufficient Background	Embedded activity	Direct	Yearly	Analysis of use of Mathcad
3 .Unifying Principles	Embedded activity	Direct	Yearly	Review of assignments in Principles of Management

				course
4. Engineering Approach	FE Exam	Direct	Yearly	Analysis of one subtest
5. Communication	Employer survey	Indirect	6 years	Last done in 2001
	Assessment by Writing Faculty	Direct	6 years	Last done in 2002
	Embedded activity – FEG 340	Direct	Yearly	Review of poster prepared to document bioswale design
	Embedded activity – ERE 440	Direct	Yearly	Review of engineering drawings created by class mates
	Evaluation – FEG 489	Direct	Yearly	Ratings of final oral presentations
6a. Knowledge	FE Exam	Direct	Yearly	Analysis of sub tests
	Embedded activity – FEG 363	Direct	Yearly	Analysis of lab project
6b. Skills	Embedded activity – APM 395	Direct	Yearly	Analysis of data/ design of experiments
6c. Attitude	FE Exam	Direct	Yearly	Per cent of seniors taking exam
	FE Exam	Direct	Yearly	Performance on one sub test
	Embedded activity – FEG 489 (2005, 2006)	Direct	Yearly	Survey before/after class discussion
7. Team Worker	Instructor Assessment – FEG 489	Direct	Yearly	Review of self and peer assessments
8. Life-Long Learner	Exit Survey	Indirect	Yearly	Student self-assessment
	FEG 300	Direct	Yearly	Review of recent technological developments

Program Outcome 1: Are competent to perform in an engineering environment

We use multiple measures to assess this outcome.

FUNDAMENTALS OF ENGINEERING EXAMINATION

We monitor the pass rate of students of students who take the Fundamentals of Engineering examination.

Metric: Annual pass rate for Forest Engineering students who take the FE examination in April of their senior year. Forest Engineering students will pass the FE examination at a rate higher than the New York State average.

Trigger: A pass rate in a given year lower than the New York State average.

Analysis: The data in Table B3-7 show the results in terms of pass rate for the Fundamentals of Engineering examination for the period 1999-2005. The data are limited to the April test date, and include only first-time test takers from the Forest Engineering program.

Table B3-7. Pass – Rate Results for the April Fundamentals of Engineering Examination

Year	Number of Students	Self-declared Major	Afternoon Exam Selected	Number Passing	Forest Engineering Pass Rate	State Pass Rate
2000	1	Agricultural	Civil	1	100	100*
	1	Forest	Civil	0	0	0*
	1	Agricultural	General	1	100	100
	6	Environmental	General	4	67	74
	7	Forest	General	5	71	71*
2001	1	Civil	Civil	1	100	78
	2	Civil	General	2	100	88
	1	Environmental	Civil	1	100	100
	1	Environmental	General	1	100	83
	2	Forest	Civil	2	100	100*
	5	Forest	General	5	100	100*
2002	2	Environmental	General	2	100	100
	1	Environmental	Environmental	1	100	80
	6	Forest	General	4	67	67*

	1	Other	Civil	1	100	100*
2003	1	Civil	Civil	1	100	82
	1	Environmental	General	1	100	100
	5	Forest	General	4	80	80*
	1	Other	General	0	0	40
2004	7	Environmental	General	3	43	71
	5	Forest	General	5	100	100*
	1	Other	General	1	100	50
2005	2	Environmental	Civil	2	100	100
	3	Environmental	General	3	100	92
	1	Environmental	Environmental	1	100	93
	7	Forest	General	7	100	100*
	2	Other	General	2	100	67
	Note: Data from Form 5 as supplied to SUNY-ESF from the State Education Department of State University of New York. * Data for Forest Engineering and New York State identical.					

Response: We have in general been pleased with the results shown in Table B3-5. There was an issue with the overall pass rate in 2000, which was identified more clearly in the sub-test analysis (shown below). The issue was addressed.

Discussion: We have discussed the metric itself. As a small, specialized engineering program, it is clear that our students describe themselves in terms of this examination in a variety of ways. For example, in 2005, 7 students identified their major as Forest Engineering, and selected the General Engineering examination in the afternoon. They were in fact the only 7 students to do so in New York State, and therefore the results for the Forest Enginnering and New York State pass rates are identical. This occurred at other points in the table identified by the asterisk in the New York State column.

EXIT SURVEY

We send a survey instrument to graduating seniors, and track the results from that survey.

Metric: One hundred per cent of the graduating seniors who return the exit survey form will feel they are prepared to enter the engineering work force.

Trigger: There is no specific trigger for this metric. Data from multiple sources are evaluated to discern the meanings associated with these data.

Analysis: A summary of survey data is presented in the next table.

Table B3-8. Summary Data from Forest Engineering Exit Survey in Answer to Statement 'I feel this program has prepared me for am prepared for: Full-time employment or Full-time graduate/professional study'		
Year	**Number of respondents**	**Per Cent Checking**
2001	8	100
2002	5	100
2003	3	100
2004	9	89
2005	6	100

Response: The data in Table B3-8 would not seem to require a response, in that the respondents feel they are well prepared for an entry-level job or graduate school or both. However, the survey instrument was critically reviewed in preparation for the Fall 2006 accreditation visit, and it was decided that the survey instrument could be improved.

Discussion: The May 2006 survey instrument is different in many regards from the previous exit surveys. The survey attempts to measure more directly student perceptions against explicit statements of Program Outcomes. These data are not available at the time of this writing. A pdf of the survey instrument is included on the enclosed CD.

ALUMNI SURVEY

The alumni survey provides information on this outcome, as was discussed in the discussion of Criterion 2, and is suggested by the mapping shown in Table B3-2.

Program Outcome 2: Have sufficient backgrounds/tools to function effectively

ANALYSIS OF EMBEDDED ACTIVITY IN ERE 440

The ERFEG unit has long been concerned with the computational skills of the students in the program. In 2003, we adopted MATHCAD as the default computational environment for all forest engineering instructional activities. We conducted two intra-faculty training sessions, and incorporated MATHCAD exercises into all of our fall and spring semester courses. We allocated funds to upgrade the campus license to the newest version.

Metric: Students were evaluated on their use of MathCAD in their final design project.

Trigger: The instructor generated a scale for assessment. The table below shows the scale and the results. The trigger is considered to be <50% in the first four categories.

Table B3-9. Analysis of Embedded Activity – ERE 440

Outcome Element	Bloom's Taxonomy Category	Performance Criteria	Maximum Number of Points	Points Earned
2. Sufficient Background /Tools	Knowledge	Uses MathCAD with units	4	3.7
	Comprehension	Uses MathCAD for calculations and carries variables through several subroutines	4	3.8
	Application	Uses MathCAD to extract biokinetic values from given experimental data	3	1.6
	Analysis	Uses MathCAD and documents steps in design analysis	3	2.7
	Synthesis	Completes design analysis demonstrating a novel approach	2	0.9
	Evaluation	Concludes whether design met design objectives and constraints	2	0.7
	Valuation	Provides statements comparing design choices to alternatives	2	0

Analysis: The results are as shown, and indicate the Program Outcome, as measure by this technique, has been attained.

Discussion: In retrospect, the choice of project to evaluate was not particularly inspired. The project was a bit too 'cook book'. The assessment would have been more valid if applied to a more open ended design exercise.

Actions To Be Taken: The assessment will be applied to a more open ended design exercise, probably a design for a flow measurement device in a circular channel.

Program Outcome 3: Have the ability to conceptualize problems in terms of unifying principles

ANALYSIS OF EMBEDDED ACTIVITY IN **FOR 360**

Method: The FOR 360 course instructor provided the ERFEG facuty with FEG student work products that were submitted in response to in-class assignments for Fall 2004 and Fall 2005. Students were directed to select a problem of their choosing from within their field of expertise and to submit a paper detailing the problem, problem constraints, potential alternative solutions, recommended solution and management implementation plan. Students submitted one report for grading, then revised and resubmitted it based on instructor feedback.

The instructor's grading rubric evaluated: Problem Definition (25%), Use of Problem Solving Framework (25%), Project Implementation/Management (25%), Writing Style (20%) and Ability to Follow Directions (5%).
I developed Performance Criteria based on my expectations that FEG students in this course are typically in their senior year, often within one semester of graduation. In particular, I believe that all of the FEG students should be able to apply a problem solving framework, having been exposed to problem solving in engineering science and design-based courses (e.g. FEG 300, FEG 340) prior to their senior year, as well as instruction in FOR 360.

The ERFEG assessment of the students' abilities focused on two aspects of problem solving and their related measurable performance criteria:

1. student is able to describe a problem

    a. recognizes that a change is possible

    b. identifies current state (a.k.a. existing conditions

    c. identifies desired state (a.k.a. improved conditions)

    d. identifies constraints on the system, process or product

2. student is able to recommend a preferred solution using a systematic process (a.k.a. the Decision Framework)

    a. identifies and ranks solution criteria

    b. identifies alternative solutions

c. tests alternative solutions against solution criteria

d. recommends “best” or “preferred” solution

Metric: The ERFEG faculty used these student work products to assess students’ abilities in satisfying the performance criteria. Each performance criterion was weighted equally, and student performance was rated on a scale of 1 to 5, where:

- 5 = Clearly identified
- 3 = present, but needs significant improvement
- 1 = absent or lacking any development

The ratings for each criterion were summarized in a matrix, and scores were computed to describe individual and group performance for comparison to performance targets.

Triggers:

1. All Individual Total Scores should exceed 24 (i.e. all students can achieve a score of three (3) in each of the eight (8) criteria).
2. Group Average Score should exceed 32 (i.e. the average student can achieve a score of four (4) in each of the eight (8) criteria.
3. The Average Criterion Score should equal or exceed 4.0.

Action Items: When scores are less than the Performance Target Score:

1. Individual Total: refer to instructor for remedial action, review of product, and explanation of circumstances. Review similar work products using these performance criteria.
2. Group Average: Consult with instructors in FEG 300 and FOR 360 to institute course activities to improve proficiency in engineering problem solving process. Advise instructors in engineering design courses (FEG course prefix) of assessment findings. Implement followup assessment in subsequent year.

3. Average Criterion: Advise and consult with instructors in FEG 300 and FOR 360 to improve student proficiency in satisfying performance criterion. Advise and consult with instructors in all FEG engineering design courses to integrate and reinforce problem solving framework. Institute followup assessment in subsequent year.

Analysis: The most common shortcoming in the report that was identified by the instructor and the assessor was the ability of the students to explain about the problem solving framework. There is a tendency towards brevity, where the students seem to provide minimal explanation of each step in the problem solving process on the assumption that the reader (i.e. instructor) already knows about the framework. While this shortcoming is associated with students' abilities in effective communication, it is clearly integrated with learning about the problem solving process.

The enclosed table summarizes individual performance over two academic cycles in FOR 360. Note that the total number of student work products (14) is approximately half of the FEG students that have taken the course during the last two years.

Individual Scores: One student failed to meet the threshold performance criterion, largely due to underperforming in the area of identifying and applying solution criteria. Two other students underperformed on one or more criteria, but performed well in other areas to "make up the difference."

Recommendation: The instructor in FOR 360 is using an approach that provides feedback to students on their draft report. I suggest that students that exhibit serious deficiencies in one or more performance criteria at the draft report stage be required to meet minimum performance requirements in ALL areas before receiving a final grade on the paper. The current grading system allows students to be deficient in some areas, yet receive passing grades.

Group Average: The Group Average Score of 33.07 slightly exceeds the threshold target. No further action is required.

Criterion Average: Two performance criteria fell short of the target score: identifies constraints and identifies and ranks solution criteria. In the assessor's opinion, and from personal observation, these two criteria are the most difficult concepts for students to grasp. As many reflected in their papers, the students recognize the importance of applying the problem solving framework, if for no other reason than it makes them "slow down" and really look at the problem. In my experience, I find that when students are in a hurry to get to the obvious solution, taking time to identify constraints and criteria seems wasteful and will hardly affect the outcome.

Recommendation: Share these findings with the instructor of FEG 300, where students are first formally introduced to the engineering design process. Consider integration of problem solving framework in other junior-level ERE/FEG courses (e.g. FEG 340).

Program Outcome 4: Are capable of utilizing an engineering approach to problem solving

We employ multiple measures to assess this outcome.

FUNDAMENTALS OF ENGINEERING EXAMINATION

Metric: We monitor the number of correct responses on the engineering economics questions in the morning portion of the FE exam.

Trigger: We expect Forest Engineering students to perform better than the New York State average for these questions.

Analysis: The graph below tracks the percent correct for Forest Engineering and comparison groups. The graphs are weighted averages from the Form 6 data received from the State Education Department. The data for the 1997-99 examinations are not available because of changes implemented at the state level in FE exam administration.

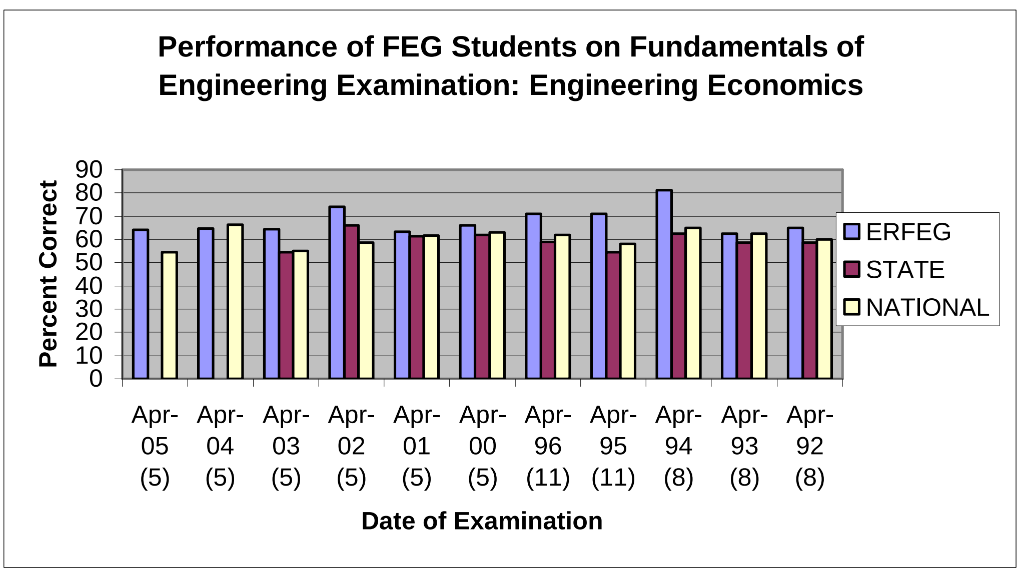


Figure 1. Results from Engineering Economics Subtest of the Morning Portion of the Fundamentals of Engineering Examination.

Response: The data support the attainment of this Outcome, and do not suggest the need for any programmatic changes.

Discussion: The results reflect directly the experience of Forest Engineering students in FEG 430 Engineering Decision Analysis, which they take in the fall semester of their senior year.

Changes Implemented: None

Program Outcome 5: Can communicate their ideas and expectations effectively

Background: Of all the Program Outcomes, this one has proven to be the most problematic. As will be shown below, we are convinced of the importance of this outcome, and have adopted a unit-wide strategy to address it. However, we have struggled with finding the appropriate assessment techniques. We have met with the staff of the college writing program to help us understand this issue, and we have used their expertise to help us with this assessment.

EMPLOYER SURVEY AND WORKSHOP

Metric: In April 2001, we invited representatives from firms who had employed recent graduates of our program. The invitation read as follows:

An Invitation from the Faculty of Environmental Resources and Forest Engineering

We are writing to ask your help in a matter of great importance to us. We know you have hired graduates from our engineering program, and we need your help in assessing how we can improve the educational opportunities for our students.

We invite you to meet for a morning with the faculty and other employers of our graduates to share views on questions such as

- What are the desired attributes of an entry level engineer?
- Does the ERFEG program produce graduates with the desired attributes?
- Are the expectations of employers different than the expectations of faculty?

We are planning a facilitated discussion for the morning of April 20, 2001.

Trigger: The discussion was lively and fruitful, and the consensus was that forest engineering graduates were at least as well prepared technically as graduates of other programs. However, most attendees agreed that recent engineering graduates were not proficient in terms of communications skills, and that forest engineering students were neither better nor worse than their peers in this regard.

Analysis: The comments of the employers echoed the observations of the ERFEG faculty.

Response: The faculty devoted the June 2001 semester end retreat to the issue of communications skills across the curriculum.

Changes Implemented: We adopted a strategy to imbed communications skills within designated courses and to communicate our expectations clearly to the forest engineering students. We created *A Guide to Effective Communications: A Handbook for Forest Engineering Students*[1], and distributed a copy to each student starting in the Fall 2001 semester. The Handbook has been updated as we add or alter new material in response to faculty and student feedback.

REVIEW OF ERFEG COMMUNICATIONS PROGRAM BY WRITING FACULTY

In the Spring of 2002, the Writing Faculty, as a part of their college-wide assessment program, conducted interviews with a focus group of forest engineering students and email interviews with ERFEG faculty. The writing faculty presented their results to the ERFEG faculty in a five page memo. Some of their findings are reproduced in the next table.

Table B3-10. Excerpts from ESF Writing Faculty Assessment of ERFEG Communications Efforts – Spring 2002

Area	Assessment	Recommendations
Writing and Communicating to Learn	Faculty commented that it is important for their students to gain competency in a range of writing and communication skills, including listening; speaking; record keeping; interpreting and creating graphics; and reading. Most students said they use writing to help them reflect and learn, and to think critically.	Students are getting a clear message that writing and communication skills are valuable in helping them to discover and learn. Teachers should continue to emphasize this important concept.
Feedback on Student Writing	Almost 90% of the faculty expressed frustration because they spend a tremendous amount of time responding to student writing, yet they have recognized little to no improvement in writing skills. Faculty members feel their main responsibility is to teach students engineering skills, which leaves little time to address writing skills, even though they feel writing is very important.	Faculty could benefit from workshops on strategies for responding to student writing. Workshops on designing writing assignments could also be useful.
Writing Guidelines	About 60% of the students felt teachers gave "fairly clear" guidelines for writing assignments, while 40% felt there could be improvement in this area. 100% of students were familiar with your Communications Handbook, and they felt it was an outstanding document.	It may be useful for teachers to review their writing assignments to make sure they express clear guidelines. Continue to promote the use of your unit's Communications Handbook. It sets an excellent standard that other units on the

[1] A pdf of the current version of the Handbook cab be found on the attached CD.

		ESF campus should follow.
Resources for Writing	Around 30% of students said they have used the ESF Writing Center, and they felt their Writing Center experience was worthwhile. Only two faculty members said they have referred students to the Writing Resource Center.	Faculty should consider referring their students to the Writing Resource Center at all stages of the writing process.

Discussion: The ERFEG faculty were generally given high marks for the communications strategies employed.

ANALYSIS OF EMBEDDED ACTIVITY IN FEG 340

Students in FEG 340 are required to present a poster describing their design of a bioswale.

Metric: The posters were evaluated according to six criteria, as described below.

Table B3-11. Analysis of Embedded Activity – FEG 340

Outcome Element	Bloom's Taxonomy Category	Performance Criteria	Maximum Number of Points
Communicate Effectively:	Knowledge	Can outline the six major categories of the stormwater biorention design process in the abstract and poster	2
	Comprehension	Can explain the environmental stormwater problem motivating the design in the abstract and poster	2
	Application	Can illustrate the location and dimensions of bioretention design specifications in the abstract and poster	2
	Analysis	Can breakdown the multiple design solution steps to move from design rainfall rates to runoff volume and bioretention size in poster	2
	Synthesis	Can create an abstract and a poster that meet conference specifications of formatting, layout, and content	2
	Evaluation	Can conclude whether design met design objective and constraints in abstract and poster	2
	Valuation	Can defend design steps taken in poster presentation when question	2

		arises on methods	

Trigger: Average scores are calculated for the class. An average score below 80% represents our trigger.

Analysis: The average scores for the Spring 2005 class are presented below.

Table B3-12. Analysis of Embedded Activity – FEG 340

Bloom's Taxonomy Category	Average	Percentage of Maximum
Knowledge	1.6	81.3%
Comprehension	2.0	97.9%
Application	1.8	89.6%
Analysis	1.8	87.5%
Synthesis	1.8	89.6%
Evaluation	1.9	95.8%
Valuation	1.6	79.2

Response: No response was required, as the average scores were above the trigger level. The score for Valuation was considered acceptable given it represents the highest level of the taxonomy.

Discussion: We chose to assess this means of communications because we think many of our graduates will be involved with poster presentations in their professional careers. We have found the posters to be useful in other regards as well. We display them prominently at College Open Houses for potential students to reinforce our marketing messages (i.e., Hands-on Learning) as described in the discussion of Criterion 1.

ANALYSIS OF EMBEDDED ACTIVITY IN ERE 440

A group of three or four students creates a design to remove marbles and sand from wastewater. They document their design with an engineering drawing. The drawing is given to a different team of students who have to construct a scale model of the system from the drawings. Each team has to write a memo critiquing the engineering drawings they had to work with.

Metric: We review the memos written, and the memos are shared with the instructor of the engineering drawing class.

Trigger: We do not have a numerical trigger for this assessment technique.

Analysis: The memos revealed a general weakness in this area. Here are some representative comments from the critiques.

"Dimensions of the weir width, the location of the screen, and the depth of water would all be helpful in your plans. To build this model we had to guess at these locations."

"The channel design was presented decently. Some of the more subtle points of the design were however a bit more challenging to figure out. . . . There is also no scale on the drawing, or any form of a title block. It could be presented in a more professional fashion."

"Information on the operation of the gate was also missing and made it difficult to construct."

"A scale model was created with relative ease after making certain assumptions regarding the design drawings."

"The plans that you created were clear and concise. . . . To improve your plan the following point should be considered.

- Include units on your drawings
- Draft your drawings in AutoCAD."

"The exercise helped us understand the detail and clarity necessary in an engineering drawing in order for it to be taken to the next step of construction."

Response: The memos were shared with the instructor of the engineering drawing class. These issues will be discussed with the students in that class, typically sophomores.

Discussion: Fall 2005 was the first year the drawings were exchanged, and the students were asked to assess the drawings of their classmates. We will work to establish a numerical scale for this assessment activity.

EVALUATION OF FINAL ORAL PRESENTATIONS IN FEG 489

Purpose: The ability of students to satisfy the communication-based Forest Engineering Program Outcome is assessed in FEG 489 Engineering Planning and Design on a regular basis as part of the course requirements. The main focus of this assessment is on oral communication in a professional setting. The results of the assessment have historically been reported to the Faculty of

Environmental Resources and Forest Engineering as part of ongoing discussions about program quality. The assessment results are reported formally about every three years.

Method: In 2006, we used "outside" reviewers to supplement the instructor's and faculty's assessment of the students' presentations and individual oral communication abilities. An example of the assessment form is included on the attached CD.

Student teams are expected to present the technical details of their proposed design. Students typically work in teams of 4 to 6 students, and all students are expected to materially participate in the project design throughout the semester, including report preparation and oral presentations.
The final oral presentations are presented to an audience comprised of student peers, College faculty, family and invited guests, including Forest Engineering alumni and representatives from local business and government agencies. Oral presentations are typically 25 minutes long, followed by 10 minutes of question and answers. Students are expected to wear professional attire, and to use presentation software such as Microsoft Powerpoint, including graphics generated from AutoCAD, GIS, and Excel.

Basis for Assessment: I expect that the students enter the course being familiar with the mechanics of oral presentations from previous course work. I provide guidelines for public speaking in the Course Handbook that all students are required to purchase. I typically reinforce their public speaking skills by having at least one informal presentation at mid-semester, followed by at least one practice session within the week prior to the final formal presentations.

I consider that all of the students in the course should be able to score a rating of 3 or better in all of the areas of individual assessment.

Collectively, the teams should score at least a rating of 3 in each of the "team effort" areas, such as Design Process, Technical Approach, Organization, Visual Aids and Time Management. Individual students are expected to perform at an "Acceptable" level (rating of 3), meaning that, in the assessor's opinion, they satisfied minimum expectations all of the time.

Any scores less than 3 will be reviewed by the instructor to determine possible reasons, and to identify and recommend potential remedies, if needed.

Review Process – 2006: The final presentations in 2006 were assessed by a group of professional engineers from the local community, including the president of a local engineering consulting firm, a senior managing engineer, and a senior engineer from a regulatory agency. In addition, three faculty from the Forest Engineering program provided assessments.

Comments: One of the obvious comments is that the results of the assessment process rely heavily on the paradigm that the assessor uses. The external reviewers generally rated the presentations higher than did the internal reviewers. Each assessor views the presentations differently depending upon his background. The tabulated results should be viewed with these differences in mind.

Results: Two teams scored less than the minimum average score of 3.0 in one of the following three categories, as determined by internal (i.e. faculty) reviewers:

- Identified criteria for evaluating alternative solutions
- Conclusion - Summarized important points of design
- Described alternative solutions
-

One individual was rated less than the minimum average score of 3.0 in his ability to "display enthusiasm" during the oral presentation.

Table B3-13a. Ratings of Final Design Presentations – FEG 489
Team One: Lake Source Cooling

Design Process and Technical Approach - Team	**Ratings by Internal Reviewers**	**Ratings by External Reviewers**
• Provided a complete problem description	4/3/4/4 = 3.75	3/4/4 = 3.7
• Demonstrated thorough understanding of the design constraints	5/4/3/5 = 4.25	4/5/4 = 4.3
• Identified components of design	4/3/4/5 = 4.0	4/5/4 = 4.3
• Identified critical design elements	4/4/3/5 = 4.0	4/5/4 = 4.3
• Described alternative solutions	4/3/4/5 = 4.0	3/4/4 = 3.7
• Understands technical issues	3/3/4/5 = 3.75	4/5/4 = 4.3
• Identified criteria for evaluating alternative solutions	5/4/4/4 = 4.75	3/5/4 = 4.0
• Applied robust technical analysis	5/3/3/4 = 3.75	3/4/4 = 3.7
• Solution is logically developed	5/3/4/5 = 4.25	4/5/3 = 4.0
• Solution is appropriate for stated problem	5/3/3/5 = 4.0	4/5/4 = 4.7
	40.5 / 50	41 / 50
Communication: Oral Presentation – Team		
Organization		
• Introduction told audience purpose of	5/3/4/4 = 4.0	3/5/4 = 4.0

presentation		
• Used logical approach to present material	5/4/4/5 = 4.5	3/5/4 = 4.0
• Included appropriate level of supporting detail	5/3/4/5 = 4.25	3/4/4 = 3.7
• Conclusion - Summarized important points of design	5/4/3/5 = 4.25	3/5/4 = 4.0
• Question and Answer session was well-managed	5/3/3/4 = 3.75	3/5/3 = 4.0
	20.75 / 25.0	19.7 / 25.0
Visual Aids		
• Appropriate	5/4/4/5 = 4.5	4/5/4 = 4.7
• Readable	5/4/4/5 = 4.5	4/5/4 = 4.7
• Support Oral Presentation	5/4/4/5 = 4.5	4/5/4 = 4.7
	13.5 / 15	14.2 / 15
• Finished within the allotted time	5/4/4/4 = 4.25	4/5/4 = 4.7
TOTAL SCORE (SUM)	79 / 95	79.6 / 95

Table B3-13b. Ratings of Final Design Presentations – FEG 489
Team Two – Orenda Facilities Plan

Design Process and Technical Approach - Team	**Ratings by Internal Reviewers**	**Ratings by External Reviewers**
• Provided a complete problem description	5/3/3 = 3.7	3/4 = 3.5
• Demonstrated thorough understanding of the design constraints	4/3/4 = 3.7	3/4 = 3.5
• Identified components of design	5/3/3 = 3.7	3/4 = 3.5
• Identified critical design elements	3/3/3 = 3	3/3 = 3.0
• Described alternative solutions	4/3/3 = 3.3	4/4 = 4.0
• Understands technical issues	4/3/3 = 3.3	4/3 = 3.5
• Identified criteria for evaluating alternative solutions	3/2/3 = 2.7	3/4 = 3.5
• Applied robust technical analysis	4/3/3 = 3.3	4/3 = 3.5
• Solution is logically developed	4/3/3 = 3.3	4/4 = 4.0
• Solution is appropriate for stated problem	4/3/3 = 3.3	4/3 = 3.5
	33.3 / 50.0	35.5 / 50.0
Communication: Oral Presentation – Team		
Organization		
• Introduction told audience purpose of presentation	5/3/4 = 4.0	3/4 = 3.5
• Used logical approach to present material	5/4/3 = 4.0	3/4 = 3.5
• Included appropriate level of supporting detail	5/3/3 = 3.7	4/4 = 4.0
• Conclusion - Summarized important points of design	3/3/2 = 2.7	4/4 = 4.0
• Question and Answer session was well-managed	4/3/3 = 3.3	3/5 = 4.0
	17.7 / 25	19 / 25

Visual Aids		
• Appropriate	4/2/3 = 3.0	4/4 = 4.0
• Readable	3/3/4 = 3.3	3/3 = 3.0
• Support Oral Presentation	4/2/3 = 3.0	4/4 = 4.0
	9.3 / 15	11 / 15
• Finished within the allotted time	5/3/3 = 3.7	4/4 = 4.0
TOTAL SCORE (SUM)	64 / 95	69.5 / 95

Table B3-13c. Ratings of Final Design Presentations – FEG 489
Team 3 - Low Impact Stormwater Design

Design Process and Technical Approach - Team	Ratings by Internal Reviewers	Ratings by External Reviewers
• Provided a complete problem description	5/3/4 = 4.0	4/4 = 4.0
• Demonstrated thorough understanding of the design constraints	4/3/3 = 3.3	3/4 = 3.5
• Identified components of design	3/3/4 = 3.3	3/4 = 3.5
• Identified critical design elements	3/3/3 = 3.0	4/4 = 4.0
• Described alternative solutions	3/2/3 = 2.7	3/4 = 3.5
• Understands technical issues	4/2/3 = 3.0	4/4 = 4.0
• Identified criteria for evaluating alternative solutions	5/3/3 = 3.7	3/4 = 3.5
• Applied robust technical analysis	5/3/3 = 3.7	3/4 = 3.5
• Solution is logically developed	5/3/3 = 3.7	4/4 = 4.0
• Solution is appropriate for stated problem	3/3/4 = 3.3	4/4 = 4.0
	33.7 / 50	37.5 / 50
Communication: Oral Presentation – Team		
Organization		
• Introduction told audience purpose of presentation	5/3/4 = 4.0	4/4 = 4.0
• Used logical approach to present material	5/4/4 = 4.3	4/4 = 4.0
• Included appropriate level of supporting detail	5/2/3 = 3.3	3/4 = 3.5
• Conclusion - Summarized important points of design	3/2/3 = 2.7	3/4 = 3.5
• Question and Answer session was well-managed	5/3/4 = 4.0	3/4 = 3.5
	18.3 / 25	18.5 / 25
Visual Aids		
• Appropriate	5/2/5 = 4.0	4/4 = 4.0
• Readable	5/3/5 = 4.3	3/4 = 3.5
• Support Oral Presentation	5/3/5 = 4.3	4/4 = 4.0
	12.6 / 15	11.5 / 15
• Finished within the allotted time	5/5/3 = 4.3	4/4 = 4.0
TOTAL SCORE (SUM)	68.9 / 95	71.5 / 95

Analysis and Interpretation; I would not consider any of the cited shortcomings to be a "fatal flaw" in determining the students' abilities to communicate effectively using oral presentation methods. Rather, considering the sum total of the entire experience, it is evident that the internal and external reviewers find that the team and student technical presentations surpass all expectations. Anecdotal comments made by external reviewers indicate a very high degree of satisfaction with the teams and individuals, expressing that the students conducted themselves "professionally." In all cases, the students demonstrated that they have the ability to communicate effectively, albeit they all need continued development as their careers progress.

Recommendations:

- As the course instructor, I recommend continued diligence in FEG 489 in teaching the elements of effective oral presentations. The current approach seems to work well.
- The addition of the mid-semester oral presentation this year was effective for two reasons. First, it required the students to stay true to the project schedule, which helps develop time management and team management skills. Second, it gave the students an opportunity early in the semester to learn to work together as a team in a stressful situation. Having had that experience, they were very receptive to the suggestions I made later in the semester that would improve their skills.
- I also suggest that ERFEG instructors that currently use, or intend to use, oral presentation methods in their courses consult the assessment form included herein for guidance. I find that students desire instructors to have consistent standards of performance. I suspect that using a similar assessment/evaluation method in junior-level courses would make the students comfortable with oral presentations before entering FEG 489.

SUMMARY: We are concerned about the communications skills of our students. While we are convinced we have seen an improvement in some areas (e.g., oral presentations) we still see weakness in written communication skills.

Program Outcome 6: Exhibit the following attributes of a competent engineer:

The next three Program Outcomes are in essence sub-sets of this Program Outcome, and therefore speak to this one. We consider successful attainment of the next three Outcomes to be evidence of the successful attainment of this overarching Program Outcome.

Program Outcome 6a: Knowledge - both in understanding basic principles and in creativity in problem solving

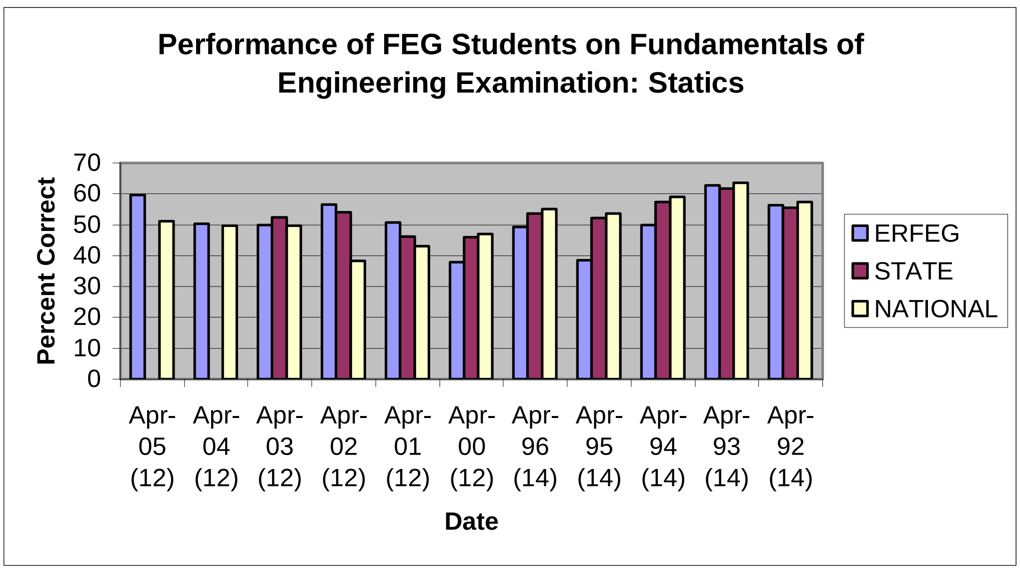
We rely on the Fundamentals of Engineering examination as one means to assess this Program Outcome. We monitor several sections of the morning portion of the FE examination.

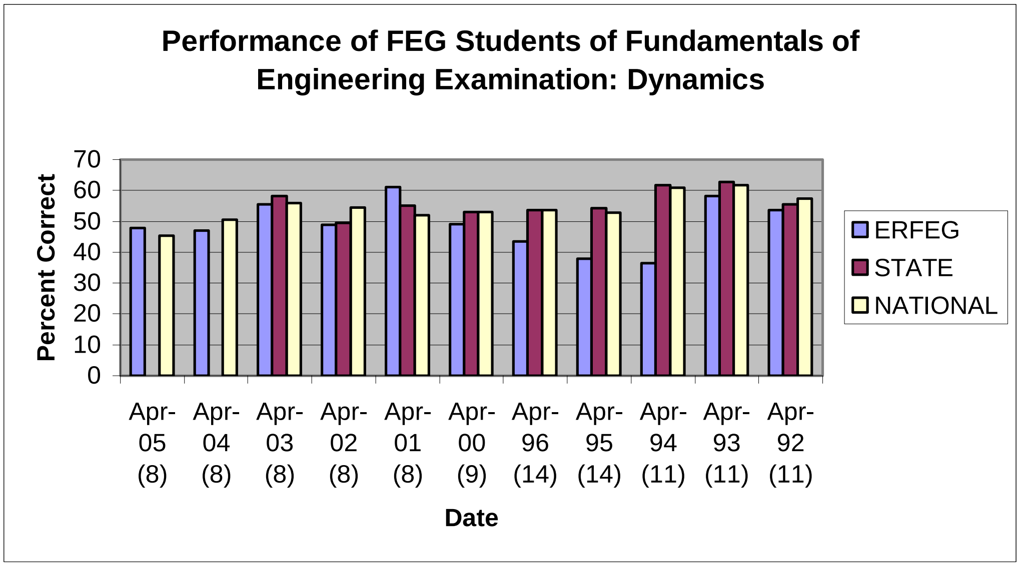
FUNDAMENTALS OF ENGINEERING EXAMINATION

Metric: We monitor the number of correct responses on several subtests in the morning portion of the FE exam.

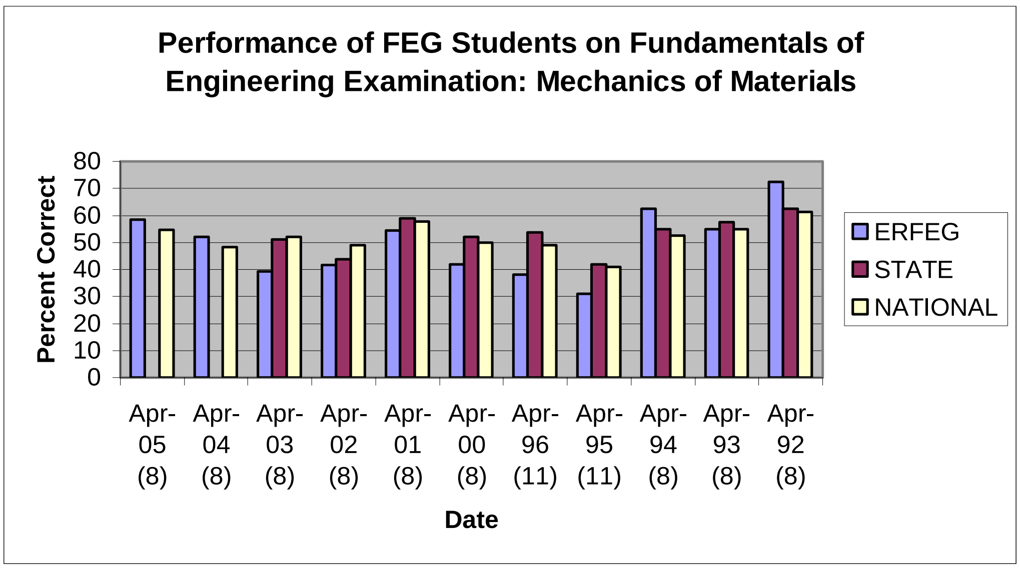
Trigger: We expect Forest Engineering students to perform better than the New York State average for these questions.

Analysis: The graphs below tracks the percent correct for Forest Engineering and comparison groups. The graphs are weighted averages from the Form 6 data received from the State Education Department. The data for the 1997-99 examinations are not available because of changes implemented at the state level in FE exam administration.





Performance of FEG Students of Fundamentals of Engineering Examination: Dynamics
Percent Correct
70
60
50
40
30
20
10
0
Apr-05 (8)
Apr-04 (8)
Apr-03 (8)
Apr-02 (8)
Apr-01 (8)
Apr-00 (9)
Apr-96 (14)
Apr-95 (14)
Apr-94 (11)
Apr-93 (11)
Apr-92 (11)
Date
ERFEG
STATE
NATIONAL



Performance of FEG Students on Fundamentals of Engineering Examination: Mechanics of Materials
Percent Correct
80
70
60
50
40
30
20
10
0
Apr-05 (8)
Apr-04 (8)
Apr-03 (8)
Apr-02 (8)
Apr-01 (8)
Apr-00 (8)
Apr-96 (11)
Apr-95 (11)
Apr-94 (8)
Apr-93 (8)
Apr-92 (8)
Date
ERFEG
STATE
NATIONAL

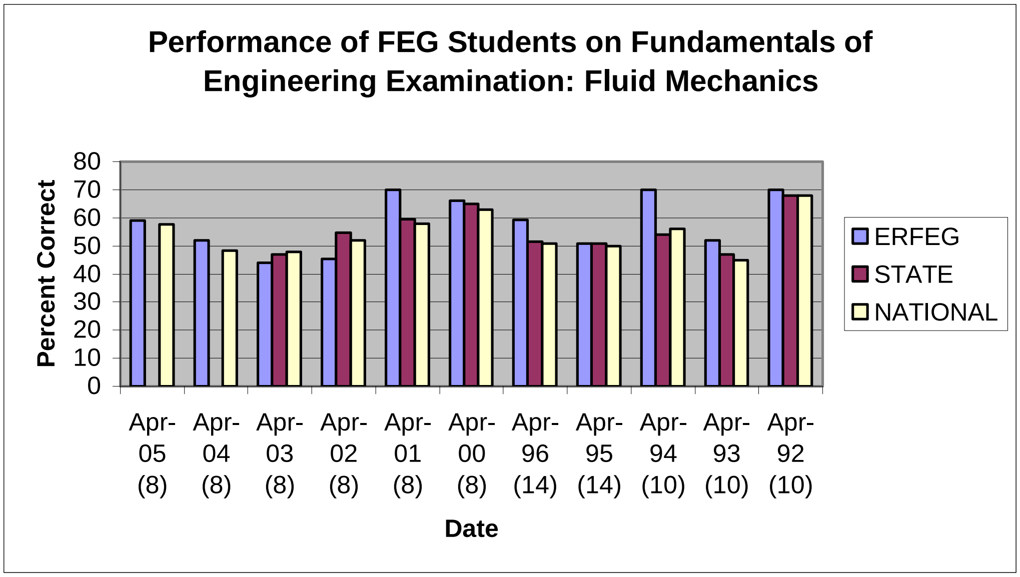


Figure 2 - 5. Results from Four Subtests of the Morning Portion of the Fundamentals of Engineering Examination.

Response: The data showed a disturbing trend in the statics, dynamics, and mechanics of materials subtests, in the Forest Engineering students consistently did not meet the metric and performed poorly as compared to the norm groups. This situation proved to be somewhat awkward in that the Forest Engineering students receive instruction in these courses from another faculty unit (see Table B4-2). The ERFEG faculty chair met, starting in the 1999-2000 academic year, with the Chair of the Faculty of Construction Management and Wood Products Engineering and shared these assessment data with him. Several hypotheses were discussed, and ultimately the Forest Engineering students were assigned to their own sections of these courses, with special care made in instructor assignment to the sections.

Discussion: The recent performance of the Forest Engineering students has improved, and now meets or exceeds our established performance metric. We have considered using the results of the afternoon portion of the FE examination, but the forest engineering students choose one of several afternoon categories (see Table B3-5) and so we would have a very small number of results to analyze.

ANALYSIS OF EMBEDDED ACTIVITY: FEG 363.

Method: During the eighth week of the Spring 2006 semester, FEG 363 students were given a lab session on Matrix Manipulation and Coordinate Transformation (attached). Being an important subject in photogrammetry, interior orientation converts photo coordinates to camera image plane coordinates through matrix manipulation. The following mathematic principles were used in the lab to solve the interior orientation problem: affine transformation and least squares adjustment. Most students in the course were in their junior year.

Assessment Criteria: Student needs to show their understanding of affine transformation models and least squares adjustment, and their ability of applying these mathematical principles to solving the photogrammetric problem. Student lab reports were used as their work products in the assessment. Student lab reports were assessed using the following criteria and grading rubrics:

1. Have knowledge on affine transformation model for coordinate transformation (i.e., Problem #1 in the lab assignment) [10 points];
2. Understand least squares adjustment (i.e., Problems #2 and #3) [20 points];
3. Apply mathematical principles to develop a transformation model (i.e., Problem #4) [30 points];
4. Evaluate and refine the model through error analysis (i.e., Problem #5) [30 points];
5. Apply the developed model to solve the interior orientation problem (i.e., Problem #6) [10 points].

Each performance criterion was weighted using the number of points, and student performance on each criterion was rated using percentage, where:

- 100% = clear and correct finish
- 75% = showing clear understanding of the principle
- 50% = on the right track
- 25% = present, but needs significant improvement
- 0% = absent or lacking any development

Performance Targets

1. Individual Total Scores should exceed 75%.
2. Averaged Group Score on each criterion should equal or exceed 75%.
3. The Grand Average Score should exceed 80%.

Result Analysis: The ratings for individual students on each criterion were summarized in the following matrix, which serves as the raw data for the analysis.

Table B3-14 Assessment of Application of Mathematics Knowledge - FOR 363							
Performance Criterion and Percentage(%)							
Forest Engineering Students	**1 [10]**	**2 [10]**	**3 [10]**	**4 [30]**	**5 [30]**	**6 [10]**	**Total Score**
1	100	60	70	100	80	100	**88**
2	100	50	50	100	80	100	**85**
3	100	80	80	90	90	70	**89**
4	100	80	100	50	100	100	**83**
5	90	100	80	100	80	100	**92**
6	100	80	100	100	90	60	**92**
7	70	80	100	100	80	100	**88**
8	100	100	100	100	100	100	**100**
9	100	100	80	70	80	70	**80**
10	50	0	0	80	90	50	**62**
11	100	100	80	90	80	100	**89**
12l	100	100	80	90	90	70	**91**
13	100	80	0	100	30	40	**62**
Average	**93**	**78**	**71**	**90**	**82**	**82**	**85**
Notes: 1 = knowledge on affine transformation; 2 = understanding of least squares adjustment; 3 = further understanding of least squares adjustment; 4 = application of least squares adjustment in model development; 5 = model evaluation and refinement; 6 = model application							

1. Individual Scores: Note: Fourteen Forest Engineering students took the course Spring 2006. One did not submit the lab report; therefore, this assessment is based on the records of 13 students. Two students out of thirteen failed to meet the threshold performance criterion (<75%). They both missed problems to answer, largely due to carelessness. Rest students performed well (>80%), with four of them higher than 90%.

Recommendation: The instructor in FEG 363 should re-emphasize the importance of carefulness and understanding the problem itself. Also suggest the instructor require re-submission of incomplete work.

2. Criterion Average: The third performance criteria (i.e., further understanding of least squares adjustment) appeared 71% and fell short of the target score (75%). The related question that needed to be answered was "Why least squares solution can help to develop an affine transformation model for the photogrammetric problem provided?" This is an open-mind problem, and needs some critical thinking. Four students addressed the problem correctly; seven students (with a score between 50% and 80%) either were on the right track or showed understanding of the principle involved, but failed present clearly and correctly. Two students did not answer the question again due to carelessness.

Recommendation: The instructor of FEG 363 should more frequently expose students to critical thinking problems and give students more opportunity to express themselves during the lecture and lab discussions.

3. Group Average: The Group Average Score of 85 exceeds the threshold target. No further action is required.

Conclusion: Students in FEG 363 are able to apply knowledge of mathematics to solving problems. **Program Outcome 6b: Skills - originality and method of problem solving**

ANALYSIS OF EMBEDDED ACTIVITY IN APM 395

This project involves the analyses and interpretation of streamflow data, the estimation of flood percentiles, and the development of a regional regression model that can be employed to estimate flood percentiles at ungauged river sites. The assessment results are documented in an end of course memo prepared by the instructor.

Metric: Students were evaluated on a project and given a numerical score indicating their understanding of the concepts.

Trigger: The instructor generated a scale for assessment.

Table B3-15. Analysis of Embedded Activity – APM 395

Average Score	Action
20 – 25 (80% - 100%)	No Action Needed
15 – 20 (60% - 80%)	Changes to APM395 course and project needed
< 15 (< 60%)	ERFEG faculty to make necessary curriculum changes

Analysis: The average score on this assessment was 19.1. This score is a trigger within our program assessment (as it is between 15 and 20), indicating a need for changes within APM395 to better prepare ERFEG graduates to meet this program outcome.

Actions Taken: The following actions are to be taken in APM395:

1) More thoroughly discuss this program outcome and the importance of this outcome in their engineering careers;
2) Hand out the assessment rubric prior to performing this project; and
3) Provide additional classroom discussion of the techniques necessary to adequately perform the semester project.

Discussion: In addition, the instructor analyzed the results in terms of individual Bloom's Taxonomy categories. These results are as follows:

Table B3-16. Analysis of Embedded Activity – APM 395 in Relation to Bloom's Taxonomy

Bloom's Taxonomy	Maximum Number of Points	Average	Percentage of Maximum
Knowledge	2	2.0	100.0%
Comprehension	6	4.6	77.3%
Application	5	4.2	83.6%
Analyze	4	3.4	84.1%
Synthesis	5	3.9	78.2%
Evaluation	1	0.5	45.5%
Valuation	2	0.5	27.3%
Total Number of Points	**25**	**19.1**	**76.4%**

Forest Engineering students exceed 80% in 3 of the 7 Bloom's Taxonomy categories, and exceed 77% in 5 of 7 categories. In general they perform better in knowledge, comprehension, application, analysis, and synthesis, and worse in evaluation and valuation. These results are consist with the general understanding that Bloom's taxonomy represents a progression, where student must first master the initial taxonomy categories before being able to adequately perform within the latter categories.

Table B3-17. Analysis of Embedded Activity – APM 395			
Outcome Element:	**Maximum Number of Points**	**Average**	**Percentage of Maximum**
Design Experiment	7	6.6	94.8%
Conduct Experiment	3	2.6	87.9%
Analyze Data	7	5.3	75.3%
Interpret Data	8	4.5	56.8%
Total Number of Points	**25**	**19.1**	**76.4%**

These results indicate adequate proficiency in designing and conducting experiments, while student are less proficient in analyzing and interpreting data. For the outcome element of interpreting data, student performance was close to the trigger for overall curriculum changes (i.e. less than 60%). This indicates that more time and effort is needed in training our student to develop further insight on interpreting the meaning of their data analyses.

Program Outcome 6c: Attitude - professional ethics, self-disciples, and perseverance

Again, we rely on data from the Fundamentals of Engineering examination to provide evidence in support of this Outcome.

FUNDAMENTALS OF ENGINEERING EXAMINATION - I

Metric: We compare the number of graduates from the Forest Engineering program with the number of students who take the FE exam in their senior year.

Trigger: We will react to anything less than 100% participation.

Analysis: The data in the next table show the number of Forest Engineering graduates by year and month as compared to the number of students registered to take the Fundamentals of Engineering examination.

Table B3-18. Numbers of Students Certified to Take the Fundamentals of Engineering Examination Compared to Numbers of Graduates			
Date of Fundamentals of Engineering Examination	**Number of Eligible Students**	**Date of Graduation**	**Number of Graduates**
April 2001	13	May 2001	13
		August 2001	1
October 2001	-	December 2001	2
April 2002	11	May 2002	8
October 2002	-	December 2002	1
April 2003	8	May 2003	8
October 2003	-	December 2003	2
April 2004	19	May 2004	13
		August 2004	1
October 2004	-	December 2004	4
April 2005	17	May 2005	13
		August 2005	1
October 2005	-	December 2005	5
April 2006	19	May 2006	14
Totals:	**87**		**86**

Response: The data support the attainment of this Outcome, and do not suggest the need for any programmatic changes.

Discussion: We feel this is an appropriate metric in that we **encourage** but do not **require** our students to take the FE examination. Further, we do not hold formal review sessions – the faculty will provide sessions if asked by the seniors, but it is up to the students to organize themselves, purchase review books, schedule review sessions, and otherwise manage their time to prepare for the exam. We therefore feel this is an appropriate metric for this Outcome.

FUNDAMENTALS OF ENGINEERING EXAMINATION - II

We also monitor the performance of Forest Engineering students on the ethics questions on the morning section of the Fundamentals of Engineering examination.

Metric: We monitor the number of correct responses on the ethics questions in the morning portion of the FE exam.

Trigger: We expect Forest Engineering students to perform better than the New York State average for these questions.

Analysis: Figure 6 below tracks the percent correct for Forest Engineering and comparison groups.

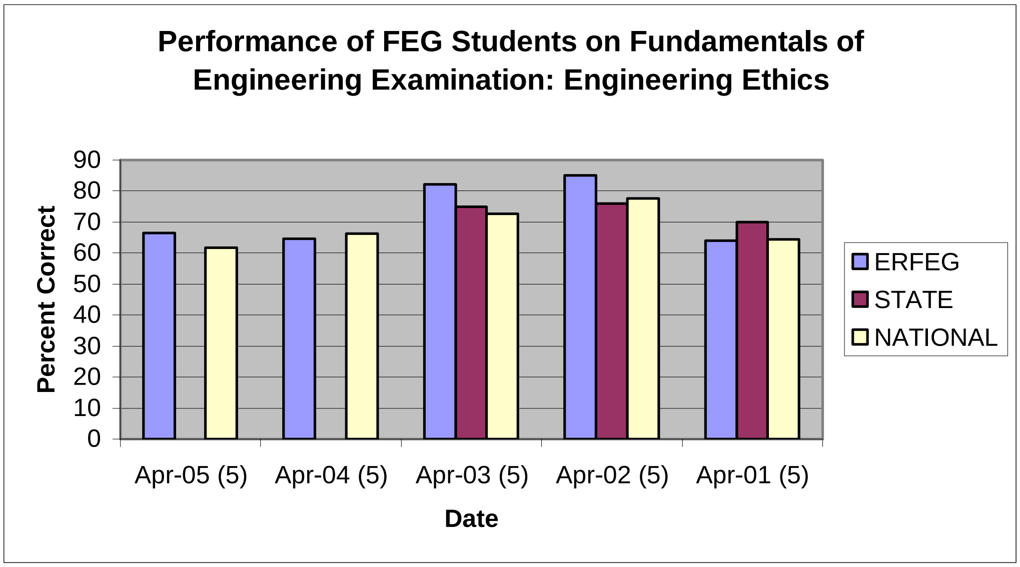


Figure 6. Results from Engineering Ethics Subtests of the Morning Portion of the Fundamentals of Engineering Examination.

Response: The data support the attainment of this Outcome, and do not suggest the need for any programmatic changes.

Discussion: The FE data were analyzed as described earlier, and are subject to the same limitations as noted previously.

Changes Implemented: We continue to develop strategies to emphasize the importance of professional and ethical behavior in the curriculum, and it is likely the assessment of this outcome will change as new strategies are employed.

ANALYSIS OF EMBEDDED ACTIVITY IN FEG 489 (2006)

Method: A four class period instructional module developed by a guest lecturer professional engineer engaged students in discussion of leadership, the NSPE Code of Ethics, Principles of Green Engineering, WFEO guidelines and AAES Action Principles for the Engineering Profession as well as an engineering ethics video. The module is designed to provide students with an understanding of the nature of professional and ethical responsibility along the career growth path from highly capable individuals to team members to competent project managers. Students applied those principles and the NSPE Code to write: 1. a viewer's response to the video *Incident at Morales* as well as 2. to complete both a pre-module and a post-module Six Item Survey on statements about engineering practice as adapted from *"Assessment of an Engineering Ethics Video: Incident at Morales"*-Journal of Engineering Education, January, 2006. In addition students engaged discussion that rationalized their responses to the Six Item Survey and changes that occurred between the pre and post module responses.

Two components of assigned student work and the applicable assessment tool were:

1. instructions for the students viewer's response to the *Incident at Morales* guided each student to choose from four open-ended problematic situations depicted or related to the video and write a professionally based response.
2. in completing the pre and post module Six Item Surveys and in discussion students rationalize their decision as to whether or not the individual exercise of professional responsibility can affect change in a corporate culture.

Assessment tool: Student is able to recognize and incorporate in written responses the problematic situation in terms that reflect a robust understanding of professional and ethical responsibility as drawn from the NSPE Code of Ethics and/or the AAES Action Principles for the Engineering Profession and a five tiered leadership responsibility pyramid.

Metric: We characterize students ability to apply codes and action principles when describing a problematic situation in the context of the referenced assessment tool and rate their performance on a scale of 1 to 5, where:

5 = Clear link with code of ethics / or action principles
3 = Logical analysis, but link to formal professional codes and principles needs development
1 = Lacking any substantive development, relying instead on assertions and beliefs only

The ratings were computed for both assessment components.

Triggers: The class average performance rating should equal or exceed a Performance Target Score of 3.5 for both sets of assigned work.

Action Items: When performance ratings are less than the Performance Target Score the instructor will institute course activities designed to strengthen students understanding of the link between the NSPE Code of Ethics and the AAES Action Principles for the Engineering Profession with professional practice and ethically based problematic situations.

Ratings: Viewer's response average rating was 4.5. No student was ranked below 3.0

Six Item Survey with rationale rating was 3.75. Two students failed to provide suitable attempts of rationale.

Analysis: The viewer's responses sometimes lapsed in part to a description of a story line rather than a response in the sense of a professionally based robust thinking process. Every student did very well in some aspect of their written response and more than one-half of the students did very well throughout. Students need better guidance about developing each paragraph in their responses in line with the instructions. The Purdue University Online Writing Lab paragraph development methods will be demonstrated in an assignment that links problematic engineering practice situations to the NSPE Code of Ethics and the AAES Action Principles for the Engineering Profession. Since NSPE has recently incorporated sustainability into its code of ethics, this would be a good teaching tool.

The results of the Six Item Survey pre module and post module, in terms of Strongly agree, Agree, Neutral, Disagree or Strongly disagree differed in only the slightest terms (effective change of none means only one student opinion changed and that change was two or fewer positions in the response range):

1. The first obligation of an engineer is to fulfill an assignment with an employer, or a contract with a client. No effective change, however, all students clarified that human safety must be embedded in the matter as the top priority, an issue originally identified by only one-half the class in a pre discussion show of hands.
2. When working in a foreign country, an American engineer should comply with local regulations and should avoid more stringent American standards for safety. No effective change
3. Ethical considerations are an integral part of making engineering decisions. Two students shifted from Agree to Strongly Agree and no other changes occurred.
4. A code of ethics can provide guidance in making engineering decisions. No effective change.

5. Many ethical problems encountered by engineers have technical solutions. Significant change occurred as students were originally two-thirds neutral on this matter and became quite active in their thinking in both the agreement and disagreement directions. This became a good topic for lively class discussion. The primary source of disagreement was semantically based.
6. The exercise of professional responsibility can affect change in a corporate culture. Modest changes from mainly neutral to some agreement and some disagreement became a focal pointfor class discussion.

Recommendation: This assessment validates that by the end of their senior year Forest Engineering students / graduates to exhibit the attitude and understanding of professional responsibility intended for the program**.** Strengthening of sustainability in the current module should be considered by the ERFEG Faculty in the year ahead.

ANALYSIS OF EMBEDDED ACTIVITY IN FEG 489 (2005)

Metric: FEG 489 students were given an assignment in the Spring 2005 semester. The Forest Engineering students in the course are principally in their final (senior) year.

Assignment:

Read the article *Ethics and the Professional Engineer* by John Speed, P.E. found at URL http://www.nspe.org/ethics/eh1-eth.asp
Reflect upon your experience by addressing the following comments/questions in an essay

- How you achieved your goals in FEG 489 in a trustworthy manner.
- How you treated your team mates and instructor in an honest and complete manner.
- How you selected an appropriate design using an objective assessment process.
- How you promoted appropriate ethical behavior amongst your team and class mates.
- How will you use these experiences as you conduct business (including continued education) over the next 2 years.

Criteria: Student essays were assessed using the following criteria:

1. Comprehends need for engineering ethics based on the reading assignment

2. Expresses an understanding of ethics and trust
3. Expresses relevant example(s) of ethical behavior
4. Proposes relevant ethical model for post-graduation activities

Results: Results from the assessment of individual papers are included in the following table. The criteria are scored based on the integer scale of 1-5, where

1 = skill or knowledge is absent
2 = skill or knowledge is apparent, but lacks sufficient development
3 = skill or knowledge satisfies minimum expectation
4 = skill or knowledge exceeds minimum expectations some of the time
5 = skill or knowledge is mastered

Trigger: All students are expected to achieve a minimum score of 3/5 for each criterion.

Analysis:

Table B3-19. Analysis of Embedded Activity – FEG 489 (2005)

Name n = 14	Comprehends Ethics from Reading	Understanding of Ethics and Trust	Cites Relevant Examples	Proposes Ethical Model	TOTAL
1	4	4	4	4	16
2	3	3	3	2	11
3	4	4	4	4	16
4	5	5	4	3	17
5	3	4	5	3	15
6	4	5	4	3	16
7	5	5	5	4	19
8	1	3	4	3	11
9	2	3	3	2	10
10	2	2	3	4	11
11	3	3	4	5	15
12	2	4	4	3	13
13	2	3	3	3	11
14	5	4	4	5	18
AVERAGE	**3.21**	**3.71**	**3.86**	**3.43**	

Response and Discussion:

1. ***Comprehends need for engineering ethics based on the reading assignment***

10/14 students satisfied the minimum expectations for this assessment criterion. The shortcoming was largely due to the students failing to make a direct reference in the essay to the key statements from the reading assignment. This may be explained by the difference between the instructor's explicit assignment requirements (which did not require an analysis of the reading) and the assessor's criteria. As there is some overlap with the other assessment criteria, these shortcomings are not considered detrimental if the other criteria are satisfied.

2. ***Expresses an understanding of ethics and trust***

13/14 students met or exceeded this assessment performance criterion. The one student that fell short seemed confused about the difference between the ethical behavior model and the project management responsibilities.

3. ***Expresses relevant example(s) of ethical behavior.***

All students met or exceeded the minimum expectations for this criterion.

4. ***Proposes relevant ethical model for post-graduation activities.***

12/14 students met or exceeded the minimum expectations for this criterion. The two that fell short of the expectation failed to expressly state what type of model they would follow (e.g. NSPE Code of Ethics), but did allude to taking their learned knowledge and experience in dealing with teammates into the next phase of life.

For the most part, the student essays demonstrated that all of the students have a reasonably good understanding that engineering ethics is vital to continued success and that honesty, trustworthiness and objectivity are important behaviors in dealing with their peers, supervisors, clients and the public. They all expressed that the course FEG 489 and the project gave them the experience they needed to go forward in pursuit of their continued education and career. Several expressed that the code of ethics is "common sense," an affirmation that these students in particular already subscribe to an ethical model. Application of ethical behavior to the engineering profession seems natural to these students.

Most cited relevant examples of actions that they consider “ethical”. Notably, many expressed the idea that they would limit their practice to their area of expertise and would put the needs of the public and the client before their own.

I believe the shortcomings are not indicative of any lack of understanding on the part of the students, but rather an inability to clearly express their ideas on this particular writing assignment. The assignment was completed at the end of the semester, in the midst of intense preparations for the final oral presentations and written reports in this class. Is suspect that the two students did not give the assignment sufficient attention.

Recommendation: The ability of the student to reflect upon the NSPE code of ethics and their own behavior is important. I suggest that the assignment be completed earlier in the semester to allow time for reflection without undue stress from other assignments. In addition, the assignment could include classroom discussion after the written portion is graded.

Program Outcome 7: Can function effectively in a multidisciplinary team/environment

The Faculty considers teamwork to be an essential skill that all engineering graduates must possess. While numerous opportunities are integrated throughout the curriculum for students to work in small groups or with partners, teaching the process of teamwork is explicitly stated as a course objective for two required engineering design courses, FEG 300 and FEG 489. As a result of these experiences, the Faculty considers the following performance criteria to be essential indicators that this outcome is met:

- Students are able to explain the functional roles and responsibilities of team members.
- Students are able to demonstrate that they are capable of functioning in an assigned role within a team.
- Students are able to assess the performance of themselves and other team members to improve the effectiveness of individual and team performance.
- Students engage in behavior that demonstrates respect of team members and their functional roles.

INSTRUCTOR ASSESSMENT – FEG 489

Performance Criterion:

- Students are able to explain the functional roles and responsibilities of team members.

Method: Students were given a quiz during the first week of the Spring 2006 semester and asked to describe four principal functional roles and at least two responsibilities for teamwork.

Results: 100% of the students responded satisfactorily to the quiz.

Performance Criterion:

- Students are able to demonstrate that they are capable of functioning in an assigned role within a team.

Method: Students were assigned to project teams and were given an activity to assign team functional roles. Team functional roles were reinforced by the instructor performing formative assessments throughout the semester. Instructor would observe teams, address questions to the "Captain", review "Recorder's" notes, and ask for oral summaries from the "Reporter".

Results: All students responded satisfactorily to performing within assigned functional roles. Students demonstrated respect for the various roles, and became proficient in satisfying their responsibilities by the end of the semester. All students materially participated in the end of semester oral project presentations, further evidence of their trust in one another and their evidence that they can function in a team environment.

Performance Criterion:

- Students are able to assess the performance of themselves and other team members to improve the effectiveness of individual and team performance, and
- Students engage in behavior that demonstrates respect of team members and their functional roles.

Method: The Self- and Peer-Assessment is the principal tool used by the students to improve their own and team members' performances throughout the semester. Students assess their own performance and their teammate's performance in several categories, namely:

- Committed to Team (e.g. attends all team meetings)
- Commitment to Team (e.g. material participation in all activities)
- Able to resolve conflict within team (e.g. reach consensus, or compromise)

- Able to perform within assigned functional team role
- Meets deadlines
- Willing to work as part of a team (respectful of team members)

Assessments are usually performed in about the sixth and tenth weeks of the semester strictly for the purpose of process improvement. Students discuss the assessment results with each other and the instructor in team-level meetings and are encouraged to develop an action plan to improve their performance based on these assessments. The end-of-semester assessment is completed by the students, with affirmation by the instructor that the student ratings are appropriate and consistent with the instructor's assessment.

Metric Peer and self-assessment scores are aggregated to compute an average score based on the number of assessors. There are six categories used for assessment of teamwork. Scoring a maximum of five points in each category yields a maximum score of 30. We expect that all students will score at least three points (3) in each category (Average Total Score of 18 points) reflecting that they have met the minimum expectations all of the time. Individuals scoring less than 18 out of 30 points will be reviewed to determine if there are any trends within the team or within the class; any individual scoring less than 12 (an average score of 2 in each category) will not be considered effective in teamwork.

Analysis Seventeen (17) Forest Engineering students were assigned the Self- and Peer-Assessment at the end of the Spring 2006 semester. Thirteen (13) students returned the forms as required.

Self Assessment Scores ranged from 17 to a perfect 30. These scores are derived from individuals assessing their own performance in each category.

Individual Peer Assessment Scores ranged from 14 to a perfect 30.

The Combined Average Score ranged from 16 to 26. These scores combine the peer and self assessment scores for the entire team.

Response: Non-responsive students participated in earlier assessments, and were generally responsive to all class assignments. Their lack of response in this case is unusual, but did not adversely affect the instructor's assessment process.

The Combined Average Scores exceeded the 18-point threshold in all but one instance. The instructor concurs that the individual student scoring 16 out of 30 points in the team assessment underperformed on more than one area. It is known to the instructor that this particular student was dealing with personal circumstances outside of the academic environment that hampered the student's academic success. Despite intervention efforts by the instructor, this student was not able to meet the minimum performance expectations in the team environment due to these conflicts.

In all instances, the instructor's assessment concludes that all students are capable of functioning in a team environment. They all understand the need for working on teams, and all work together to try to overcome adversity and conflict. While instructor intervention is sometimes needed to pull the teams back into the process, once intervention occurred the teams moved beyond the conflict and seemed to thrive and succeed.

Actions: Instructor will need to continue formative assessment process and intervention with teams and individuals that are not functioning as needed. Faculty may give consideration to requiring each individual to demonstrate satisfactory team performance before receiving course grade.

Program Outcome 8: Understand the need for life-long learning

We assess this outcome by two measures.

EXIT SURVEY

We send a survey instrument to graduating seniors, and track the results from that survey.

Metric: We review the numerical scores on the exit surveys returned.

Trigger: We expect an average score of at least 4 on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree)

Analysis: A summary of 2006 survey data is presented in the next table.

Table B3-20. Summary Data from Forest Engineering Exit Survey in Response to Statement 'I understand the need for me to engage in life long learning'

Year	Number of respondents	Average Score
2006	3	3.67

Response: The results are from the 2006 survey only, as that survey instrument was modified to provide better feedback from the graduates. Earlier versions of the survey did not explicitly address this issue. Still, the results show the need to better inculcate this outcome into the Forest Engineering curriculum.

Discussion: The May 2006 survey instrument is different in many regards from the previous exit surveys. The survey attempts to measure more directly student perceptions against explicit statements of Program Outcomes. A pdf of the survey instrument is included on the enclosed CD.

EMBEDDED ACTIVITY IN FEG 300

Method: FEG 300 students were given the following assignment during the third week of the Fall 2005 semester. The Forest Engineering students in the course are principally in their junior year.

1) Read text Chapter 1 and Sections 2.1 through 2.4 (Text: *Design Concepts for Engineers*, 3rd Ed, Mark N Horenstein, ISBN: 0-13-146499-X, Prentice Hall)

    a) Prepare a two-page statement of your own that reflects on the statement at the bottom of page 19 – "… the prudent engineer also acquires knowledge through … a lifetime of study and exploration."

        i) Give two examples of civil/environmental engineering and technology in common use today that either did not exist 20 years ago, or has significantly improved the effectiveness of civil/environmental engineering and management systems over the past 20 years.
        ii) Reflect on how ESF engineering students graduating in 1985 have kept informed of and proficient with this technology development over the past 20 years. Identify at least two ways that these alumni may have continued their lifetime of education.
        iii) Describe two examples of how you might continue your study and exploration for the 10 years after you graduate from ESF.

Assessment Criteria: Student work products were assessed using the following criteria:

1. identifies need for continued education in engineering
2. provides one relevant example of technology change
3. identifies at least two methods for continuing learning after graduation
4. reflects upon personal interests in continued learning

Results from the assessment of individual papers are included in the following table.

Table B3-21. Summary of Responses in FEG 300

Name	1. Need	2. Change	3. Learning Processes					4. Reflection
			Field Observation	Reading Journals	Work-shops	Formal Education	Professional Meetings/ Conference	
1	•	•	•		•			•
2	•	•		•	•	•		•
3	•	•	•	•		•	•	
4	•	•	•	•	•		•	
5	•	•	•	•	•	•		
6	Incomplete							
7	Incomplete							
8	Incomplete							
9	•	•		•			•	
10	•	•	•	•		•		
11	•	•						
12	•	•						
13	•	•	•	•		•	•	•

The reading assignment exposes students to the concept of continuous learning in an engineering environment. A related assignment regarding professional registration underscores the need for continuing education as part of professional engineering. Classroom discussion is used to explore the students' perceptions and to present opportunities for continued learning after graduation.

The writing assignment assessment underscores that all of the students that completed the assignment understand the need for continuous learning, especially in the context of technology changes. All of the students were able to identify at least two methods that they would use to continue their learning after graduation. Although it was not part of the assignment, three of the students did reflect upon their personal interests and what method would be most successful for themselves.

Conclusion: Students in FEG 300 understand that lifelong learning is an essential part of the engineering profession.

Reflections on Assessment Activities and Future Directions

Our efforts described in this Criterion have reminded us that we are not experts in assessment. While we have as a faculty embraced the concept of finding ways to improve our program, we have struggled with the details of the implementation. What is described here is a work in progress, subject to refinement as we learn more.

It is also fair to say that our assessment efforts, off to a good start in 2000, suffered a setback when our faculty numbers declined during the middle of the assessment cycle (see discussion under Criterion 5). We have had to train new faculty in the basics of assessment, and otherwise bring them into our culture.

Our Program Outcomes (originally cast as Objectives) predate the ABET Criterion 3 a – k statements. Our Outcomes were generated with the help of our Advisory Council, and so we are convinced we have to honor them in our assessment program. However, as we have gained experience with program assessment, we realize that our Outcome statements can be improved to make them more ‘assessable’. We will discuss this as a faculty and bring our ideas to our Advisory Council as we move forward.

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Criterion 4. Professional Component

Introduction

The Faculty has spent considerable time and effort in developing and articulating the Forest Engineering curriculum. Curriculum matters are discussed at every semester-end faculty retreat, and most faculty meetings. We participate in campus activities concerning teaching and learning, and coordinate our activities with the other engineering units at ESF and Syracuse University.

2005-2006 Curriculum

The table on the page B4-1 describes the curriculum offered during the 2005-2006 academic year, and is described in that year's catalog. The curriculum features are described below, with the specific courses in each area identified. Note that, as per the discussion under Criterion 1, some freshmen and all transfer students will have fulfilled some of the requirements via the granting of advanced standing credits.

1. Math and Basic Science (38 credit hours)

   - 15 credit hours of calculus through differential equations, (MAT 295[*], 296[*], 397[*]. MAT[*] or APM 485)
   - 3 credit hours of calculus-based probability and statistics (APM 395)
   - 8 credit hours of calculus-based physics (PHY 211[*]/221[*], 212[*]/222[*])
   - 8 credit hours of chemistry, with lab experience (FCH 150-FCH 153)
   - 4 credit hours of botany, with laboratory (EFB 226)

[*] Syracuse University course

2. Other (17 credit hours)

   - 1 credit hour of orientation (FEG 132)
   - 3 credit hours of computer programming (APM 153)
   - 1 credit hour of engineering graphics (ERE 225)
   - 2 credit hours of dendrology (EFB 335)
   - 3 credit hours of forest ecology and silviculture (FOR 321)
   - 1 credit hour of harvest systems (FEG 420)
   - 3 credit hours of resource policy and management (FOR 360)

3. General Education (24 credit hours not counted elsewhere)

   - 3 credit hours of Basic Communication (CLL 190)
   - 3 credit hours of Natural Science (coverd by Botany)
   - 3 credit hours of Quantitative (covered by calculus)
   - 3 credit hours of Humanities (CLL 290)
   - 3 credit hours of Social Science (FOR 207)
   - 3 credit hours of Western Civilization (approved elective)
   - 3 credit hours of Other World Civilization (approved elective)
   - 3 credit hours of American History (approved elective)
   - 3 credit hours of Western Civilization (approved elective)
   - 3 credit hours of The Arts (approved elective)

4. Engineering Sciences (24 credit hours)

   - 5 credit hours of statics and dynamics (ERE 221,222)
   - 4 credit hours of electrical sciences (ELE 231*)
   - 3 credit hours of mechanics of materials (ERE 362)
   - 3 credit hours of surveying (ERE 371)
   - 4 credit hours of fluid mechanics (MAE 341*)
   - 2 credit hours of remote sensing (FEG 350)
   - 3 credit hours of engineering decision analysis (FEG 430)

5. Engineering Courses with a Design Component (30 credit hours)

   - 1 credit hour of engineering design (FEG 300)
   - 4 credit hours of engineering hydrology (FEG 340)
   - 3 credit hours of photogrammetry (FEG 363)
   - 4 credit hours of structures (FEG 410)
   - 4 credit hours of soil mechanics (CIE 337*)

- 3 credit hours of transportation engineering (FEG 437)
- 2 credit hours of power systems (FEG 454)
- 3 credit hours of water pollution engineering (ERE 440)
- 6 credit hours consisting of two approved engineering design electives

6. Capstone Course (3 credit hours)

   - 3 credit hour design course in the spring semester of the senior year (FEG 489).

Table B4-1. Presentation of Forest Engineering Curriculum
as Implemented for 2005 – 2006

Freshman Year							
Fall Semester				**Spring Semester**			
Course	**Title**	**Cr. Hrs**	**Category**	**Course**	**Title**	**Cr. Hrs**	**Category**
MAT 295	*Calculus I*	*4*	M&S/GE	*MAT 296*	*Calculus II*	*4*	M&S/GE
PHY 211	*Engr Physics I*	*3*	M&S/GE	*PHY 212*	*Engr Physics I*	*3*	M&S/GE
PHY 221	*Engr. Phy. I Lab*	1	M&S	*PHY 222*	*Engr. Phy.II Lab*	*1*	M&S
EFB 226	*Gen. Botany*	*4*	M&S	*APM 153*	*Compt. Methods*	*3*	O
CLL 190	*Writing*	*3*	H-SS/GE	*Elective*	*General Edn*	*3*	H-SS/GE
FEG 132	*Orientation*	*1*	O	*Elective*	*General Edn*	*3*	H-SS/GE
Sophomore Year							
MAT 397	*Calc III*	*4*	*M&S*	*APM 485*	*Diff Eqns*	*3*	*M&S*
FCH 150	*Gen Chem I*	*3*	*M&S*	*FCH 152*	*Gen Chem II*	*3*	*M&S*
FCH 151	*Chem Lab*	*1*	*M&S*	*FCH 153*	*Chem Lab*	*1*	*M&S*
ERE 221	*Statics*	*3*	*E*	*ERE 222*	*Dynamics*	*2*	*E*
ERE 225	*Engr Graphics*	*1*	*O*	*ERE 362*	*Mech Materials*	*3*	*E*
FOR 207	*Economics*	*3*	H-SS/GE	*ELE 231*	*Elec Sci*	*3*	*E*
				CLL 290	*Persp on Env*	*3*	H-SS/GE
Junior Year							
ERE 371	*Surv Engr*	*3*	*E*	*FEG 340*	*Hydrology & Hydraulics*	*4*	*E-D*
MAE 341	*Fluid Mech*	*4*	*E*	*FEG 350*	*Remote Sensing*	*2*	*E*
EFB 335	*Dendrology*	*2*	*O*	*FEG 363*	*Photogram I*	*3*	*E-D*
FOR 321	*For Ecol Silv*	*3*	*O*	*APM 395*	*Prob Stats/Engr*	*3*	*M&S*
FEG 300	*Engr Design*	*1*	*E-D*	*ERE 351*	*Basic Engr Thermo*	*2*	H-SS/GE
Elective	*General Edn*	*3*	H-SS/GE	*Elective*	*General Edn*	*3*	H-SS/GE
Senior Year							
FEG 410	*Structures*	*4*	*E-D*	*FEG 437*	*Transportation*	*3*	*E-D*
FEG 420	*Harvest Systs*	*1*	*O*	*FEG 454*	*Power Systs*	*2*	*E-D*
FEG 430	*Engr Dec Anal*	*3*	*E*	*FEG 489*	*FEG Plan/Design*	*3*	*E-D*
CIE 337	*Soil Mechanics*	*4*	*E-D*	*Elective*	*Engr Design*	*3*	*E-D*
FOR 360	*Res Pol & Management*	*3*	*O*	*Elective*	*Engr Design*	*3*	*E-D*
ERE 440	*Water Pol Engr*	*3*	*E-D*				
Notes: M&S = Math and Science, H-SS/GE = Humanites and Social Sciences.General Education; O = Other; E = Engineering Science; E-D = Engineering Design							

Course Prefixes and Course Responsibilities

The logic for the course prefixes for the engineering courses delivered at ESF is as follows.

- FEG – course taught primarily for forest engineering students
- ERE – engineering course offered by one faculty for students in two or more undergraduate programs. For example, ERE 371 is required for both forest engineering and construction management students.

The forest engineering program takes advantage of other engineering units for instruction in required subjects. This is illustrated in the following table.

Table B4-2. Faculties Responsible for Required Engineering Courses in the Forest Engineering Curriculum

Course(s)	Responsible Faculty
ERE 351, 371, 440 FEG 300, 340, 350, 363, 430, 437, 454, 489	Faculty of Environmental Resources and Forest Engineering
ERE 221, 222, 362 FEG 410	Faculty of Construction Management and Wood Product Engineering
FEG 420	Faculty of Forest and Natural Resources Management
ELE 231	Department of Electrical Engineering and Computer Science, L. C. Smith College of Engineering and Computer Science, Syracuse University
MAE 341	Department of Mechanical and Aerospace Engineering, L. C. Smith College of Engineering and Computer Science, Syracuse University
CIE 337	Department of Civil and Environmental Engineering, L. C. Smith College of Engineering and Computer Science, Syracuse University

Table B4-3. Faculties Responsible for Required Non -Engineering Courses in the Forest Engineering Curriculum	
Course(s)	Responsible Faculty
MAT 295, 296, 397, 485	Department of Mathematics, College of Arts and Sciences, Syracuse University
PHY 211, 212, 221, 222	Department of Physics, College of Arts and Sciences, Syracuse University
CLL 190, 290	Faculty of Environmental Studies
APM 153	Faculty of Paper Science and Engineering
FCH 150, 151, 152, 153	Faculty of Chemistry
FOR 207, 321, 360	Faculty of Forest and Natural Resources Management
FEG 132, APM 395	Faculty of Environmental Resources and Forest Engineering

The grouping of courses presented above is consistent with previous ABET guidance. The curriculum concentrates math and science in the first two years, with a considerable amount of engineering sciences as well. The student engages engineering design courses beginning in the junior year.

General Education

The Board of Trustees of the State University of New York required all SUNY campuses to address the issue of General Education, and to implement a General Education program of at least 30 credit hours for starting with the freshmen entering for the 2000-2001 academic year. SUNY-ESF undertook a campus-wide effort to implement the General Education guidelines, and as a result each academic unit modified their undergraduate program to accommodate the requirements.

The SUNY Board of Trustees identified three Areas of Competency and nine Knowledge and Skill Areas. The Areas of Competency are:

1. Basic Communications
2. Critical Thinking
3. Information Management

The nine Knowledge and Skills areas are:

1. Mathematics
2. Natural Sciences
3. Social Sciences

4. American History
5. Western Civilization
6. Other World Civilizations
7. Humanities
8. The Arts
9. Foreign Language

The General Education requirements are tracked on the Curriculum Plan Sheet (See Section One). The implementation of the requirements for forest engineering students is given in the next table.. Note that the campus has a waiver for the Foreign Language requirement.

Table B4-4. Implementation of SUNY General Education Requirements	
Competency Area	Course (or Strategy)
Basic Communications	CLL 190
Critical Thinking	Embedded
Information Management	Embedded
Knowledge and Skill Areas	Course
Mathematics	MAT 295
Natural Sciences	EFB 226
Social Sciences	FOR 207
Humanities	CLL 290
American History, Western Civilization, Other World Civilizations, The Arts	Approved elective

It is fair to say that the General Education requirements have generated some new issues with respect to academic advising. For example, the General Education electives in American History, Western Civilization, The Arts, and Other World Civilizations have to be selected from a short list of approved courses. Scheduling these electives is relatively easy in the freshman year, but more problematic in the more structured junior year, which in effect eliminates several choices from the already short list of approved electives. Second, faculty advisors have to be very careful when working with students who wish to take a summer session course to fulfill a General Education requirement. If the student is taking a course at a SUNY institution, the student and adviser are obligated to check whether the course in on that institution's list of approved general education courses.

A student can petition to have a course substitute for one of the required General Education courses. A sub-committee of the faculty governance Committee on Instruction decides on each case.

The Faculty compared the Trustees Areas of Competency with the Forest Engineering Program Objectives and Outcomes (see discussion of Criteria 2 and 3) and decided the Areas of Competency were already addressed by our own Program Outcomes, although not in the exact same terms. Table B-XX maps our Program Outcomes with the Board of Trustees Areas of Competency.

Table B4-5. Comparison of SUNY Board of Trustees Areas of Competencies to Forest Engineering Program Outcomes

SUNY Area of Competency	Forest Engineering Program Outcomes
Basic Communications	Can communicate their ideas and expectations effectively
Critical Thinking	Are capable of utilizing an engineering approach to problem solving
Information Management	Can communicate their ideas and expectations effectively Have sufficient background/tools to function effectively in an engineering environment

Engineering Design Electives

Forest Engineering students can elect two engineering design electives to explore an area of particular interest. Currently the Faculty allows the following courses to fulfill this curriculum requirement:

- CIE 332 Structures II
- CIE 338 Soil Mechanics and Foundations II
- ERE 441 Air Pollution Engineering
- FEG 448 Open Channel Hydraulics
- FEG 464 Photogrammetry II
- ERE 506 Hazardous Waste Management
- ERE 445 Hydrologic Modeling
- ERE 596(1) Storm Water Management
- ERE 596(2) GIS for Engineers

Details of these courses can be found in the Appendix.

The choice of electives can allow a student to begin to specialize in a particular branch of engineering, as noted in the next table. Note that these combinations of courses are used as a guide; students are free to choose any two approved courses to meet this requirement.

Table B4-6. Suggested Combinations of Engineering Design Electives

Specialty	Suggested Courses
Civil Engineering	CIE 332, CIE 338, FEG 448
Environmental Engineering	ERE 441, ERE 506, FEG 448, ERE 596(1)
Water Resources Engineering	ERE 445, FEG 448, ERE 596(1)
Mapping Sciences	FEG 464, ERE 596(2)

Substitutions for Engineering Design Electives

There are two circumstances in which courses or learning experiences can be used to substitute for one of the engineering design electives. These substitutions are documented by a petition originated from the student and endorsed by the advisor and Faculty Chair.

- Occasionally a student will want to take an engineering course from Syracuse University that is not on our list of approved electives. This is allowed if, after investigation by the Faculty Chair and consultation with colleagues at Syracuse University, that the course is considered to have a design component within the SU program.

- Occasionally a student will be involved in an extracurricular activity that involves engineering analysis and design. For example, one student, as part of an independent mission experience, designed, constructed and tested a solar water disinfection apparatus while spending a summer in Uzbekistan. The student enrolled in an independent study, wrote an engineering report, and made a formal presentation to his class mates. Upon completion of those requirements, he was granted credit for one of the engineering design electives. This was duly noted on his curriculum plan sheet.

Capstone Design Experience

FEG 489 Engineering Planning and Design is an important professional component of the Forest Engineering program. The course objective is to provide a major design experience at the culmination of the student's curriculum. The experience is based on the knowledge and skills acquired in earlier coursework and incorporates engineering standards and realistic constraints that include some or all of the following: economic; environmental; sustainability; constructability; manufacturability; ethical; health; safety; social; regulatory; and political. The students will strengthen their problem-solving skills. Teamwork, critical thinking, evaluation and assessment form the core of the course, where students will develop skills that will assist them in becoming lifelong learners and self-growers.

At the completion of FEG 489, each student will have:

1. An ability to apply the knowledge of mathematics, science and engineering to open-ended engineering design problems.

2. An ability to use project management tools, techniques and skills, such as scheduling, resource allocation, cost estimating, time management and documentation, to effectively manage the execution of engineering design projects.

3. An ability to formulate a problem solving and design approach for a system, component or process to meet the desired needs.

4. An ability to communicate effectively with partners, supervisors, subordinates, clients, public citizens and regulatory agencies using oral and written formats such as memos, letters, technical design reports, drawings, specifications and public presentation.

5. An ability to understand the roles of each team member and to function effectively as a contributing member of an engineering design team.

6. An ability to discern the problem and define the client's needs to effectively solve the problem to the satisfaction of the client.

7. An appreciation for the professional, legal and ethical responsibility of the engineer.

8. An ability to use learning skills as part of continuing growth and development.

Students are assigned to design a solution to a broad, complex problem. Solutions are found through a rigorous problem analysis and a search for and evaluation of practical alternative solutions. Students are expected to specify a chosen alternative that meets the design criteria established by the student team for that problem. Students are expected to follow a design process, driven largely by their own initiative, that involves inquiry, deliberation, evaluation, innovation and attention to professional duty. Students are expected to:

1. Investigate problems and synthesize information
2. Propose and test alternative solutions

3. Develop designs for critical elements of the project
4. Study, evaluate and revise designs as needed
5. Prepare and make oral presentations of the work
6. Write, edit and revise reports suitable for publication and professional presentation

The course involves the structured guidance, assessment and evaluation of the students' work and their individual progress in becoming self-growers. Students receive guidance in the systematic application of engineering design and project management skills to solve complex, environmentally-related, "real world" problems.

Students are expected to record project correspondence in a logical format as part of the documentation process. While much of the assessment and evaluation is expected to be in written form, any verbal communications germane to the project completion between instructor and student are written by the student as part of the project record. This ensures a mutual understanding has been reached.

Student participation in the classes and as part of a team is essential to success in this course. Students are expected to participate in classes, labs, field trips, investigations, guest speaker presentations, report writing, and oral presentations. Students maintain project management records and personal reflecting journals in addition to the usual class notes.

EVALUATION AND ASSESSMENT TOOLS USED IN FEG 489

Student performance in FEG 489 is evaluated and assessed using a number of methods and products. The significant products produced by individual students and student teams are described in the following section. The products and assessment processes are: Final Team Oral Presentation; Final Team Engineering Design Report; Final Solution; Team Peer Evaluation; Project Management Records; Personal Reflecting Journal; Client Evaluation; and Instructor Assessment.

Final Team Oral Presentation

The presentation is one of the two principal products related to the design project. The oral presentation is made before an audience of peers, faculty and professional colleagues at the end of the semester. Evaluation criteria, focusing on the delivery and quality of the presentation, are provided in class.

Final Team Engineering Design Report

The Engineering Design Report is the second principal product related to the design project. The instructor evaluates the written report for conformance with the guidelines and specifications provided in class. The documentation of the design process, calculations and graphics form a significant portion of the evaluation.

Final Solution

The problem solution is evaluated against the criteria developed by the team. The robustness of the solution and adherence to the definition of a high quality solution is the primary focus of the evaluation.

Team Peer Evaluation

Each team member provides an evaluation of the other team members' contributions to the team's success. Guidelines are provided in class. Students are exposed to an ongoing system of performance assessment throughout the semester, and are thus prepared to assess and evaluate peer contributions.

Project Management Records

Each team is required to keep a project management notebook charting progress and decisions throughout the semester. The team is evaluated on its ability to document the project completely and accurately. The project management notebook contains, at a minimum: time records; schedule; client meeting record; team meeting records; team self-assessment; scope of work; communications; team contact information; and change orders. Bi-weekly assessment of the notebook by the instructor is used to guide the team's success.

Personal Reflecting Journal

Each individual is required to keep a journal, separate from the usual management notebook that records assignments, notes, calculations and "to do" lists. The journal is used to perform self-assessments that reflect on the individual's learning experiences throughout the semester. The student is evaluated on their ability to keep the journal current and complete.

Client Evaluation

The client or the client's representative evaluates the design project. The team and its individual members are evaluated on their understanding of the problem, their ability to develop a solution that satisfies the client's needs and the quality of their communication with the client.

Instructor Assessment

The student progress is assessed regularly throughout the semester. Key tools that are used for assessment include, but are not limited to: performance during structured activities; Project Management Notebook; weekly team reports; personal journal assessment; 30% Engineering Design Report; 75% Engineering Design Report.

Instructor assessment of student performance occurs throughout the semester. These assessments may be real-time (occurring during the execution of an activity), formative, or summative (occurring at the conclusion of an activity). Instructor assessments may focus on a number of factors, ranging from basic knowledge of science and engineering to teamwork skills to communication skills. Instructor assessments may take place for individual students or for teams. Student self-assessments are also used to identify areas of strength, areas for improvement, and shared insights in the design and learning processes.

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Criterion 5. Faculty

INTRODUCTION

The Faculty of Environmental Resources and Forest Engineering has experienced a significant shift in personnel since the last accreditation visit. The changes were caused by retirements, a resignation, and the sudden death of a valued colleague. The vacant faculty lines could not be filled because of New York State–wide post 9/11 budget issues, relief from which has only recently been felt.

CURRENT COMPOSITION

The Faculty consists of seven full-time faculty members, all of whom have either the Ph. D. or M. S. and several with the additional credential of Professional Engineer. In addition, one faculty member (Dr. C. Davis) split his assignment between the Faculty of Environmental Resources and Forest Engineering (10%), and the Faculty of Forest and Natural Resources Management[1]. Dr. Davis has a Ph. D. in an engineering field.

[1] This arrangement ended at the beginning of the Spring 2006 semester, with Dr. C. Davis being 100% in the Faculty of Forest and Natural Resources Management.

Table B5-1. Faculty and Competency Areas for Faculty of Environmental Resources and Forest Engineering Members	
Name and Rank	Comments
James M. Hassett Professor and Chair	Ph. D., Civil and Environmental Engineering, Syracuse University. Research interests in watershed processes and drinking water quality.
Charles N. Kroll,, Jr Associate Professor	Ph. D., P.E., Civil and Environmental Engineering, Cornell University. Research interests in stochastic and deterministic hydrology and hydrologic modeling.
Douglas J. Daley Associate Professor	M. S. SUNY-ESF, Environmental Resources and Forest Engineering P.E., Research interests in waste management and environmental restoration.
Theodore A. Endreny Associate Professor	Ph. D., P.H., P.E., Civil and Environmental Engineering, Princeton University. Research interests in innovative rainfall-runoff models.
Lindi J. Quackenbush Assistant Professor	Ph.D., Environmental and Resources Engineering, SUNY-ESF. Research interests in remote sensing and image processing, spatial techniques for data analysis.
Yongwei Sheng Assistant Professor	Ph.D., University of California, Berkeley. Research interests in analytical photogrammetry, detection of environmental changes by remote sensing technology
Giorgos Mountrakis Assistant Professor	Ph.D., Department of Spatial Information Science and Engineering, University of Maine,Research interests in applications of artificial intelligence to remote sensing problems.

The faculty are clearly competent, at least by statement of credentials, to deliver instruction in the core components of the Forest Engineering program. It is especially noteworthy that two faculty members (C. Kroll and T. Endreny) earned the credential of Professional Engineer after beginning their appointments at SUNY ESF, in part to act as a role model for the students in the program. The Faculty Chair supported these efforts by, for example, reimbursing examination expenses.

Since the last ABET accreditation visit, the Faculty has been transformed from an exceptionally experienced unit with decades of institutional experience to a unit whose average experience is much shorter. Details of the transformation are given in the next table.

Table B5-2. Personnel Changes in ERFEG Since the Last Accreditation Visit		
Academic Year	Tenure Track or Tenured Faculty	Total Years of ESF Experience
1999-2000	R. Brock, M. Duggin, P. Hopkins, J. Hassett, C. Kroll, T. Endreny(*), D. Daley, C. Davis(*)	104.33
2000-2001	R. Brock, M. Duggin, P. Hopkins, J. Hassett, C. Kroll, T. Endreny(*), D. Daley, C. Davis(*),	110.33
2001-2002	R. Brock, P. Hopkins, J. Hassett, C. Kroll, T. Endreny(*), D. Daley, C. Davis(*),	116.83
2002-2003	R. Brock (retired December 2002), P. Hopkins, J. Hassett, C. Kroll, T. Endreny(*), D. Daley, C. Davis(*),	63.08
2003-2004	J. Hassett, C. Kroll, D. Daley, T. Endreny(*), L. Quackenbush, C. Davis(*)	67.58
2004-2005	J. Hassett, C. Kroll, D. Daley, T. Endreny (*), L. Quackenbush, Y. Sheng (December 2004), C. Davis(*)	47.83
2005-2006	J. Hassett, C. Kroll, D. Daley, T. Endreny, L. Quackenbush, Y. Sheng, G. Mountrakis (October 2005), C. Davis(*)	54.08
Notes: T. Endreny 20% ERFEG in 1999-2000, then 80% ERFEG. C. Davis 10% ERFEG, These split appointments ended at the beginning of the Spring 2006 semester.		

It can be seen that ERFEG was down to 4.9 Full Time Equivalent faculty for the 2003-2004 academic year, and added one new Assistant Professor (Dr. Yongwei Sheng) in December of 2004, and another (Dr. Giorgos Mountrakis) in October of 2005. We have strived to hire well-rounded faculty members, with strengths in teaching, research, and public service. The ERFEG unit was awarded two of the first four faculty lines that became available as the SUNY budget situation began to ease. It is a credit to the core faculty that metrics (e.g., performance on the Fundamentals of Engineering examination) did not suffer during this difficult period.

The faculty shortage required shifts in faculty responsibilities and an unprecedented increase in the use of adjunct instructors. The mapping sciences area was particularly hard hit. Some of the accommodations made are shown in the next table.

Table B5-3. Accommodations Made by ERFEG During Period of Faculty Shortage		
Academic Year	Course	Accommodation
2002-2003	FEG 363 Photogrammetry I	Taught by adjunct instructor Marian Poczobutt
	FEG 350 Remote Sensing.	Taught by Ph. D. student Shan Chen
	ERE 351 Engineering Thermodynamics	Taught by M. S. student Jessica Black
2003-2004	FEG 363 Photogrammetry I	Taught by adjunct instructor Trevis Giglotti
	ERE 450/550 Introduction to GIS.	Taught by adjunct instructor Trevis Giglotti
	ERE 351 Engineering Thermodynamics.	Taught by Adjunct Instructor John McNabb
	ERE 566 Global Positioning I	Taught by Paul Szemkow.
	ERE 567 Global Positioning II	Taught by Ph. D. candidate Jeff Walton
2004-2005	ERE 351 Engineering Thermodynamics	Taught by M. S. student Reyaz Rajab
	ERE 450/550 Introduction to GIS	Taught by Ph.D. student Eric Greenfield
2005-2006	ERE 450/550 Introduction to GIS	Taught by Ph.D. student Eric Greenfield

TEACHING RESPONSIBILITIES

The following table shows teaching activities for the ERFEG core faculty for the 2005-2006 academic year.

Table B5-4. Teaching Responsibilities for the ERFEG Faculty 2005 – 2006		
Faculty Member	Required or Elective Forest Engineering Course	Other Formal Courses
James M. Hassett	ERE 440 Water Pollution	ERE 797 Proposal

	Engineering FEG 448 Open Channel Hydraulics	Writing Seminar
Douglas J. Daley	ERE 225 Engineering Drawing, FEG 300 Engineering Design FEG 437 Transportation Systems FEG 489 Planning & Design	
Charles N. Kroll,	FEG 430 Engineering Decision Analysis FEG 445 Hydrologic Modeling APM 395 Probability and Statistics*	
Theodore A. Endreny	FEG 340 Engineering Hydrology and Hydraulics*	FOR 338 Meteorology
Lindi J. Quackenbush	ERE 371 Surveying for Engineers FEG 350 Remote Sensing ERE 496 GIS for Engineers	
Yongwei Sheng	FEG 363 Photogrammetry I FEG 464 Photogrammetry II	
Giorgos Mountrakis		ERE 596 Digital Image Analysis
Note: *See Table B5-4. These courses were covered by other instructors for the Spring 2005 semester because Drs. Kroll and Endreny were on leave.		

The College teaching load is four courses per academic year unless the faculty member is active in doctoral level research. The ERFEG faculty are typically at three courses per academic year, and younger faculty are at one course per semester as they build their research program. Also, all ERFEG faculty are teaching in their areas of expertise (see Table B5-4 below).

The ERFEG unit uses a small number of highly qualified adjuncts to deliver required and elective courses for the forest engineering program. These activities are described in the next table. The table also identifies the instructors used to cover requirements in the absence of Drs. Kroll and Endreny.

Table B5-5. Adjunct Faculty and Teaching Responsibilities for the 2005-2006 Academic year

Adjunct	Required or Elective Forest Engineering Course	Comments
David Gerber	FEG 454 Power Systems	Professional Engineer with an MS in Engineering Management. VP at a local engineering firm

Nasipur Subramanayan	ERE 351 Engineering Thermodynamics	Recent retiree from Michigan Technological University.
Donald Lake	ERE 596 Storm Water Management	Professional Engineer with many years of experience in storm water management.
Eddie Bevilaquea	APM 391 Statistics	Associate Professor at ESF.
Virginia Collins	FEG 340 Engineering Hydrology and Hydraulics	Ph. D. Candidate

Some required engineering courses are taught by engineering faculty outside the Faculty of Environmental Resources and Forest Engineering (see Table B4-2). Forest Engineering students take three courses (fluid mechanics, soil mechanics, and electrical science) from the L. C. Smith College of Engineering at Syracuse University as part of their required course work, and have the option of taking selected Syracuse University courses as engineering design electives. The engineering programs at Syracuse University are EAC/ABET-accredited, and the instructors are highly qualified.

Forest Engineering students also receive instruction in engineering courses from faculty members associated with the Faculty of Construction Management and Wood Products Engineering. Again, the instructors are qualified by virtue of their engineering degrees and extensive consulting experience.	

RESEARCH

Research activities with the Faculty of Environmental Resources and Forest Engineering represent a wide range of activities with a number of different research sponsors, as detailed in the next table.

Table B.5-5. Illustrative Sponsored Research Activities of the Faculty of Environmental Resources and Forest Engineering	
Faculty Member	Project and Sponsor
J. Hassett	• Sponsor: Congressman Walsh via EPA Region 2. A Feasibility Study for a Chilled Water System in Central New York (with several collaborators), $1.5 million. Funding imminent. • Sponsor: Catskill Watershed Corporation. An Evaluation of Alternative On-Site Wastewater Treatment Systems (with two co-PIs), $250,000. In progress. • Sponsor: NASA. Technology and Policy Aspects of Applying Remote Sensing to Forest Management. $496.000. In progress.

D. Daley	• Sponsor: SUNY Center for Brownfield Studies at Harbor Point Site in Utica NY. Niagara Mohawk Power Corporation. 2001-2006. $250,000 • Sponsor: SUNY Center for Brownfield Studies. State University of New York. 2003-2005. $250,000 • Sponsor: Depot Street - Main Street Development Project for Remsen, NY. Village of Remsen, NY. 2005-2006. $25,000 • Sponsor: DEC Outreach Program. New York State Department of Environmental Conservation. 2003 – 2006. $258,145 • Sponsor: SUNY Center for Brownfield Studies/ Bronx Overall Economic Development Corporation (South Bronx, Hunt's Point) U.S. Department of Commerce Economic Development Administration. 2005-2007. $289,513 • Sponsor: Honeywell International. With Volk, T. (PI), and Abrahamson. Growing Willow as an Alternative Cover for the Solvay Wastebeds. February 2005 – March 2007. $499,737 • Sponsor NRI Competitive Grants Program, USDA- CSREES. 2003-2006. With Donald Leopold (PI), Amidon, Nakas, Scott, Participating Investigators. Fertilizer from Pulp and Paper Waste: The Ecology of Fertilization with Biologically Nitrogen-Enriched Waste. $446,000. • Sponsor: Home Headquarters, Inc. With Carter, Emanuel (PI). Vacant Land Strategy, Syracuse, NY. 2004 to 2006. $42,500. • Sponsor: USDA McIntire Stennis Project NYZ-2413-11-005.With T. A. Endreny. Characterizing Forested Bioretention Processes to Restore Water Quality and Quantity. 2005-2008. $76,000. • Sponsor: United States Environmental Protection Agency (USEPA) Community Action for a Renewed Environment (CARE). With Hawks (PI) Adirondack Park Brownfields Partnership. 2006-2007. $98,515. (Pending) • Sponsor: USEPA. With Hawks (PI). Communities and the Built Environment.. 2006 – 2007. $105,373.(Pending). • Sponsor: O'Brien & Gere Engineers. Daley (PI) and Leopold. Novelis North Ponds Remediation Project. 2006-2010. $187,925.(Pending) • Sponsor: NYSERDA. Daley (PI). Biodiesel Process Equipment Optimization. Submitted on behalf of Guptill Farms in response to PON-936. 2006. $88,817 including ESF Cost Share $24,617.(Pending)

	Daley (PI) and Volk. Alternative C&D Landfill Cover System. Barton & Loguidice. 2006-2009. $634, 105. Nowak, C. (PI), Tim Volk, Larry Smart, Laura Lautz, and Doug Daley.

C. Kroll	• Sponsor: USDA. Improving the Estimation of Low Streamflow Statistics at Ungauged River Sites. $87,000. In progress. • Sponsor: USGS. An Assessment of New Advances in Low Streamflow Estimation and Characterization. $154, 058. In progress.
T. Endreny	• Sponsor: NSF through Syracuse University, Title "Water Flux and Nitrogen Cycling in the Hyporheic Zone of a Semi-Arid Watershed", Lead-PI Don Siegel, Co-PIs Myron Mitchell, Andria Costello, and Laura Lautz. Total Amount of sub-award: $131,046, May 2005 to April 2008. • Sponsor: USDA McIntire Stennis, Title: "Characterizing Forested Bioretention Processes to Restore Water Quality and Quantity", Total Amount: $76,847, August 2005 to May 2007, Co-PI with Doug Daley, P.E. • Sponsor Award from US Department of Agriculture, Forest Service, Title "Urban Forest Modeling Tool – Water Quality Effects" Total Amount, $250,727, September 2002 to December 2006, Lead-PI. • Sponsor: Award from EPA, Title "Linking Watershed and River Structure and Function for Improved Urban Water Quality", Total Awarded: $347,900, August 2004 to July 2007. Co-PI with Dr. Don Leopold. • Sponsor: Onondaga Lake Partnership, Title "Onondaga Lake Scientific and Technical Program Integration Board", Total Awarded: $16,500, May 2005 to December 2008. • Sponsor: Award from Honeywell, Title "Growing Willow as an Alternative Cover for the Solvay Waste Beds", Total Amount $375,201, Time December 2005 to November 2006. Co-PI with team working for Dr. Tim Volk.
L. Quackenbush	• Sponsor: USDA McIntire Stennis, Title: "Investigating New Advances in Forest Species Classification", Total Amount: $78,200, October 2005 – September 2008. Lead-PI with Charles Kroll, PE.
Y. Sheng	• Sponsor: NASA, Terrestrial Hydrology Program (2006 – 2009). "Growing or Going? A Pan-Arctic Assessment of Recent Terrestrial Water Storage Change in High-Latitude Lakes and Wetlands." PIs: Yongwei Sheng and Laurence C. Smith ($449,802). Proposal Pending. • Sponsor: NASA, New Investigator Program (2006 – 2009). "Satellite-based Lake Dynamics in the Tibetan Plateau in the Context of Global Change." PI: Yongwei Sheng ($343,379). Proposal Pending.

G. Mountrakis	• Sponsor: National Science Foundation (2006-2009). "Spatiotemporal Modeling of Environmental Change Through Data and Method Fusion". PI: Giorgos Mountrakis (with CO-PIs from Univ. of Maine) ($907,819). Proposal Pending. • Sponsor: Syracuse Center of Excellence (2006-2008). "An Integrated Monitoring/Modeling Framework for Assessing Human-Nature Interactions in Urbanizing Watersheds: Onondaga and Wappinger Creeks". Co-PI: Giorgos Mountrakis ($299,882). Proposal Pending. • Sponsor: NOAA's Great Lakes Ecosystem Research (2006-2009) "Multi-temporal, Large-scale Impervious Surface Detection Using Multi-Source, Context-Specific Analysis". PI: Giorgos Mountrakis ($156,587). Proposal Pending. • Sponsor: Lake Ontario Coastal Initiative (2006) "Systematic Large-scale Monitoring of Impervious Surfaces along the Lake Ontario Coast". PI: Giorgos Mountrakis ($10,000). Awarded. • Sponsor: National Science Foundation (2007-2012). "Developing Integrated Spatiotemporal Models for our Environmental, Social, Economic and Energy Future". PI: Giorgos Mountrakis (with 4 CO-PIs from ESF and Syracuse Univ.) ($3,000,000). Proposal Pending. • Sponsor: National Geospatial-Intelligence Agency (2006-2009). "Supporting a Unified Framework for Hierarchical Multi-Threaded Hyperspectral Analysis with Spatially-Explicit Uncertainty Metrics". PI: Giorgos Mountrakis ($450,000). Proposal Pending .

The Faculty's extensive research portfolio provides direct benefits to the undergraduates in the Forest Engineering program, iSTUFF TO BE ADDFED HERE

Faculty Professional Development

Faculty engage in a number of activities related to their professional development. The Provost's Office conducts an annual mentoring conference/workshop, and untenured faculty are strongly encouraged to attend. The topic for the January 2006 session was grantsmanship, and was led by a panel of experienced faculty put together by the Office of Sponsored Research.

New faculty hires are encouraged to attend workshops for beginning engineering educators. For example, Dr. Endreny attended a workshop at Carnegie-Mellon University, and Dr. Quackenbush a similar workshop sponsored by Syracuse

University. Both workshops were funded by the National Science Foundation; travel and miscellaneous expenses were paid from departmental resources.

Faculty are expected to be professionally active as well, with activities consistent with academic rank and experience. The following table provides illustrative examples of these activities. The table gives information in two senses: activities to assist others in their professional development, and activities undertaken by faculty to improve their own skills.

Table B.5-6. Illustrative Recent Professional Development Activities of the Faculty of Environmental Resources and Forest Engineering

Faculty Member	Activities
J. Hassett	Provide 4 review classes for local Intern Engineers preparing for the Professional Engineers Examination (last 11 years). Took over administration (with Outreach Office) of review classes for FE and PE exams (2005-2006). Planner and Instructor, Certificate Program in Advanced Engineering Tools (20004-2005) (with Outreach Office, funded by Department of Labor grant). Planner and presenter, short course in wetlands classification and function, prepared for and funded by New York City Department of Environmental Protection, June 2005. Planner and Presenter, Annual Workshop to Prepare Graduate Teaching Assistants, SUNY-ESF (Every fall for the past 14 years) Attended ABET Program Evaluator Training in Las Vegas, 2003, and Ottawa, 2004. Attend annual meetings and technical workshops of Water Environment Federation (Los Angeles, 2003, New Orleans, 2004, Washington, 2005). Attend annual meetings of American Society of Agricultural and Biological Engineers (including sessions for academic leaders, Las Vegas, 2003, Ottawa, 2004, Portland, 2006).

D. Daley	Design, Installation and Monitoring of Alternative Final Landfill Covers. USEPA Interstate Technology Regulatory Council (ITRC) Webcast. November 3, 2005. Developed and taught one PE Review Session. Solid Waste Management. SUNY College of Environmental Science and Forestry. December 2005. 2 PDHs Design and Implementation of Erosion and Sediment Control Practices. SUNY College of Environmental Science and Forestry. March 15-16, 2006. 14.0 PDHs.
C. Kroll	USDA Career Enhancement Award, Spring 2006, Christchurch, New Zealand. Associate Editor, Water Resources Research, 2003-2005. Reviewer for the National Science Foundation, US Dept. of Agriculture, Water Resources Research, ASCE Journal of Hydrologic Engineering, Water Resources Bulletin, Developer of an International Associate of Hydrologic Science (IAHS) work group on Low Streamflow Prediction at Ungauged Basins (PUBS), initiated Spring 2006. Passed the New York State Professional Engineering Exam, Spring 2005. Attend and present at spring and/or fall American Geophysical Union meetings (annually).

T. Endreny	Fulbright Award for Sabbatical, Spring 2006, Cyprus, Turkey River Assessment and Monitoring (10 day) by Dr. Dave Rosgen, P.H. of Wildland Hydrology, Colorado. Workshop held at the National Conservation Training Center in Lubrecht Forest, Montana, August 2004. Applied Fluvial Geomorphology (5 day) by Dave Rosgen, P.H. of Wildland Hydrology, Colorado. Workshop held at the National Conservation Training Center in Shepherdstown, WV, May 2003. River Morphology and Applications (5 day) by Dave Rosgen, P.H. of Wildland Hydrology training, Colorado. Workshop held at the National Conservation Training Center in Shepherdstown, WV, May 2003. Bank Stability and Channel Evolution Software Training (1 day) at ASCE by the USDA Agricultural Research Service National Sedimentation Laboratory, Oxford, MS, May 2002 Flood Mitigation & Design Workshop (1 week) at the Federal Emergency Management Agency Emergency Management Institute, Multi-Hazard Building Design Summer Institute (E329), Emmitsburg, MD, June 2002 Quantitative Methods in Stream Restoration (1 day), by Dr. J. Craig Fischenich, P.E. of USACE. At the Mid-Atlantic NE Training Workshop on Stream Restoration, hosted by the Association of State Wetland Managers, Bear Mountain, NY, October 2002 Urban Waterway Restoration Survey (1 day), American Water ResourcesAssociation, Annual Conference Field Trips, Philadelphia, PA, November 2002
L. Quackenbush	Registered for NSF-funded Course Design Workshop (2006) Planner and presenter for NASA FOReST project workshop to encourage State Forestry Organizations to utilize remote sensing (2006) Planner, moderator, presenter at NYS Remote Sensing Symposium (2002-2006) Attended NSF-funded Engineering Educators Scholars Program (2002)
Y. Sheng	Planner and presenter for NASA FOReST project workshop to encourage State Forestry Organizations to utilize remote sensing (2006)

G. Mountrakis	Annual meeting of the Association of American Geographers in Chicago, IL (March 7-11, 2006).

FACULTY SIZE AND DEMOGRAPHICS

The number of faculty is currently adequate to deliver a high quality Forest Engineering program. However, we were saddened to learn that Dr. Yongwei Sheng has accepted an offer to return to UCLA. We will start a search for a replacement during the Fall 2006 semester.

We are also in the process of adding two new faculty members. We are currently (May 2006) advertising for an assistant professor in ecological engineering, a new line granted to ERFEG in response to increases in extramural funding, and undergraduate and graduate student numbers. The new faculty position is consistent with the unit's aspirations as articulated in ERFEG's Strategic Plan.

We are also, under the vision and guidance of SUNY-ESF President Murphy, involved in a campaign to raise funds for an endowed chair for our unit. We have about $220,000 in committed funds and the campaign is about ready to go public. The Faculty Chair has met several times with CEOs of engineering firms, and otherwise made the campaign known to potential corporate donors.

FACULTY TRAINING - ABET ACCREDITATION

In order to stay abreast of the EAC/ABET process, and how this process strengthens the program, several faculty have participated in EAC/ABET training sessions since the previous accreditation cycle. For example, Dr. Hassett went through Program Evaluator Training twice (once at the ASAE meeting in Las Vegas, 2003, and once in Ottawa in 2004. Professor Daley participated in the Evaluator Training program in 2005. Professor Daley (in 2005) and Dr. Hassett (in 2006) attended the Best Practices in Engineering Assessment at Rose-Hulman Institute, Dr. Hassett and Professor Daley, in concert with faculty colleagues from the Faculty of Paper Science and Engineering, have acted as local leaders in accreditation activities on campus.

PROMOTION AND TENURE GUIDELINES AND ACTIVITIES

The ERFEG unit recognized the demographic shift warranted a renewed discussion on scholarship within the unit. We therefore devoted a semester end retreat to the general issue of scholarship within our unit. There were two primary agenda items:

- review the general issue of scholarship in the context of our faculty unit so as to communicate our expectations to faculty interviewees, and
- discuss changes in our day-today activities so as to enhance our scholarly productivity.

With respect to the second topic, the ERFEG group decided several steps could be taken, including:

- demonstrate greater discernment in accepting students into our engineering graduate program;
- take greater advantage of the manuscript thesis option;
- require a formal thesis/dissertation proposal from our graduate students; and
- schedule a dissertation defense only after at least one manuscript has been sent for review.

The work product of this discussion was a revised ERFEG Document, *Promotion and Tenure Within the Faculty of Environmental Resources and Forest Engineering.* A pdf of this document is included on the CD attached to this self study.

The more senior faculty make up the review committees for the junior faculty, and have taken upon themselves the obligation to provide mentoring letters to the junior faculty. The letters are from the Peer Review Committee, and are discussed with the Faculty Chair before being shared with the faculty member under review.

INTERACTIONS WITH STUDENTS

GENERAL

Faculty members in the Faculty of Environmental Resources and Forest Engineering maintain a close working relationship with the undergraduate students. The faculty do almost all of the teaching, including most laboratory sessions. Graduate Teaching Assistants are used primarily as graders and not as deliverers of instruction, except in relatively rare cases when a faculty member is unavailable. The project nature of much of the course work encourages faculty-student interactions in settings outside the formal classroom.

INTERACTIONS WITH STUDENTS: ADVISING

Activities with respect to the 'nuts and bolts" of advising were addressed in the discussion of Criterion 1. In this section, we focus on broader issues of faculty-student interactions.

INTERACTIONS WITH STUDENTS: PRE-PROFESSIONAL ACTIVITIES

The undergraduate students have formed and continue an active Forest Engineering Club, currently advised by Dr. Kroll. The club is funded in part by college student activity fees, and frequently subsidized by modest influxes to the club from the ERFEG state account. Club activities for the past several years have included:

- An annual fall retreat to welcome new students into the program. The retreats were held at the Adirondack Ecological Center. Faculty members have participated as chaperones and attendees. Drs. Endreny, Hassett and Kroll attended the Fall 2005 retreat.

- A winter retreat to the Adirondack Ecological Center for winter recreation and planning activities for the spring semester. Drs. Hassett and Sheng attended the Winter 2006 retreat.

- Review sessions for the Fundamentals of Engineering examination. Students are responsible for ordering review materials and conducting review sessions. The sessions are sometimes led by peers, and sometimes by faculty invited by the students.

- A seminar series for students to present their extracurricular experiences, i.e., a summer in Uzbekistan researching solar-disinfection of drinking water, a winter research cruise to Antarctica, a Research Experience for Undergraduates semester in Bermuda, Engineers Without Borders in Honduras, etc. Dr. Hassett helped organize and advertise the seminar series, and provided refreshments from the state budget.

- A spring banquet to celebrate the year's accomplishments. Faculty attend are presented with gifts[2] from the graduating seniors. In addition, the Faculty Chair announces the winners of the Forest Engineering Scholarship for the next year.

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[2] For example, one year, for reasons known only to the students, a faculty member was presented with a genuine straight jacket.

The faculty are also involved with reviewing résumés, writing letters of recommendation, talking about graduate school opportunities, career counseling, and the other myriad tasks characteristic of a faculty with genuine interest in the development of its students.

ROLE OF THE ADVISORY COUNCIL

The Environmental Resources and Forest Engineering (ERFEG) Advisory Council serves in an advisory capacity to the Faculty regarding issues such as student enrollment, faculty needs, curriculum, scholarships, research programs, equipment and facility needs, and ABET reaccredidation. The Advisory Council envisions its role, as of January 30, 2006, as per the following table, taken from the minutes of that meeting.

Areas of Focus for the ERFEG Advisory Council[3]
Student Placement Opportunities
• Help students connect with alumni and a wider network. *Note: (We also reached agreement for sharing of internship and job posting info between ESF and SU)*
Support for Faculty Research
As Needed • Support researchers in prioritization of activities. • Provide a validation of thinking and assumptions. • Provide insight from someone in the field.
Student Recruitment
• Provide help from alumni in linking to urban aspects of environmental engineering. • Advice and council to help develop a better link to the urban environment in school communications.
Increase Program Visibility
• Generate external visibility for the program to: - Potential undergraduate and graduate students - Employers - Funding Agencies • Create visibility for the program outside of New York state
Resources for Growth
PROVIDE SUPPORT TO THINK FURTHER ON DESIRED ENROLLMENT LEVELS AND ROLE OF THE ADVISORY COUNCIL

[3] Table taken from the Advisory Council meeting minutes, and retains that format.

The Council organized itself into three committees, with charges as follows:

Chairman: Scott Wheeler

- **Networking: Dan Davis**

  The Networking Committee will look after the activities highlighted for both *Student Recruitment* and *Student Placement* categories. Additionally it will look after networking support for the faculty support tasks and alumni. We agreed that improving networking among ERFEG alumni was an important part of this as we all felt that a stronger alumni network would support ERFEG activities as well as the alumni.

- **Program Visibility: David Gerber**

  The Program Visibility committee will look after the activities highlighted for the *Increase Program Visibility* category.

- **Faculty Support: Al Labuz**

  The Faculty Support committee will look after the activities highlighted for the *Resources for Growth*, *Program Evolution*, and *Support for Faculty Research* categories. The Faculty Support Committee will leverage the activities of the Networking Committee for networking support within their area of coverage.

CONCLUSION

The ERFEG faculty is committed to delivering a high quality undergraduate engineering program, and is fully involved in all aspects of the life of the academy. The ERFEG group has been professionally productive (as demonstrated by publications), active (presentations) and creative (proposals written and funded). See the list below, taken from the most recent ERFEG Annual Report.

Publications (Refereed)

a. Prestigiacomo, T., S. W. Effler, J. M. Hassett and E. Michalenko, "Robotic Monitoring of Suspensoid-Rich Onondaga Creek", under major revision (including title change), *Journal of the American Water Resources Association.*

b. Effler, S. W., D. A. Matthews, C. M. Brooks-Matthews, M. Perkins, C. Siegfried and J. M. Hassett, "Water Quality Impacts and Indicators of Metabolic Activity of the Zebra Mussel Invasion of the Seneca River", *Journal of the American Water Resources Association*, 40(3): 737-754, June 2004.

c. Burns, D., T. Vitvar, J. McDonnell, J. Hassett, J. Duncan and C. Kendall. "Effects of Suburban Development on Runoff Generation in the Croton River Basin, New York, USA", In press, *Journal of Hydrology*, 2005

d. Wang, J, J.M. Hassett, T.A. Endreny, "An Object Oriented Approach to the Description and Simulation of Watershed Scale Hydrologic Processes" *Computers & Geosciences* 31: 425-435, 2005.

e. Wang, J., T.A. Endreny and J.M. Hassett, "OBJTOP: Object Oriented Topographically Based Simulation of Watershed Scale Hydrologic Processes", In press, *Journal of Hydrology*, 2005

f. Riley, T. T.A. Endreny and J. Halfman, "Advancing the HWS Data Logger for Soil Moisture and 1-in Diameter Groundwater Wells", Accepted, *Computers & Geosciences*, 2005.

g. Endreny, T.A., "Stormwater Management for Society & Nature via Service Learning & Ecological Engineering", *International Journal of Water Resources Development*, In Press, 2005.

h. Wechsler, S.P., and Kroll, C. N. (2005). Quantifying DEM Uncertainty and Its Effect On Topographic Parameters. ASPRS Journal, accepted for publication.

i. Quackenbush, L.J., "A review of techniques for extracting linear features from imagery." *Photogrammetric Engineering and Remote Sensing*, 70(12): 1383-1392, 2004.

j. Smith, L.C, Y. Sheng, G.M. MacDonald, and L.D. Hinzman. 2005. "Disappearing Arctic Lakes." *Science,* Accepted.

k. Sheng, Y. and D. Alsdorf. 2005. "Automated Ortho-Rectification of Amazon Basin-Wide SAR Mosaics Using SRTM DEM Data." *IEEE Transactions on Geoscience and Remote Sensing*, Accepted with minor revision.

l. Smith, L.C, Y. Sheng, F.J. Magilligan, N.D. Smith, B. Gomez, L.A.K. Mertes, W.B. Krabill and J.B. Garvin. 2004. "Geomorphic Impact and Recovery from the November 1996 Skeiðarársandur Jökulhlaup, Iceland, Assessed with Repeat-Pass Airborne LiDAR." Geomorphology, Accepted.

m. Sheng, Y. 2005. "Theoretical Analysis of the Iterative Photogrammetric Method to Determining Ground Coordinates from Photo Coordinates and a DEM." *Photogrammetric Engineering & Remote Sensing*, Forthcoming.

Presentations: National and International (selected)

1) Douglas J. Daley, P.E., T.A. Volk, A.R. Johnson, J. Mirck, L.P. Abrahamson. Design and Modeling of a Landfill Cover using Salix for Hydrologic Control, Biomass Production and Land Reclamation at the Solvay Wastebeds, Syracuse, NY. Presented at the 2005 ASAE Annual International Meeting, July 17-20, 2005.

2) D.J. Daley, A.R. Johnson, T.A. Volk, J. Mirck, L.P. Abrahamson. Initial Success in Design and Modeling of a Landfill Cover using Salix on the Solvay Wastebeds in Syracuse, NY. Presented at the 3rd International Phytotechnologies Conference. April 19-22, 2005. USEPA

3) Sheng, Y. 2005. Theoretical Analysis of Iterative Mono-plotting Algorithms: Convergence and Error Budget. The 2005 ASPRS Annual Conference, March 7 – 11, 2005, Baltimore, Maryland.

4) Sheng, Y. 2005. Direct Geo-Rectification of Regional-Scale SAR Mosaics Using SRTM DEM Data. The 25th EARSeL Symposium and the First Workshop on 3D Remote Sensing, June 6 – 11, 2005, Porto, Portugal, Accepted for oral presentation.

Grants

1) Sponsor: Catskill Watershed Corporation. Title: "Comparison of Alternative On-Site Wastewater Treatment Options." Co PIs J. Hassett, T. Endreny, D. Siegel (SU). Total award: $350,000. In progress.

2) Sponsor: NYC Department of Environmental Protection. Title: 'Classification of Wetlands in Catskill-Delaware System." PIs J. Hassett, M. Mitchell, D. Siegel (SU), C. Cirmo (SUNY-Cortland), Total award: $370,000. In progress.

3) Sponsor: NASA. Title: "Forestry Organization Remote Sensing Technology (FOReST)." PI J. Hassett and W. Stiteler. Total Award (Year 5): $467,000. In progress.

4) Sponsor: Award from EPA, Title "Linking Watershed and River Structure and Function for Improved Urban Water Quality", Total Awarded: $350,000, Co-PIs T. Endreny and Dr. Don Leopold. Support obtained through efforts of SUNY ESF's Michael Brower and Congressman James Walsh.

5) Sponsor: Award from Honeywell, Title "Growing Willow as an Alternative Cover for the Solvay Waste Beds", Total Amount $346,109, Time July 2003 to December 2004. T. Endreny co-PI with team working for Dr. Larry Abrahamson. Developing an infiltration model that incorporates data gathered by soil and meteorological sensors on waste beds.

6) Sponsor: Award from EnSPIRE of Syracuse University and ESF, Title: "Watershed Analyses: An Integration of Science, Engineering and Policy", Total Amount: $25,000, Lead PI Dr. Myron Mitchell, with Charles Kroll, Elizabeth Boyer, Donald Siegel, Don Leopold, Karin Limburg, Kim Shulze and others. Working to write an NSF IGERT proposal to advance watershed engineering and related disciplines with seed money.

7) Sponsor: SUNY Chancellors Office, Title: "Ecological Engineering in the Tropics", Total Amount: $8,000, Lead PI T. Endreny. Develop and teach a course to engineers and ecologists in lesser visited Honduras.

8) Sponsor: Award from Department of Education, US-Brazil Higher Education Consortia Program, Title "Sustainable Urban Design and Community Based Resource Management", Total Amount $199,934, Time, 4 yrs from September 2002, T. Endreny co-PI for work C. Doble, E. Carter, M. Pottinger and others at Penn State and University of Brasilia and Porto Allegre. Ascertaining urban environmental pollution issues and restoration options.

9) Sponsor: Award from US Department of Agriculture, Forest Service, Title "Urban Forest Modeling Tool – Water Quality Effects" Total Amount, $30,000, Time 8 months from June 2004, T. Endreny co-PI with Dr. David Nowak of USFS (Supplements two prior awards of $32,227 and $60,000 from sponsor) Developing an urban hydrological model with Dr. Jun Wang providing code and theory development.

10) Sponsor: Award from US Environmental Protection Agency, Title, "Monitoring Effectiveness of Riparian Zones: An Agriculture, Willow, Spafford Brook Gradient", Total Amount, $150,000, Time 2 years, T. Endreny with lead PI Dr. Russ Briggs. Modeling the drainage and fluxes from the agricultural field.

11) Sponsor: EPA/NSF. Title: "A National Assessment of Low-Streamflow Estimation Using a Physically Based Statistical Methodology", funded by EPA/NSF in the area of Environmental Statistics. PI C. Kroll. This $353,135 grant terminated in December, 2004.

12) Sponsor: USDA. Title: "The Impact of Forest Management on Hydrology and Biogeochemistry:, funded from the USDA's McIntire-Stennis initiative for $72,000 over a three year period. PI C. Kroll. The majority of this active project is the development of a hydrologic field site at Heiburg Forest in Tully, New York. This site transmits real-time data to a dedicated internet site to facilitate distance learning activities (hew.esf.edu).

13) Sponsor: USGS. Title: "An Assessment of New Advances in Low Streamflow Estimation and Characterization", USGS NWIS, 3 years, $154,340. PI. C. Kroll. This proposal will investigate new methodology for the estimation of low streamflow statistics. Dr. Ken Eng, of the USGS's Reston Office, is collaborator on this project.

14) Sponsor: Honeywell International. Title: "Growing Willow as an Alternative Cover for the Solvay Wastebeds." 2003-2006. $767,000. With L. Abrahamson, T. Volk, D. Daley.

15) Sponsor: NRI Competitive Grants Program, CSREES/USDA. Title: "Fertilizer from Pulp and Paper Waste: The Ecology of Fertilization with Biologically Nitrogen-Enriched Waste." $446,000. Donald Leopold, PI. with Daley, Amidon, Nakas, Scott, Participating Investigators.

SUMMARY

The ERFEG faculty is in transition, from a faculty dominated by full professors with decades of institutional experience, to one with a much younger profile. The transition was accompanied by challenges, including a reduction in numbers (to 4.9 Faculty FTEs) for a period of time in the middle of the accreditation cycle. The faculty has had to revisit and refine promotion and tenure guidelines, reinvigorate peer review committees, chair and populate search committees, interview faculty candidates, mentor new faculty hires, and otherwise involve the junior faculty into the academic life of our unit. Of importance to this report is the fact that we have spent considerable time mentoring new faculty as to the importance and substance of assessment practices in general and the ABET review process in particular.

Criterion 6. Facilities 1
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Criterion 6. Facilities

Introduction

The following statement is from the ERFEG Self Study Report prepared in June, 2000 in preparation for our last accreditation visit,

> The facilities available to the Faculty of Environmental Resources and Forest Engineering are adequate, as will be discussed below. However, we are excited about the rehabilitation of a campus building (Baker Lab), which is being renovated in accordance with plans developed by our faculty and the project architects. We will move into the building when all the renovations are done. The new space will do much to help us integrate our teaching, research, and public service activities.
>
> The Faculty has dedicated classrooms and laboratories, access to laboratory facilities maintained by other engineering units at SUNY-ESF and Syracuse University, access to college-wide facilities at SUNY-ESF. In addition, faculty and students have access to University-wide facilities at Syracuse University.

The vagaries of the New York State budget process, the realities of the 9/11 effects on that budget, and the Byzantine rules of the New York State Dormitory Authority (the building's funder) have conspired to delay the rehabilitation process. However, we are told, with some degree of assurance, that we will actually occupy the top three (of four) floors of Baker Lab in late May, 2007. The completion of the final phase (the first floor) will occur after this date.

Current Facilities within the Faculty of Environmental Resources and Forest Engineering

COMMON AREAS AND FACULTY OFFICES

The common areas in the Faculty of Environmental Resources and Forest Engineering were refurbished in 1999, in part because of planned maintenance, and in part to repair water damages that occurred during lengthy roof repairs on Bray Hall. The common areas have new carpeting, wall treatments, display cases, and bulletin boards, all of which create a positive first impression for our constituents.

Faculty offices are adequate and well maintained. Graduate student offices on the 4th floor of Bray Hall were, during the summer of 1999, completely renovated. The administration provided $30,000 for new furniture for these offices. The furniture was installed during the Fall of 1999. Office spaces in the basement of Bray Hall have also been renovated recently.

LABORATORIES

The Faculty has adequate laboratory resources for surveying, photogrammetry and related mapping sciences, and fair laboratory resources to support instruction in other engineering areas. The equipment is well maintained, and new equipment is obtained from a variety of resources. The table below describes the current laboratories and their uses. In addition the newly renovated Baker Lab will have ample laboratory space, as described in the "Future Facilities" subsection of this document.

Table B6-1. Laboratory Facilities within the Faculty of Environmental Resources and Forest Engineering			
Physical Facility Building and Room	**Purpose of Laboratory**	**Adequacy for Instruction**	**Area (sq. ft.)**
Geotechnical Instrumentation 11 Bray	Instrument Repair and Maintenance Facility	Good	290
Geotechnical 12 Bray	Surveying and Mapping Science Instruction	Good	910
Geotechnical Instrumentation 12A Bray	Instrument Holding Facility	Specialized Instruction Only	230
Digital Photogrammetry, Image Analysis and GIS Lab 13 Bray	Precision Photogrammetry Measurements, Advance Image Analysis, Advanced GIS Equipment	Good for Small Groups	620
Mapping Science 14 Bray Hall	Supports Mapping Science Instruction and Research	Good for Small Groups	460
Photogrammetric Engineering 15 Bray	Houses Photogrammetric Analog Computers	Good for Small Groups	290
Photographic Labs 16, 16A, 17 Bray	Provides Darkroom, Wet and Dry Photo Processing, Support for Instruction and Research	Good for Small Groups	580
Global Positioning System 314A Bray	Houses GPS Base Station	Good for Small Groups	80
Photogrammetry and Planning Lab 315 Bray	Photo Lab Exercises, Lab Space for Senior Capstone Course	Good	890
Wet Lab in Old Greenhouse	Support Field Exercises In Water Resources Engineering	Poor	530
East Wing of Old Greenhouse	Support Field Exercises In Water Resources Engineering	Poor	1,050

LABORATORY AND INSTRUCTIONAL EQUIPMENT MAINTAINED BY THE FACULTY OF ENVIRONMENTAL RESOURCES AND FOREST ENGINEERING

The following table provides details as to some of the laboratory and instructional equipment maintained by the Faculty and routinely used by Forest Engineering students.

Table B.6-2. Examples of Instructional and Laboratory Equipment Routinely Used by Forest Engineering Students		
Category	**Description**	**Use**
GPS Surveying Equipment	4 Trimble Basic Plus Units	Support instruction and research in surveying and mapping sciences
	2 Trimble Pro-XL Units	
	4 Trimble Pro-RL Units	
	5 Trimble GEO HT (GIS, GPS units)	
	2 Leica System 500 with a Leica System Base Unit	
	2 Leica System 300 with a Leica System Base Unit	
	1 Magellan ProMark X CP Unit	
	1 Magellan Nav 5000 Pro Unit	
	3 Trimble GPS Backpacks	
Surveying Equipment	4 Zeiss Elta 50-R Total Stations	Support instruction and research in surveying and mapping sciences
	4 Reflexive Prisms with Prism Poles	
	Trimble Total Station DR 3603	
	2 Precision International, Citation Electronic Distance Meters	
	2 EDM Battery Chargers and Associated Prisms	
	5 Nikon AP-5 Autolevels	
	3 TOPCON AT-G3 Autolevels	
	1 Bausch and Lomb Laser Range Finder	
Image Interpretation Equipment	1 Richards MIM light table with a Bausch and Lomb 240 Stereoscope	Support instruction and research in photogrammetry and image analysis
	1 Old Delft Scanning Stereoscope	
	1 Bausch and Lomb Zoom Transfer Scope	
	Numerous stereoscopes	
Photogrammetric Equipment	1 David W. Mann Company Mono-Comparator	Support research and instruntion in photogrammetry
	1 Ziess PSK2 Stereocomparator	
	1 Wild B8 Optical/Mechanical Analytical Plotter	
	1 Wild A9 Optical Analytical Plotter	
	1 B+L Optical/Mechanical Stereoplotter	
Water Resources	1 Marsh-McBirney Flo-Mate Portable Flowmeter	Support instruction in engineering hydrology and hydraulics
	2 YSI portable water quality probes	
	1 Double ring permeameter	
	1 Gwelph permeameter	

Laboratory Facilities Used by Forest Engineering Students

Forest Engineering students have access to laboratory facilities maintained by other academic units at SUNY-ESF and Syracuse University. The following table describes these facilities.

Table B.6-3 Laboratory Facilities Forest Engineering Students Use That Are Maintained by Other Academic Units

Facility and Location	Use	Entity Responsible for Maintenance	Comments
Hydraulics Laboratory, First Floor, Walters Hall	Support Instruction in Engineering Hydrology and Hydraulics	Faculty of Paper Science and Engineering	Closed-loop hydraulic flume. (1,100 sq.ft.)
Materials Testing, Baker lab	Supports Materials Science Instruction and Research	Faculty of Construction Management and Wood Products Engineering	Currently under reconstruction as part of Baker rehab project. (650 sq. ft.)
Structural Testing, Baker Lab	Supports Instruction for Structures Course	Faculty of Construction Management and Wood Products Engineering	Currently under reconstruction as part of Baker rehab project. (700 sq. ft.)
Geotechnical Laboratory, Hinds Hall	Supports Instruction and Research in Geotechnical Engineering	L. C. Smith College of Engineering, Syracuse University	Recently renovated.

Class Room Facilities

The College maintains classroom facilities, and the Registrar assigns classes to rooms of appropriate size. Most rooms are equipped with the standard suite of audio-visual equipment.

A classroom equipped for distance learning is located in 16 Illick Hall. The facility has a complete suite of audio-visual equipment, and can be used in either a local classroom or distance learning (send or receive) mode. The Faculty is a disproportionate user of that facility.. Our use of the so-called 'smart classroom' is especially important in that it is in a sense a test-bed for the design of instructional facilities to be installed in the renovated Baker Lab. In addition our move to Baker Lab will place us close to newly renovated large lecture halls in the southern portion of Baker Lab, which are ideal for larger gatherings such as for outside speakers, keynote addresses, and larger project presentations. Being in such close proximity to these facilities will allow us to better take advantage of opportunities that warrant their use.

Computer Infrastructure

Forest Engineering students have access to Faculty computing resources, College computer clusters, and all the computing resources at Syracuse University, including computer clusters and main-frame computers. The College academic computer support personnel will install specific engineering-related software on the servers, at the request of an individual Faculty. Computer clusters can be scheduled for class computer exercises. Some details of these facilities are provided in the next table.

Table B.6-4. Computer Facilities to Which Forest Engineering Students Have Access

Location	Description
Mapping Sciences	2 Dell File Servers, 1 Dell UNIX and 9 Dell WinXP workstations, 2.5 GHz, 1 MB RAM
ESF Computer Cluster-Moon Library	24 E-3400 933 MHz Gateway Computers equipped with networked printers and standard word processing, spread sheet, etc. software
ESF Computer Cluster-156 Baker Lab	24 E-3400 933 MHz Gateway Computers equipped with networked printers and standard word processing, spread sheet, etc. software
ESF Computer Cluster-143 Baker Lab	28 Dell E 4000 2.4 GHZ 256 MB of RAM Windows XP Version 2002, equipped with networked printers (one color) and standard word processing, spread sheet, etc. software.
ESF Computer Cluster-149 Baker Lab	32 Dell Optiplex SX 280 Intel (R) Pentium (R) 4 CPU 3.4 GTZ Windows XP Version 2002 Computers, networked printers (one color), and standard word processing, spread sheet, etc. software.
PSE Computer Cluster 415 Walters Hall	9 866 MHz Gateway Computers, networked printer, and standard word processing, spreadsheet, etc. software. Specialized engineering software.
Syracuse University	UNIX mainframe computers, computer clusters in dormitories, academic buildings and Schine Student Center. Syracuse University Residence Halls are wired for internet access.

Future Facilities

The Faculty will move into the rehabilitated and renovated Baker Laboratory. The Faculty has had continuing dialogue with the project architects, and participated in every step of the Program Study for the Rehabilitation of Baker Laboratory. The following table provides a summary of the plans for the new facilities for the Faculty of Environmental Resources and Forest Engineering. The Faculty spaces will total about 15,000 sq. ft.

Table B.6-5. Planned Spaces for the Faculty of Environmental Resources and Forest Engineering in the Rehabilitated Baker Laboratory

Program Component	Description	Square footage
Department Offices	Chair's office, secretarial space, conference room, etc.	1050
Faculty Offices	Twelve faculty offices, each with space for a computer workstation	3000
Professional Staff	Five offices, associated work space	1100
Graduate Student Offices	Office space for 72 graduate students, office space for 8 graduate assistants	3000
Geo-Spatial Modeling Teaching Lab	Teaching and research laboratory, preparation and storage area, specialized laboratory	3500
Mapping Science Teaching/Research Laboratory	Teaching laboratory, surveying equipment maintenance and storage, remote sensing, image interpretation, server room	2100
Water Resources/ Ecological Engineering	Wet chemistry laboratory, hydraulics laboratory, dedicated computer cluster	1500
Engineering Design and Computation Laboratory	Laboratory for capstone design course, and other engineering design activities	1000

Program Component	Description
Department Offices	Chair's office, secretarial space, conference room, etc.
Faculty Offices	Twelve faculty offices, each with space for a computer workstation
Professional Staff	Five offices, associated work space
Graduate Student Offices	Office space for 72 graduate students, office space

	for 8 graduate assistants
Geo-Spatial Modeling Teaching Lab	Teaching and research laboratory, preparation and storage area, specialized laboratory
Mapping Science Teaching/Research Laboratory	Teaching laboratory, surveying equipment maintenance and storage, remote sensing, image interpretation, server room
Water Resources/ Environmental Engineering	Wet chemistry laboratory, hydraulics laboratory, dedicated computer cluster
Engineering Design and Computation Laboratory	Laboratory for capstone design course, and other engineering design activities

Summary

The current facilities available to the Faculty of Environmental Resources and Forest Engineering have been and are adequate. However, the fact is that the facilities are spread among three buildings (Bray and Walters Hall, and the Old Green House) and on three floors in one building (Bray Hall). The Faculty is in a very favorable position with respect to the rehabilitation of Baker Laboratory, in that we will not suffer any disruption to our current activities and programs. The Baker Laboratory plans call for the Faculty to have facilities on three floors of that building, and ready access to state-of-the-art laboratory, classroom and computer facilities, which should allow for a better integration of Faculty activities. The plans also provide space for an increase in the number of faculty in the unit. We are looking forward to the challenges and opportunities the new space will provide us.

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Criterion 7. Institutional Support and Financial Resources

Introduction

The support available to the Faculty of Environmental Resources and Forest Engineering is adequate, as will be discussed below. However, we recognize the changing dynamics and sometimes precarious nature of funding for public assisted higher education. We have therefore begun to consider how we can increase the amount of discretionary funds available to our Faculty. We will discuss our efforts in this regard as well.

Leadership

The Faculty of Environmental Resources and Forest Engineering has benefited from the fact that the senior administration of the College understands the importance of the Forest Engineering program, and holds the activities of the Faculty in high regard. President Dr. Cornelius Murphy, began his tenure on May 15, 2000, and came to the College after having been the Chief Executive Officer of O'Brien and Gere, Ltd., a nationally known environmental engineering firm with headquarters in Syracuse, NY. Dr. Murphy understands the importance of engineering education and knows our Forest Engineering program by virtue of having hired several of our graduates. Dr. Bruce Bongarten, Provost since August 2005, obtained his undergraduate degree from ESF, and in fact started in the Forest Engineering program before transferring to the forestry program. Dr. William Tully, current Director of the Division of Engineering, was one of the original designers of the Forest Engineering program, and served as a professor and chair of the department before he became Dean of Engineering, and then Provost, a position he left when Dr. Bongarten was hired. Dr. Tully is a Professional Engineer registered in the State of New York.

Dr. James Hassett has been Faculty Chair since 1999, and also Director of the Division of Environmental Science since 2003. Dr. Hassett was a faculty member in the department for 18 years before becoming chair. His tenure has been characterized as one of humor, vision, compassion, a penchant for raw oysters and steamed clams, and good beer. His most significant accomplishment is that he has outlasted most other faculty chairs and is now honored as having the third-longest tenure as a faculty chair on this campus, behind only Richard Hawks of the Faculty of Landscape Architecture whose tenure, rumor has it, is made possible only by regular injections of embalming fluid.

Budget

Funds available to the Faculty of Environmental Resources and Forest Engineering come from four sources:

- state allocations
- research funding
- continuing education, and
- development activities.

The Faculty Chair has final authority on expenditures from all accounts except research funding, for which the faculty Principal Investigator has sole authority. However, the Chair has little discretion in salary matters, given that unions that represent faculty and staff negotiate salaries at the SUNY system level on behalf of their members.

STATE ALLOCATION

The state allocation is usually distributed to each academic unit before the end of the fiscal year, i.e., June 30. While this is the goal, the reality depends on when the state legislature passes a final budget, and that is highly variable from year to year[1]. The amount is more or less assigned, with little input from Faculty Chairs. The amount has been relatively unchanged for the last several years. However, the unit has had to respond to several 'unfunded mandates' which has increased pressure on this limited resources. For example, each faculty unit is expected to host unit-specific graduation receptions (as opposed to the previous college-wide function), the funds for which come from our state allocation. We have also been asked to become more involved in undergraduate recruiting activities, and therefore we have instituted the strategies described under Criterion 1.

In addition, the ERFEG office is the administrative home of the Division of Environmental Science. The ERFEG office communicates with potential Environmental Science students, sends materials in support of recruitment activities, and occasionally sponsors students for travel and conferences. While the costs of these activities are modest, the funding is even more modest, and in essence the Environmental Science program is subsidized by the ERFEG faculty unit.

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[1] The state budget has been on time for the last two years. Some observers credit this less to any changes in Albany and more to Governor Pataki's apparent presidential ambitions.

State funds have to be spent during the fiscal year they are allocated.

RESEARCH FUNDING

Sponsored research generates funds to support the Faculty in several ways. Some grants are designed to support and enhance undergraduate education directly. Dr. Kroll obtained USDA funding to develop a hydrologic field site for teaching and research at Heiberg Forest, in Tully, NY. Heiberg Forest is one of the College's properties, and is located about 15 miles south of the Syracuse campus. While the initial funding has expired, Dr. Kroll continues to seek additional funds to further develop this site. Some grants include funds to support undergraduates. Three undergraduate Forest Engineering students were supported by this mechanism during the most recent academic year. Inevitably, some research equipment, computers and software purchased from research funds is used in support of the undergraduate program, thus freeing state allocated funds for other purposes. Likewise, research funding is sometimes used for travel to professional conferences, again reducing the demand on state allocated funds for this purpose.

Each Faculty unit also receives a yearly allocation from the Provost's Office via the Research Foundation more or less proportional to the amount of research overhead funds generated by the unit during the previous year. These funds accrue to the Faculty Chair, and have to be used to support opportunities to generate more research funding. Finally, the Faculty has begun to generate funds from development activities.

Research funding must be spent during the project award period; research incentive funds can be carried forward from one year to the next.

CONTINUING EDUCATION

Funds accrue to the Faculty from the Office of Continuing Education by virtue of faculty involvement in continuing education activities. Such activities might include participation in the design and delivery of non-credit short courses, or work during the summer on grants managed by the Office of Continuing Education.

Funding from continuing education activities is returned to the Faculties in the form of an account maintained by the Research Foundation; funds can be carried forward from year to year.

DEVELOPMENT

Like many state-assisted institutions, SUNY-ESF does not yet have extensive experience with seeking funds via institutional development activities. However, an increased endowment is a goal of the college's strategic plan, and the ERFEG faculty has begun to work with the ESF Office of Development to fund the endowed chair position (see criterion 5) and to raise funds to provide equipment for the renovated baker lab. These funds can be carried forward from year to year.

The following table summarizes sources and amounts of funds available to the Faculty of Environmental Resources and Forest Engineering, and comments on expenditure guidelines.

Table B.7-1. Sources, Amounts, and Restrictions on Funds Available to the Faculty of Environmental Resources and Forest Engineering

Source	Amount			Comment
	Fiscal Year 2003-2004	Fiscal Year 2004-2005	Fiscal Year 2005 -2006 (to 4/26)	
State Allocation: Operations Travel Equipment Part Time Assistance TOTAL	 $19,392.07 $4,807.29 $2,164.00 $1,240.00 $27,603.36	 $18,098.75 $8,625.41 - $84.00 $26,808.16	 $14,852.38 $6,047.85 $1,858.22 - $22,758.45	Faculty Chair has final authority on expenditure of state allocated funds, but little discretion in salary matters.
State Allocation: Instructional Equipment	$0	$0	$23,250.00*	Faculty Chair has final authority; must be spent in support of educational activities
Sponsored Research Expenditures Direct Indirect Total	 $975,057 $220,465 $1,195,522	 $806,858 $161,555 $968,413	 $656,616 $171,888 $828,504	Multiple projects; Project Director has final authority
Research Foundation Sponsored Program Development	$11,504	$7,312	$8,422	Faculty Chair has final authority; must be spent to enhance Faculty research efforts
Continuing Education			$3,895	Faculty Chair has final authority, in

Program Development				consultation with faculty generating the funds
Development Activities: Donations E. Church Fund W. Johnson Fund Forest Engineering Fund	 $0 $4,677,50 $570	 $0 $175 $550	 $0 ($400) $750 ($1,900) $1,010 ($6,696)	Faculty Chair (and sometimes one other faculty member) has authority; restrictions apply according to particular fund.
Funds collected/ committed for Endowed Chair	$71,000	$77,500	$118,600	Funds not available until principle reaches $500,000.
Notes: Academic equipment for 2005-2006 includes an extraordinary allocation of $20,000 because of unprecedented year-end budget surplus. * Numbers in parentheses are available as a result of indicated (or prior) donations.				

The data in the above table demonstrate success by the Faculty in attracting a substantial amount of sponsored research, and adequate support from other sources. Many of the larger research projects are multi-year efforts, and so the funds are or will be expended over two or three years. As will be demonstrated below, the funding has created opportunities to hire a substantial number of research-funded employees and graduate research assistants, all of whom contribute to the academic success of the Faculty.

Personnel

The Faculty of Environmental Resources and Forest Engineering employs several individuals in instructional and research support roles. These positions are detailed in the next table.

Table B.7-2. Instructional and Research Support Personnel Associated with the Faculty of Environmental Resources and Forest Engineering

Position	Duties	Years With Faculty
Secretary	Administrative assistance (budget, personnel, student queries, etc.)	11
Instructional Support Specialist	Maintain instructional and research equipment, assist in instruction as needed	6

Instructional Support Specialist	Maintain instructional and research equipment, assist in instruction as needed	7
Research Scientist	Research director for NASA funded project	3
Graduate Teaching Assistants	Assist with graduate and undergraduate instruction. Unit policy: 2 years for MS, 3 years for PhD students	Faculty has 10 TA allocations for 2006-2007
Research Project Assistants	Graduate students funded to assist with funded research projects. Number varies with research activities	9 RPAs as of May 10, 2006
Associate Director	Associated with Brownfield Center. Reports to D. Daley	1 as of May 10, 2006
Senior Research Scientist	Associated with US Forest Service project. Reports to T. Endreny	1 as of May 10, 2006
Research Scientist	Associated with NASA project. Reports to J. Hassett	1 as of May 10, 2006
Project Staff Associate	Associated with EPA Chilled Water Project and NYWEA Office. Both reports to J. Hassett	2 as of May 10, 2006
Administrative Assistant, Clerical Assistant, Project Staff Assistant	All associated with NYWEA Office. All report to J. Hassett	1 in each title as of May 10, 2006

Summary

The ERFEG unit has been successful in attracting research dollars, with every faculty member having at least one extramurally funded project. The research expenditures have reduced the effects of the stagnant state budget in that faculty frequently travel on research funds and do not need to avail themselves of limited state funds. In a very real sense, research dollars are subsidizing faculty development efforts in terms of travel and equipment purchases.

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Criterion 8 Program Criteria

Introduction

As mentioned previously in this report, the Forest Engineering program at SUNY-ESF is unique in that it evolved within a College of Forestry and not within a department of agricultural engineering at a land-grant institution. The history of the program is reflected in the biological science and forestry courses offered to the current Forest Engineering students. In addition, the evolution of the College from a College of Forestry to a College of Environmental Science and Forestry is reflected in the unit's aspirations for the future.

This section discusses how our program satisfies the Program Criteria for the Agricultural and Similarly Named Engineering Programs. This is broken into two areas: curricular topics and faculty qualifications. We conclude with a summary of our thoughts as to how the program will continue to evolve.

Curricular Topics

We have developed a broad curriculum which spans a wide range of engineering topics. Below in Table B8-1 we have mapped the Program Criteria for the Agricultural and Similarly Named Engineering Programs to specific courses within our curriculum. Note that only a subset of the ERFEG undergraduate curriculum was used to match the Program Criteria. As one can see, our curriculum provides an excellent match to the Program Criteria for the Agricultural and Similarly Named Engineering Programs. The curriculum is discussed in more detail under Criterion 4 of this report.

Table B.8-1. Mapping of Program Criteria for the Agricultural and Similarly Named Engineering Programs to Forest Engineering Curriculum	
Program Criteria for the Agricultural and Similarly Named Engineering Programs	**Forest Engineering Curriculum Requirements Satisfying Criteria**
Mathematics through Differential Equations	15 credit hours of calculus through differential equations
Engineering Sciences (20 credit hours)	5 credit hours of statics and dynamics 3 credit hours of electrical sciences 3 credit hours of mechanics of materials 3 credit hours of surveying 4 credit hours of fluid mechanics 2 credit hours of thermodynamics
Biological Sciences (9 credit hours)	4 credit hours of botany 3 credit hours of forest ecology and silviculture 2 credit hours of dendrology

Assessment

The Program Criteria statement says 'Programs must demonstrate that graduates have proficiency in mathematics through differential equations . . ', We define a metric of proficiency in this regard as completion of MAT 485 Differential Equations (or the equivalent APM 485) with a grade of C or better, and assess the metric by means of a transcript analysis. The next table shows proficiency data for the last two graduating classes, and current (May 2006) seniors and juniors.

Table B8-2. Grade Analysis to Assess Proficiency of Forest Engineering Students in Differential Equations			
Graduating Class	Number	Grades ≥ C	Comment
2004	12	9	Analysis does not include grades from transfer institutions
2005	15	9	
2006	12	8	
2007	7	4	

It should be noted that students can continue with a grade of D or better, and further that we assess other aspects of the students' ability to apply mathematics as discussed in Criterion 3. In both regards, it will be interesting to track changes in mathematical proficiency that may occur as a result of our newly adopted mathematics placement examination, as discussed in Criterion 3.

The Program Criteria further state 'Programs must demonstrate that graduates have proficiency in . . . biological and engineering sciences consistent with program educational objectives.' We build proficiency for our students by a number of exercises that reinforce biological and engineering science concepts in class and design exercises in upper division courses. Table B8-3 describes some of these exercises.

Table B8-3. Class Exercises in Upper Division Courses in the Forest Engineering Program Designed to Reinforce Biological and Engineering Science Concepts

Course	Activity	Concepts Reinforced
FEG 340	Design of bioswale	Fluid mechanics, dendrology
ERE 440	Design of flow measurement device	Fluid mechanics, hydraulics
	Design of solid-liquid separation device	Fluid mechanics, hydraulics
	Design of biological treatment system	Fluid mechanics, kinetics of biological growth
APM395	Design of regional regression models for flood estimation	Mathematics, hydrology
FEG430	Management design of a reservoir system	Hydrology, water resources

The faculty assesses students' competencies by reviewing the projects, and providing feedback as appropriate.

The Program Criteria further state 'Competence must be demonstrated [by graduates] in the application of engineering to agriculture, aquaculture, forestry, human, natural resources, or other biological systems.' We repeat here some data from our alumni surveys to demonstrate that the forest engineering graduates are active in a variety contexts in which they demonstrate their competence in the course of their careers.

STUFF TO BE ADDED

Faculty Qualifications

The faculty are well qualified to teach courses which are primarily design in content. Qualifications involve advanced educational degrees, professional experience, and professional licensure. Below in Table B.8-2 we have mapped engineering courses with a design component to the qualifications of the faculty involved with those courses. A thorough discussion of faculty qualification can be found under Criterion 5 of this document. Included in the Appendix are the summary curriculum vitae for each faculty member.

Table B.8-4.: Mapping of Faculty Qualifications to Design Courses

Design Course	Faculty Qualification
1 credit hour of engineering design (FEG300)	Professional Licensure Over 15 years of professional experience
4 credit hours of engineering hydrology (FEG340)	Professional Licensure, Certification as Professional Hydrologist PhD in Civil and Environmental Engineering
3 credit hours of photogrammetry (FEG363))	PhD in Photogrammetry and Remote Sensing Engineering
4 credit hours of structures (FEG410)	Professional Licensure
4 credit hours of soil mechanics (CIE337)	Professional Licensure
3 credit hours of transportation systems (FEG437)	Professional Licensure 10 years of professional experience
2 credit hours of power systems (FEG454)	Professional Licensure 10 years of professional experience
3 credit hours of water pollution engineering (ERE440)	PhD in Civil and Environmental Engineering Active in research in on-site waste water disposal systems
3 credit hour capstone design course (FEG489)	Professional Licensure 15 years of professional experience

Summary and Reflections on the Future

The Forest Engineering program has evolved from a program designed to support the forest products industry to a program educating engineers to more broadly apply engineering and biological sciences to solve complex problems, be they in urban, suburban or rural settings. We envision changing our program focus to better reflect this reality. We discussed changing the program name to

Ecological Engineering with our Advisory Council in the January 2006 meeting, and have had discussions with the College President and Provost as well. We are currently advertising for a new assistant professor in ecological engineering, and are scheduled to have interviews during the Fall 2006 semester pending, of course, a pool of viable applicants.

We think our program's setting in a College of Environmental Science and Forestry provides us access to a unique collection of engineers, scientists, designers, and policy makers with their primary focus on environmental issues. In that regard, we think moving towards a more ecologically based engineering program makes eminent sense, and we look forward with excitement as we plan and make the necessary changes to our already strong program.