## A. Tabular Data for Program

### Table I-1. Basic-Level Curriculum (Paper Engineering)

| Year; Semester | Course (Department, Number, Title) | | Category (Credit Hours) | | | |
|---|---|---|---|---|---|---|
| | | | Math & Basic Sciences | Engineering Topics *Check if Contains <u>Significant</u> Design (✓)* | General Education | Other |
| Year 1: Fall | FCH 150 | General Chemistry Lecture I | 3 | ( ) | 3 | |
| | FCH 151 | General Chemistry Lab I | 1 | ( ) | | |
| | MAT 295 | Calculus I* | 4 | ( ) | 3 | |
| | CLL 190 | Writing and the Environment | | ( ) | 3 | |
| | PSE 132 | PSE Orientation Seminar | | ( ) | | 1 |
| | | General Education Elective | | ( ) | 3 | |
| | | General Education Elective | | ( ) | 3 | |
| | | | | | | |
| Spring | PHY 211 | General Physics* | 3 | ( ) | 3 | |
| | PHY 221 | General Physics Lab* | 1 | ( ) | | |
| | FCH 152 | General Chemistry Lecture II | 3 | ( ) | | |
| | FCH 153 | General Chemistry Lab II | 1 | ( ) | | |
| | MAT 296 | Calculus II* | 4 | ( ) | 3 | |
| | APM 153 | Computing Methods | | ( ) | 3 | |
| | ERE 225 | Engineering Graphics | | ( ) | | 1 |
| | FOR 207 | Introduction to Economics | | ( ) | 3 | |
| | | | | ( ) | | |
| Year 2: Fall | FCH 221 | Organic Chemistry I | 3 | ( ) | | |
| | FCH 222 | Organic Chemistry Lab I | 1 | ( ) | | |
| | MAT 397 | Calculus III* | 4 | ( ) | | |
| | PSE 300 | Intro to Papermaking | | 3 ( ) | | |
| | PSE 302 | Pulp and Paper Laboratory Skills | | 1 ( ) | | |
| | PSE 370 | Principles of Mass and Energy Balances | | 3 (✓) | | |
| | | General Education Elective | | ( ) | 3 | |
| | | | | | | |
| Spring | FCH 223 | Organic Chemistry II | 3 | ( ) | | |
| | FCH 224 | Organic Chemistry II Lab | 1 | ( ) | | |
| | PHY 212 | General Physics II* | 3 | ( ) | | |
| | PHY 222 | General Physics II Lab* | 1 | ( ) | | |
| | APM 485 | Differential Equations | 3 | ( ) | | |
| | CLL 290 | Writing, Humanities, and the Environment | | ( ) | 3 | |
| | | General Education Elective | | ( ) | 3 | |

**Table I-1. Basic-Level Curriculum (Paper Engineering) (continued)**

| Year; Semester or Quarter | Course (Department, Number, Title) | | Category (Credit Hours) | | | |
|---|---|---|---|---|---|---|
| | | | Math & Basic Science | Engineering Topics | General Edu-cation | Othe r |
| Year 3: | FCH 380 | Analytical Chemistry I | 3 | ( ) | | |
| Fall | FCH 360 | Physical Chemistry I | 3 | ( ) | | |
| | PSE 361 | Engineering Thermodynamics | | 3 (✓) | | |
| | PSE 371 | Fluid Mechanics | | 3 (✓) | | |
| | CLL 405 | Writing for Science Professionals | | ( ) | 2 | |
| | CLL 300 | Library Research | | ( ) | 1 | |
| | | | | | | |
| Spring | FCH 361 | Physical Chemistry II | 3 | ( ) | | |
| | WPE 386 | Structure and Properties of Wood | | ( ) | | 2 |
| | WPE 390 | Fiber Identification Laboratory | | ( ) | | 1 |
| | PSE 350 | Pulping and Bleaching Processes | | 3 ( ) | | |
| | PSE 351 | Pulping and Bleaching Laboratory | | 2 ( ) | | |
| | PSE 372 | Heat Transfer | | 3 (✓) | | |
| | PSE 480 | Engineering Design Economics | | 3 (✓) | | |
| | | | | | | |
| Summer | PSE 304 | Summer Mill Experience | | 2 (✓) | | |
| | | | | | | |
| Year 4: | PSE 465 | Paper Properties | | 4 ( ) | | |
| Fall | PSE 473 | Mass Transfer | | 3 (✓) | | |
| | PSE 481 | Engineering Design | | 3 (✓) | | |
| | ERE 223 | Statics and Dynamics | | 4 ( ) | | |
| | PSE 477 | Process Control | | 3 ( ) | | |
| | | | | | | |
| Spring | PSE 467 | Papermaking Wet End Chemistry | | 3 ( ) | | |
| | PSE 466 | Paper Coating and Converting | | 2 ( ) | | |
| | PSE 468 | Papermaking Processes | | 3 (✓) | | |
| | ERE 440 | Water Pollution Engineering | | 3 (✓) | | |
| | APM 395 | Probability and Statistics for Engineers | 3 | ( ) | | |
| | ERE 362 | Mechanics of Materials | | 3 ( ) | | |
| | *Or* | | | | | |
| | ELE 231 | Electrical Science I | | | | |
| TOTALS-ABET BASIC-LEVEL REQUIREMENTS | | | | | | |
| OVERALL TOTAL FOR DEGREE | | | | | | |
| PERCENT OF TOTAL | | | | | | |
| Totals must satisfy one set | Minimum semester credit hours | | 32 hrs | 48 hrs | | |
| | Minimum percentage | | 25% | 37.5 % | | |

**Table I- 2. Course and Section Size Summary: Paper Engineering**

| Course No. | Title | No. of Sections offered in 2005-2006 (Fall/Spring) | Total Enrollment | Type of Class[1] | | | |
|---|---|---|---|---|---|---|---|
| | | | | Lecture | Laboratory | Recitation | Other |
| | | | | | | | |
| FCH 150 | General Chemistry Lecture I | 1/0 | 307 | 100 | | | |
| FCH 151 | General Chemistry Lab I | 12/0 | 303 | | 100 | | |
| MAT 295 | Calculus I | 7/6 | 51 | 75 | | 25 | |
| CLL 190 | Writing and the Environment | 17/0 | 280 | 100 | | | |
| PSE 132 | PSE Orientation Seminar | 1/0 | 15 | | | | 100[2] |
| PHY 211 | General Physics I | 1/1 | 98 | 75 | | 25 | |
| PHY 221 | General Physics Lab I | 1/1 | 97 | | 100 | | |
| FCH 152 | General Chemistry Lecture II | 0/2 | 276 | 100 | | | |
| FCH 153 | General Chemistry Lab II | 0/12 | 267 | | 100 | | |
| MAT 296 | Calculus II | 6/9 | 71 | 75 | | 25 | |
| APM 153 | Computing Methods | 0/0 | | 100 | | | |
| ERE 225 | Engineering Graphics | 1/0 | 34 | | 100 | | |
| FOR 207 | Introduction to Economics | 1/1 | 133 | 100 | | | |
| FCH 221 | Organic Chemistry I | 1/0 | 80 | 100 | | | |
| FCH 222 | Organic Chemistry Lab I | 4/0 | 69 | | 100 | | |
| MAT 397 | Calculus III | 6/6 | 46 | 75 | | 25 | |
| PSE 300 | Intro to Papermaking | 1/0 | 9 | 100 | | | |
| PSE 302 | Pulp and Paper Laboratory Skills | 1/0 | 8 | | 100 | | |
| FCH 223 | Organic Chemistry II | 0/1 | 49 | 100 | | | |
| FCH 224 | Organic Chemistry II Lab | 0/2 | 46 | | 100 | | |
| PHY 212 | General Physics II | 1/1 | 64 | 75 | | 25 | |
| PHY 222 | General Physics II Lab | 1/1 | 65 | | 100 | | |
| APM 485 | Differential Equations (MAT 485) | (2)/1 (2) | 27 | 100 | | | |
| CLL 290 | Literature, Humanities, and the Environment | 0/11 | 216 | 100 | | | |
| FCH 380 | Analytical Chemistry I | 1/0 | 14 | 50 | 50 | | |
| FCH 360 | Physical Chemistry I | 1/0 | 17 | 100 | | | |
| PSE 370 | Principles of Mass and Energy Balances | 1/0 | 9 | 100 | | | |
| PSE 371 | Fluid Mechanics | 1/0 | 7 | 100 | | | |
| CLL 405 | Writing for Science Professionals | 2/1 | 48 | 100 | | | |
| ESF 200 | Library Research | 6/4 | 182 | 100 | | | |
| FCH 361 | Physical Chemistry II | 0/1 | 15 | 100 | | | |
| WPE 386 | Structure and Properties of Wood | 0/1 | 7 | 100 | | | |
| WPE 390 | Fiber Identification Laboratory | 0/1 | 7 | | 100 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PSE 350 | Pulping and Bleaching Processes | 0/1 | 7 | 100 | | | |
| PSE 351 | Pulping and Bleaching Laboratory | 0/1 | 7 | 25 | 75 | | |
| PSE 372 | Heat Transfer | 0/1 | 6 | 85 | 15 | | |
| APM 395 | Probability and Statistics for Engineers | 0/0 | | 100 | | | |
| PSE 304 | Summer Mill Experience | 1 | 2 | | | | 100[3] |
| PSE 305 | Co-op Experience | 1/1 | 2 | | | | 100[4] |
| PSE 465 | Paper Properties | 1/0 | 3 | 75 | 25 | | |
| PSE 473 | Mass Transfer | 1/0 | 4 | 100 | | | |
| PSE 361 | Engineering Thermodynamics | 1/0 | 2 | 100 | | | |
| ERE 223 | Statics and Dynamics | 1/0 | 5 | 100 | | | |
| ELE 231 | Electrical Science I | 1/1 | 36 | 100 | | | |
| PSE 467 | Papermaking Wet End Chemistry | 0/1 | 5 | 100 | | | |
| PSE 466 | Paper Coating and Converting | 0/1 | 5 | 100 | | | |
| PSE 468 | Papermaking Processes | 0/0 | | 50 | 50 | | |
| ERE 440 | Water Pollution Engineering | 1/1 | 29 | 100 | | | |
| PSE 480 | Engineering Design Economics | 0/1 | 4 | 100 | | | |
| ERE 362 | Mechanics of Materials | 1/1 | 41 | 100 | | | |
| PSE 477 | Process Control | 1/0 | 4 | 100 | | | |
| PSE 481 | Engineering Design | 1/0 | 4 | 100 | | | |
| | | | | | | | |

1. Percentages indicate each type of class for each course (e.g., 75% lecture, 25% recitation).
2. PSE 132 (Orientation Seminar) includes a three-day orientation program in the Adirondacks including mill and forest properties tours.
3. PSE 304 (Summer Mill Experience) is a 3-month internship with a paper mill or supplier company.
4. PSE 305 (Co-op Experience) is a 4-month work experience in conjunction with PSE 304.
5. MAT 485 is available at Syracuse University and can substitute for APM 485 if necessary.

**Table I- 3. Faculty Workload Summary: Paper Engineering**

| Faculty Member (Name) | FT or PT | Classes Taught (Course No./Credit Hrs.) (All data apply to the 2005-2006 (F=fall, S=spring, Sum = summer) | Total Activity Distribution[2] | | |
|---|---|---|---|---|---|
| | | | Teaching | Research | Other[3] |
| Dr. Wayne Amato | PT | PSE 361 (3, F)<br>PSE 477 (3, F)<br>APM 485 (3, S) | 100 | | |
| Dr. Thomas E. Amidon | FT | PSE 456 (3, S)<br>PSE 351 (2, S) | 25 | 15 | 60 |
| Mr. William Burry | FT | PSE 302 (1, F)<br>PSE 351 (2, S) | 25 | 50 | 25 |
| Dr. Siddharth Chatterjee | FT | ERE 440 (3, F)<br>ERE 441 (3, S)<br>PSE 480 (3, S)<br>PSE 481 (3, F) | 60 | 20 | 20 |
| Dr. Joseph Cornell | PT | APM 153 (3, S) | 100 | | |
| Dr. Raymond C. Francis | FT | PSE 473 (3, F) | 20 | 70 | 10 |
| Dr. Jose Iribarne | PT | PSE 481 (3, F) | | | |
| Dr. D. Steven Keller | FT | PSE 300 (3, F)<br>PSE 304 (2, Sum)<br>PSE 305 (2, F, S)<br>PSE 465 (4, F)<br>PSE 466 (2, S) | 50 | 25 | 25 |
| Dr. Yuan-Zong Lai | FT | ERE 670 (3, S) | 30 | 60 | 10 |
| Dr. Shijie Liu | FT | PSE 372 (3, S) | 30 | 45 | 25 |
| Dr. Bandaru V. Ramarao | FT | PSE 371 (3, F)<br>PSE 467 (3, S) | 45 | 45 | 10 |
| Dr. Leland R. Schroeder | PT | PSE 350 (3, S) | 100 | | |
| Dr. Gary M. Scott | FT | PSE 132 (1, F)<br>PSE 370 (3, F) | 25 | 25 | 50 |
| | | | | | |
| | | | | | |

1. Indicate Term and Year for which data apply.
2. Activity distribution should be in percent of effort. Members' activities should total 100%.
3. Indicate sabbatical leave, etc., under "Other."

**Table I-4. Faculty Analysis (as of June 2006): Paper Engineering**

| Name | Rank | FT or PT | Highest Degree | Institution from which Highest Degree Earned & Year | Years of Experience | | | State in which Registered | Level of Activity (high, med, low, none) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Govt./ Industry Practice | Total Faculty | This Institution | | Professional Society (Indicate Society) | Research | Consulting /Summer Work in Industry |
| Dr. Wayne Amato | AdjP | PT | Ph.D. | Syracuse University, 1970 | 29 | 34 | 11.5 | PE (NY) EIT (NJ) | L-AIChE | M | H |
| Dr. Thomas E. Amidon | P | FT | Ph.D. | SUNY-ESF, 1974 | 23 | 6 | 6 | None | H-Tappi H-PIMA | H | M |
| Dr. Siddharth Chatterjee | AP | FT | Ph.D. | Rensselaer Polytechnic Institute, 1987 | 5.5 | 12.5 | 11.5 | None | N-IIChE N-ASEE | H | L |
| Dr. Joseph Cornell | AdjP | PT | Ph.D. | SUNY-ESF, 2003 | 0 | 2 | 3 | None | | L | L |
| Dr. Raymond C. Francis | RA | FT | Ph.D. | University of Toronto, 1987 | 0 | 19 | 19 | None | M-Tappi L-ACS L-ASEE | H | M |
| Dr. Jose Iribarne | AdjP | PT | Ph.D. | SUNY-ESF, 1999 | 6 | 3 | 3 | None | L-Tappi | L | H |
| Dr. D. Steven Keller | AP | FT | Ph.D. | SUNY-ESF, 1996 | 10 | 10 | 16 | None | M-ACS M-Tappi | H | M |
| Dr. Yuan-Zong Lai | SRA | FT | Ph.D. | University of Washington, 1968 | 0 | 15 | 25 | None | L-Tappi L-ACS | H | L |
| Dr. Shijie Liu | AsP | FT | Ph.D. | University of Alberta | 1 | 11 | 1 | P.Eng., Alberta | M-AIChE M-TAPPI H-PAPTAC | H | L |
| Dr. Bandaru V. Ramarao | P | FT | Ph.D. | Clarkson University, 1985 | 0 | 20 | 18 | None | M-AIChE | H | L |
| Dr. Leland R. Schroeder | AdjP | FT | Ph.D. | Institute of Paper Chemistry, 1965 | 2 | 39.5 | 20.0 | None | H-Tappi L-ACS | M | L |
| Dr. Gary M. Scott | P | FT | Ph.D. | University of Wisconsin, 1993 | 6 | 8.5 | 8.5 | None | M-Tappi M-ASEE | M | M |

[1]The ranks are as follows: P=Professor; AsP=Associate Professor, AP=Assistant Professor, AdjP=Adjunct Professor, RA=Research Associate, SRA=Senior Research Associate.

Instructions: Complete table for each member of the faculty of the program. Use additional sheets if necessary. Updated information is to be provided at the time of the visit. The level of activity should reflect an average over the current year (year prior to visit) plus the two previous years.

**Table I-5. Support Expenditures: Paper Engineering**

| Fiscal Year | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | 2003-04 | 2004-2005 | 2005-2006 (YTD) | 2006-2007 (Budget) |
| Expenditure Category | | | | |
| Operations (not including staff) | $18,962 | $18,838 | $15,728 | * |
| Travel | $7,784 | $6,528 | $5,752 | * |
| Equipment, Institutional | - | $3,027 | $4,058 | * |
| Research Grants[1] | $403,262 | $604,516 | $1,037,605 | * |
| SPPF Funds[2] | $167,789 | $237,077 | $241,812 | $262,465 |
| Graduate Teaching Assistants[3] | $84,976 | $80,445 | $163,766 | * |
| Part-time Assistance (other than teaching) | - | - | - | * |

*****The budget is not yet determined. These data will be provided at the time of the visit.

**Instructions:**

**Notes:**

1. Research Grants include all expenditures through the research foundation, which includes equipment, supplies, graduate research assistants, etc. This equipment is often also used to support the educational mission of the Faculty.
2. The Syracuse Pulp and Paper Foundation provides support for undergraduate scholarships, equipment, recruitment, travel, etc., primarily in support of the undergraduate educational mission of the Faculty.
3. Totals reflect college supported graduate assistants.

## B. Example Plan Sheets

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Freshman Year - Fall Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| FCH150 | General Chemistry Lec I | 3 | | 0 | | | | |
| FCH151 | General Chemistry Lab I | 1 | | 0 | | | | |
| MAT295 | Calculus I | 4 | | 0 | | | | |
| CLL190 | Writing And The Environment | 3 | | 0 | | | | |
| PSE132 | Orientation Seminar: PSE | 1 | | 0 | | | | |
| GENEDU | General Education Elective | 6 | | 0 | | | | |
| GENEDU | General Education Elective | | | 0 | | | | |
| **Freshman Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PHY211 | Physics I | 3 | | 0 | | | | |
| PHY221 | Physics Lab I | 1 | | 0 | | | | |
| FCH152 | General Chemistry II | 3 | | 0 | | | | |
| FCH153 | General Chemistry II Lab | 1 | | 0 | | | | |
| MAT296 | Calculus II | 4 | | 0 | | | | |
| APM153 | Computing Methods | 3 | | 0 | | | | |
| GENEDU | General Education Elective | 3 | | 0 | | | | |
| **Sophomore Year - Fall Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE370 | Prin Mass/Energy Balance | 3 | | 0 | | | | |
| FCH221 | Organic Chemistry I | 3 | | 0 | | | | |
| FCH222 | Organic Chemistry Lab 1 | 1 | | 0 | | | | |
| MAT397 | Calculus III | 4 | | 0 | | | | |
| PSE302 | Pulp and Paper Laboratory Skills | 1 | | 0 | | | | |
| PSE300 | Introduction to Papermaking | 3 | | 0 | | | | |
| FOR207 | Introduction To Economics | 3 | | 0 | | | | |
| ERE225 | Engineering Graphics | 1 | | 0 | | | | |
| **Sophomore Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CLL290 | Writing, Humanities & Envrn | 3 | | 0 | | | | |
| FCH223 | Organic Chemistry II | 3 | | 0 | | | | |
| FCH224 | Organic Chemistry Lab II | 1 | | 0 | | | | |
| PHY212 | General Physics II | 3 | | 0 | | | | |
| PHY222 | General Physics Lab II | 1 | | 0 | | | | |
| APM485 | Differential Equations | 3 | | 0 | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sophomore Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type |
| GENEDU General Education Elective | 3 | | 0 | | | | |

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** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type |
| FCH360 Physical Chemistry I | 3 | | 0 | | | | |
| PSE361 Engr Thermodynamics | 3 | | 0 | | | | |
| PSE371 Fluid Mechanics | 3 | | 0 | | | | |
| CLL405 Writing for Science Professionals | 2 | | 0 | | | | |
| ESF200 Information Literacy | 1 | | 0 | | | | |
| FCH380 Analytical Chemistry I | 3 | | 0 | | | | |
| **Junior Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type |
| FCH361 Physical Chemistry II | 3 | | 0 | | | | |
| WPE386 Structure & Properties of Wood | 2 | | 0 | | | | |
| WPE390 Fiber Identification Lab | 1 | | 0 | | | | |
| PSE350 Pulping and Bleaching Processes | 3 | | 0 | | | | |
| PSE372 Heat Transfer | 3 | | 0 | | | | |
| PSE351 Pulp & Bleach Laboratory | 2 | | 0 | | | | |
| PSE480 Engr Design Economics | 3 | | 0 | | | | |
| **Junior Year - Summer Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE304 Mill Experience | 2 | | 0 | | | | |
| **Senior Year - Fall Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE477 Process Control | 3 | | 0 | | | | |
| PSE465 Paper Properties | 4 | | 0 | | | | |
| PSE473 Mass Transfer | 3 | | 0 | | | | |
| ERE223 Statics and Dynamics | 4 | | 0 | | | | |
| PSE481 Proc/Plant Design II:Synthes | 3 | | 0 | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Senior Year - Spring Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | - - - ESF - - Semester | Grade | Type |
| PSE466 | Paper Coating & Converting | 2 | _____ | 0 | | | | |
| PSE467 | Papermaking Wetend Chemistry | 3 | _____ | 0 | | | | |
| PSE468 | Papermaking Processes | 3 | _____ | 0 | | | | |
| APM395 | Probability & Stats/Engr | 3 | _____ | 0 | | | | |
| ERE440 | Water Pollution Engineering | 3 | _____ | 0 | | | | |
| ELE231 | Electrical Eng. Fundamentals I | 3 | _____ | 0 | | | | |
| | or | | | | | | | |
| ERE362 | Mechanics of Materials * | 3 | _____ | 0 | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 72 | Required: | 68 | Required: | 140 |
| Earned: | 0 | Earned: | 0 | Earned: | 0 |
| In Progress: | 0 | In Progress: | 0 | In Progress: | 0 |
| Deficient: | 72 | Deficient: | 68 | Deficient: | 140 |

## UPPER DIVISION FOOTNOTES

(*) Student must take 1 of the following:
ELE 231 Electrical Science I 3
ELE 362 Mechanics of Materials 3
(Students taking ELE 231 are strongly encouraged to also take ELE 394)

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

**General Educational Requirements**

You must complete one course per knowledge and skill area. Bold indicates course completed or in progress.

| Area | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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** | | | | | | | |
| EST201 | USHIS1 | USHIS2 | | | FOR204 | | |
| EST361 | | | | | | | |
| **WESTERN CIVILIZATION** | | | | | | | |
| EIN471 | FOR203 | EURHIS1 | | | EURHIS2 | | |
| **OTHER WORLD CIVILIZATIONS** | | | | | | | |
| EST200 | | | | | | | |
| **HUMANITIES** | | | | | | | |
| CLL290 | LANCOM1 | LITCOMP | | | | | |
| **THE ARTS** | | | | | | | |
| EFB215 | EIN205 | EIN206 | | | LSA182 | | |
| ARTHIS1 | MUSTH1 | ARTHIS2 | | | MUSTH2 | | |
| **BASIC COMMUNICATION** | | | | | | | |
| CLL190 | | | | | | | |

American History - EIN 371, EST 361, and ETS 116 are only for students scoring above 84 on the U.S. History Regents examination.

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

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 requirements are split between lower and upper division, and the "summaries" display the total credit hours required, earned, and deficient in each division.

"ID" refers to the Course ID, which may 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 received.

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

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

This report has been prepared to assist you in determining your academic progess at ESF. If this report does not appear to be accurate, contact your academic advisor and bring this report with you. Please be advised final confirmation that you have met all degree requirements is subect 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:Paper Engineering
Advisor:
Entered Fall 2005 as a Transfer

Printed: May 19, 2005

**LOWER DIVISION COURSE REQUIREMENTS**

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CHEM1 | General Chemistry w/Lab I | 4 | | 0 | | | | |
| CHEM2 | General Chemistry w/Lab II | 4 | | 0 | | | | |
| ORCHM1 | Organic Chemistry w/Lab I | 4 | | 0 | | | | |
| ORCHM2 | Organic Chemistry w/Lab II | 4 | | 0 | | | | |
| QUANT | Quantitative Analysis | 3 | | 0 | | | | |
| PHYS1 | Physics w/Lab I | 4 | | 0 | | | | |
| PHYS2 | Physics w/Lab II | 4 | | 0 | | | | |
| CALC1 | Calculus I | 4 | | 0 | | | | |
| CALC2 | Calculus II | 4 | | 0 | | | | |
| CALC3 | Calculus III | 4 | | 0 | | | | |
| DIFEQ | Differential Equations | 3 | | 0 | | | | |
| COMSCI | Computer Science | 3 | | 0 | | | | |
| ECON | Economics | 3 | | 0 | | | | |
| COMP1 | English with a Focus on Writing | 3 | | 0 | | | | |
| COMP2 | Literature with a Focus on Writing | 3 | | 0 | | | | |
| ENGDRW | Engineering Graphics | 1 | | 0 | | | | |
| WESCIV | Western Civilization | 3 | | 0 | | | | |
| AMHIST | American History | 3 | | 0 | | | | |
| OWDCIV | Other World Civilization | 3 | | 0 | | | | |
| THEART | The Arts | 3 | | 0 | | | | |

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** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CLL405 | Writing for Science Professionals | 2 | | 0 | | | | |
| ESF200 | Information Literacy | 1 | | 0 | | | | |
| FCH360 | Physical Chemistry I | 3 | | 0 | | | | |
| PSE132 | PSE Orientation Seminar | 1 | | 0 | | | | |
| PSE370 | Principles of Mass & Energy Balance | 3 | | 0 | | | | |
| PSE371 | Fluid Mechanics | 3 | | 0 | | | | |
| PSE300 | Introduction To Papermaking | 3 | | 0 | | | | |
| PSE302 | Pulp and Paper Laboratory Skills | 1 | | 0 | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Transfer

Printed: May 19, 2005

**UPPER DIVISION COURSE REQUIREMENTS**

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Junior Year - Fall Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | ESF Semester | ESF Grade | Type |
| PSE361 | Engineering Thermodynamics | 3 | | 0 | | | | |
| **Junior Year - Spring Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | ESF Semester | ESF Grade | Type |
| FCH361 | Physical Chemistry II | 3 | | 0 | | | | |
| WPE386 | Structure & Properties of Wood | 2 | | 0 | | | | |
| WPE390 | Fiber Identification Lab | 1 | | 0 | | | | |
| PSE350 | Pulping and Bleaching Processes | 3 | | 0 | | | | |
| PSE351 | Pulping and Bleaching Lab | 2 | | 0 | | | | |
| PSE372 | Heat Transfer | 3 | | 0 | | | | |
| PSE480 | Engr Design Economics | 3 | | 0 | | | | |
| **Junior Year - Summer Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | ESF Semester | ESF Grade | Type |
| PSE304 | Mill Experience | 2 | | 0 | | | | |
| **Senior Year - Fall Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | ESF Semester | ESF Grade | Type |
| PSE465 | Paper Properties | 4 | | 0 | | | | |
| PSE473 | Mass Transfer | 3 | | 0 | | | | |
| ERE223 | Statics and Dynamics | 4 | | 0 | | | | |
| PSE477 | Process Control | 3 | | 0 | | | | |
| PSE481 | Proc/Plant Design II:Synthesis | 3 | | 0 | | | | |
| **Senior Year - Spring Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | ESF Semester | ESF Grade | Type |
| PSE467 | Papermaking Wetend Chemistry | 3 | | 0 | | | | |
| PSE466 | Paper Coating & Converting | 2 | | 0 | | | | |
| PSE468 | Papermaking Processes | 3 | | 0 | | | | |
| APM395 | Probability & Statistics for Engineers | 3 | | 0 | | | | |
| ERE440 | Water Pollution Engineering | 3 | | 0 | | | | |
| ELE231 | Electrical Eng. Fundamentals I | 3 | | 0 | | | | |
| | or | | | | | | | |
| ERE362 | Mechanics of Materials * | 3 | | 0 | | | | |

SUMMARIES

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Transfer

Printed: May 19, 2005

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 67 | Required: | 73 | Required: | 140 |
| Earned: | 0 | Earned: | 0 | Earned: | 0 |
| In Progress: | 0 | In Progress: | 0 | In Progress: | 0 |
| Deficient: | 67 | Deficient: | 73 | Deficient: | 140 |

**UPPER DIVISION FOOTNOTES**

(*) Student must take 1 of the following:

ELE 231 Electrical Science I 3

ELE 362 Mechanics of Materials 3

(Students taking ELE 231 are strongly encouraged to also take ELE 394)

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Transfer

Printed: May 19, 2005

**General Educational Requirements**

You must complete one course per knowledge and skill area. Bold indicates course completed or in progress.

| Area | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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** | | | | | | | |
| | EST201 | USHIS1 | USHIS2 | | FOR204 | | |
| | EST361 | | | | | | |
| **WESTERN CIVILIZATION** | | | | | | | |
| | EIN471 | FOR203 | EURHIS1 | | EURHIS2 | | |
| **OTHER WORLD CIVILIZATIONS** | | | | | | | |
| | EST200 | | | | | | |
| **HUMANITIES** | | | | | | | |
| | CLL290 | LANCOM1 | LITCOMP | | | | |
| **THE ARTS** | | | | | | | |
| | EFB215 | EIN205 | EIN206 | | LSA182 | | |
| | ARTHIS1 | MUSTH1 | ARTHIS2 | | MUSTH2 | | |
| **BASIC COMMUNICATION** | | | | | | | |
| | CLL190 | | | | | | |

American History - EIN 371, EST 361, and ETS 116 are only for students scoring above 84 on the U.S. History Regents examination.

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered Fall 2005 as a Transfer

Printed: May 19, 2005

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 requirements are split between lower and upper division, and the "summaries" display the total credit hours required, earned, and deficient in each division.

"ID" refers to the Course ID, which may 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 received.

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

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

This report has been prepared to assist you in determining your academic progess at ESF. If this report does not appear to be accurate, contact your academic advisor and bring this report with you. Please be advised final confirmation that you have met all degree requirements is subect 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:Paper Engineering
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES

EARNED COURSES

### Freshman Year - Fall Semester

| ID | Name | Credits |
|---|---|---|
| FCH150 | General Chemistry Lec I | 3 |
| FCH151 | General Chemistry Lab I | 1 |
| MAT295 | Calculus I | 4 |
| CLL190 | Writing And The Environment | 3 |
| PSE132 | Orientation Seminar: PSE | 1 |
| GENEDU | General Education Elective | 6 |
| GENEDU | General Education Elective | |

| Transfer | | | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |
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### Freshman Year - Spring Semester

| ID | Name | Credits |
|---|---|---|
| PHY211 | Physics I | 3 |
| PHY221 | Physics Lab I | 1 |
| FCH152 | General Chemistry II | 3 |
| FCH153 | General Chemistry II Lab | 1 |
| MAT296 | Calculus II | 4 |
| APM153 | Computing Methods | 3 |
| FOR207 | Introduction To Economics | 3 |

| Transfer | | | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |
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### Sophomore Year - Fall Semester

| ID | Name | Credits |
|---|---|---|
| PSE370 | Prin Mass/Energy Balance | 3 |
| FCH221 | Organic Chemistry I | 3 |
| FCH222 | Organic Chemistry Lab 1 | 1 |
| MAT397 | Calculus III | 4 |
| PSE302 | Pulp and Paper Laboratory Skills | 1 |
| PSE300 | Introduction to Papermaking | 3 |
| ERE225 | Engineering Graphics | 1 |
| GENEDU | General Education Elective | 3 |

| Transfer | | | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |
| | | | | | |
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Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sophomore Year - Spring Semester** | | | | | Transfer | | ESF | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CLL290 | Writing, Humanities & Envrn | 3 | | | | | | |
| FCH223 | Organic Chemistry II | 3 | | | | | | |
| FCH224 | Organic Chemistry Lab II | 1 | | | | | | |
| PHY212 | General Physics II | 3 | | | | | | |
| PHY222 | General Physics Lab II | 1 | | | | | | |
| APM485 | Differential Equations | 3 | | | | | | |
| PSE361 | Engr Thermodynamics | 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** | | | | | Transfer | | ESF | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| FCH360 | Physical Chemistry I | 3 | | | | | | |
| PSE371 | Fluid Mechanics | 3 | | | | | | |
| CLL405 | Writing for Science Professionals | 2 | | | | | | |
| ESF200 | Information Literacy | 1 | | | | | | |
| FCH380 | Analytical Chemistry I | 3 | | | | | | |
| ERE440 | Water Pollution Engineering | 3 | | | | | | |
| ELECT | Elective * | 3 | | | | | | |
| **Junior Year - Spring Semester** | | | | | Transfer | | ESF | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| BPE335 | Transport Phenomena | 3 | | | | | | |
| WPE386 | Structure & Properties of Wood | 2 | | | | | | |
| WPE390 | Fiber Identification Lab | 1 | | | | | | |
| PSE350 | Pulping and Bleaching Processes | 3 | | | | | | |
| PSE351 | Pulp & Bleach Laboratory | 2 | | | | | | |
| PSE480 | Engr Design Economics | 3 | | | | | | |
| GENEDU | General Education Elective | 3 | | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Junior Year - Summer Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE304 | Mill Experience | 2 | | | | | | |
| **Senior Year - Fall Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE436 | Pulp and Paper Unit Operations | 3 | | | | | | |
| PSE465 | Paper Properties | 4 | | | | | | |
| PSE481 | Proc/Plant Design II:Synthes | 3 | | | | | | |
| ELECT | Elective * | 6 | | | | | | |
| ELECT | Elective * | | | | | | | |
| **Senior Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE468 | Papermaking Processes | 3 | | | | | | |
| APM395 | Probability & Stats/Engr | 3 | | | | | | |
| ELECT | Elective * | 9 | | | | | | |
| ELECT | Elective * | | | | | | | |
| ELECT | Elective * | | | | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 72 | Required: | 68 | Required: | 140 |
| Earned: | | Earned: | | Earned: | |
| In Progess: | | In Progess: | | In Progess: | |
| Deficient: | | Deficient: | | Deficient: | |

## UPPER DIVISION FOOTNOTES

* Electives
Science Directed Electives ( 6 Credits)
Engineering Directed Electives ( 12 Credits)

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

Program Specific Options

| | Name | Credits | Transfer College | Sem | Grade | Type |
|---|---|---|---|---|---|---|
| ***Science Directed Electives ( 6 Credits)*** | | | | | | |
| FCH361 | PSE466 | PSE467 | | | | |
| ***Engineering Directed Electives ( 12 Credits)*** | | | | | | |
| ELE231 | ERE232 | ERE362 | | | ERE441 | |
| PSE477 | | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

**General Educational Requirements**

You must complete one course per category.

| Categories | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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:Paper Engineering Printed: May 9, 2006
Advisor:
Entered: 2006 as a Freshman

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:Paper Engineering
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CHEM1 | General Chemistry w/Lab I | 4 | | | | | | |
| CHEM2 | General Chemistry w/Lab II | 4 | | | | | | |
| ORCHM1 | Organic Chemistry w/Lab I | 4 | | | | | | |
| ORCHM2 | Organic Chemistry w/Lab II | 4 | | | | | | |
| QUANT | Quantitative Analysis | 3 | | | | | | |
| PHYS1 | Physics w/Lab I | 4 | | | | | | |
| PHYS2 | Physics w/Lab II | 4 | | | | | | |
| CALC1 | Calculus I | 4 | | | | | | |
| CALC2 | Calculus II | 4 | | | | | | |
| CALC3 | Calculus III | 4 | | | | | | |
| DIFEQ | Differential Equations | 3 | | | | | | |
| COMSCI | Computer Science | 3 | | | | | | |
| ECON | Economics | 3 | | | | | | |
| COMP1 | English with a Focus on Writing | 3 | | | | | | |
| COMP2 | Literature with a Focus on Writing | 3 | | | | | | |
| ENGDRW | Engineering Graphics | 1 | | | | | | |
| WESCIV | Western Civilization | 3 | | | | | | |
| AMHIST | American History | 3 | | | | | | |
| OWDCIV | Other World Civilization | 3 | | | | | | |
| THEART | The Arts | 3 | | | | | | |

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:Paper Engineering
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

**UPPER DIVISION COURSE REQUIREMENTS**

REQUIRED COURSES

**Junior Year - Fall Semester**

| ID | Name | Credits |
|---|---|---|
| CLL405 | Writing for Science Professionals | 2 |
| ESF200 | Information Literacy | 1 |
| FCH360 | Physical Chemistry I | 3 |
| PSE132 | PSE Orientation Seminar | 1 |
| PSE370 | Principles of Mass & Energy Balance | 3 |
| PSE371 | Fluid Mechanics | 3 |
| PSE300 | Introduction To Papermaking | 3 |
| PSE302 | Pulp and Paper Laboratory Skills | 1 |
| PSE361 | Engineering Thermodynamics | 3 |

**Junior Year - Spring Semester**

| ID | Name | Credits |
|---|---|---|
| BPE335 | Trasport Phenomena | 3 |
| WPE386 | Structure & Properties of Wood | 2 |
| WPE390 | Fiber Identification Lab | 1 |
| PSE350 | Pulping and Bleaching Processes | 3 |
| PSE351 | Pulping and Bleaching Lab | 2 |
| PSE480 | Engr Design Economics | 3 |
| ELECT | Elective * | 3 |

**Junior Year - Summer Semester**

| ID | Name | Credits |
|---|---|---|
| PSE304 | Mill Experience | 2 |

**Senior Year - Fall Semester**

| ID | Name | Credits |
|---|---|---|
| PSE436 | Pulp and Paper Unit Operations | 3 |
| PSE465 | Paper Properties | 4 |
| PSE481 | Proc/Plant Design II:Synthesis | 3 |
| ELECT | Elective * | 6 |
| ELECT | Elective * | |

EARNED COURSES

| ID | Credits | Transfer College | ESF Semester | ESF Grade | ESF Type |
|---|---|---|---|---|---|
| | | | | | |
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| ID | Credits | Transfer College | ESF Semester | ESF Grade | ESF Type |
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| ID | Credits | Transfer College | ESF Semester | ESF Grade | ESF Type |
|---|---|---|---|---|---|
| | | | | | |

| ID | Credits | Transfer College | ESF Semester | ESF Grade | ESF Type |
|---|---|---|---|---|---|
| | | | | | |
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Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Senior Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE468 | Papermaking Processes | 3 | | | | | | |
| APM395 | Probability & Statistics for Engineers | 3 | | | | | | |
| ERE440 | Water Pollution Engineering | 3 | | | | | | |
| ELECT | Elective * | 9 | | | | | | |
| ELECT | Elective * | | | | | | | |
| ELECT | Elective * | | | | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 67 | Required: | 73 | Required: | 140 |
| Earned: | | Earned: | | Earned: | |
| In Progess: | | In Progess: | | In Progess: | |
| Deficient: | | Deficient: | | Deficient: | |

## UPPER DIVISION FOOTNOTES

* Electives
Science Directed Electives ( 6 Credits)
Engineering Directed Electives ( 12 Credits)

Program Specific Options

| Name | Credits | Transfer College | Sem | Grade | Type |
|---|---|---|---|---|---|
| ***Science Directed Electives ( 6 Credits)*** | | | | | |
| FCH361 | PSE466 | PSE467 | | | |
| ***Engineering Directed Electives ( 12 Credits)*** | | | | | |
| ELE231 | ERE232 | ERE362 | | ERE441 | |
| PSE477 | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Engineering
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

**General Educational Requirements**

You must complete one course per category.

| Categories | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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:Paper Engineering Printed: May 9, 2006
Advisor:
Entered: 2006 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

Program of Study:Paper Science
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| **Freshman Year - Fall Semester** | | | | | | | | |
| FCH150 | General Chemistry Lec I | 3 | | 0 | | | | |
| FCH151 | General Chemistry Lab I | 1 | | 0 | | | | |
| MAT295 | Calculus I | 4 | | 0 | | | | |
| CLL190 | Writing And The Environment | 3 | | 0 | | | | |
| PSE132 | Orientation Seminar: PSE | 1 | | 0 | | | | |
| GENEDU | General Education Elective | 6 | | 0 | | | | |
| GENEDU | General Education Elective | | | 0 | | | | |
| **Freshman Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PHY211 | Physics I | 3 | | 0 | | | | |
| PHY221 | Physics Lab I | 1 | | 0 | | | | |
| FCH152 | General Chemistry II | 3 | | 0 | | | | |
| FCH153 | General Chemistry II Lab | 1 | | 0 | | | | |
| MAT296 | Calculus II | 4 | | 0 | | | | |
| APM153 | Computing Methods | 3 | | 0 | | | | |
| GENEDU | General Education Elective | 3 | | 0 | | | | |
| **Sophomore Year - Fall Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE370 | Prin Mass/Energy Balance | 3 | | 0 | | | | |
| FCH221 | Organic Chemistry I | 3 | | 0 | | | | |
| FCH222 | Organic Chemistry Lab 1 | 1 | | 0 | | | | |
| MAT397 | Calculus III | 4 | | 0 | | | | |
| PSE302 | Pulp and Paper Laboratory Skills | 1 | | 0 | | | | |
| PSE300 | Introduction to Papermaking | 3 | | 0 | | | | |
| FOR207 | Introduction To Economics | 3 | | 0 | | | | |
| ERE225 | Engineering Graphics | 1 | | 0 | | | | |
| **Sophomore Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CLL290 | Writing, Humanities & Envrn | 3 | | 0 | | | | |
| FCH223 | Organic Chemistry II | 3 | | 0 | | | | |
| FCH224 | Organic Chemistry Lab II | 1 | | 0 | | | | |
| PHY212 | General Physics II | 3 | | 0 | | | | |
| PHY222 | General Physics Lab II | 1 | | 0 | | | | |
| APM485 | Differential Equations | 3 | | 0 | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Sophomore Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type | |
| GENEDU General Education Elective | 3 | | 0 | | | | | |

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

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Junior Year - Fall Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type | |
| FCH360 Physical Chemistry I | 3 | | 0 | | | | | |
| PSE371 Fluid Mechanics | 3 | | 0 | | | | | |
| CLL405 Writing for Science Professionals | 2 | | 0 | | | | | |
| ESF200 Information Literacy | 1 | | 0 | | | | | |
| FCH380 Analytical Chemistry I | 3 | | 0 | | | | | |
| ELECT Technical Elective * | 3 | | 0 | | | | | |
| **Junior Year - Spring Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type | |
| FCH361 Physical Chemistry II | 3 | | 0 | | | | | |
| WPE386 Structure & Properties of Wood | 2 | | 0 | | | | | |
| WPE390 Fiber Identification Lab | 1 | | 0 | | | | | |
| PSE372 Heat Transfer | 3 | | 0 | | | | | |
| PSE350 Pulping and Bleaching Processes | 3 | | 0 | | | | | |
| PSE351 Pulpnig and Bleaching Laboratory | 2 | | 0 | | | | | |
| **Junior Year - Summer Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type | |
| PSE304 Mill Experience | 2 | | 0 | | | | | |
| **Senior Year - Fall Semester** | | | | | | | | |
| | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | ID | Credits | College | Semester | Grade | Type | |
| PSE465 Paper Properties | 4 | | 0 | | | | | |
| PSE473 Mass Transfer | 3 | | 0 | | | | | |
| PSE477 Process Control | 3 | | 0 | | | | | |
| ELECT Technical Elective * | 6 | | 0 | | | | | |
| ELECT Technical Elective * | | | 0 | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

**UPPER DIVISION COURSE REQUIREMENTS**

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Senior Year - Spring Semester** | | | | | | | | |
| ID | Name | Credits | ID | Credits | Transfer College | - - - ESF - - Semester | Grade | Type |
| PSE466 | Paper Coating & Converting | 2 | _____ | 0 | | | | |
| PSE468 | Papermaking Processes | 3 | _____ | 0 | | | | |
| ERE440 | Water Pollution Engineering | 3 | _____ | 0 | | | | |
| PSE467 | Wet End Chemistry | 3 | _____ | 0 | | | | |
| ELECT | Technical Elective * | 3 | _____ | 0 | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 72 | Required: | 61 | Required: | 133 |
| Earned: | 0 | Earned: | 0 | Earned: | 0 |
| In Progress: | 0 | In Progress: | 0 | In Progress: | 0 |
| Deficient: | 72 | Deficient: | 61 | Deficient: | 133 |

**UPPER DIVISION FOOTNOTES**

(*) At least 9 credit hours of electives must be selected from an advisor-approved sequence of technical courses. Examples of acceptable elective concentration areas are shown below.

Colloid and Surface Chemistry Instrumental Analysis
Polymer Chemistry Pollution Abatement
Applied Mathematics Computer Modeling
Management Mechanics
Engineering Design Materials Science
Independent Research Project

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

**General Educational Requirements**

You must complete one course per knowledge and skill area. Bold indicates course completed or in progress.

| Area | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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** | | | | | | | |
| | EST201 | USHIS1 | USHIS2 | | FOR204 | | |
| | EST361 | | | | | | |
| **WESTERN CIVILIZATION** | | | | | | | |
| | EIN471 | FOR203 | EURHIS1 | | EURHIS2 | | |
| **OTHER WORLD CIVILIZATIONS** | | | | | | | |
| | EST200 | | | | | | |
| **HUMANITIES** | | | | | | | |
| | CLL290 | LANCOM1 | LITCOMP | | | | |
| **THE ARTS** | | | | | | | |
| | EFB215 | EIN205 | EIN206 | | LSA182 | | |
| | ARTHIS1 | MUSTH1 | ARTHIS2 | | MUSTH2 | | |
| **BASIC COMMUNICATION** | | | | | | | |
| | CLL190 | | | | | | |

American History - EIN 371, EST 361, and ETS 116 are only for students scoring above 84 on the U.S. History Regents examination.

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered Fall 2005 as a Freshman

Printed: May 19, 2005

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 requirements are split between lower and upper division, and the "summaries" display the total credit hours required, earned, and deficient in each division.

"ID" refers to the Course ID, which may 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 received.

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

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

This report has been prepared to assist you in determining your academic progess at ESF. If this report does not appear to be accurate, contact your academic advisor and bring this report with you. Please be advised final confirmation that you have met all degree requirements is subect 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:PSE Science Option
Advisor:
Entered: 2003 as a Transfer

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CHEM1 | General Chemistry w/Lab I | 4 | | | | | | |
| CHEM2 | General Chemistry w/Lab II | 4 | | | | | | |
| ORCHM1 | Organic Chemistry w/Lab I | 4 | | | | | | |
| ORCHM2 | Organic Chemistry w/Lab II | 4 | | | | | | |
| QUANT | Quantitative Analysis | 3 | | | | | | |
| PHYS1 | Physics w/Lab I | 4 | | | | | | |
| PHYS2 | Physics w/Lab II | 4 | | | | | | |
| CALC1 | Calculus I | 4 | | | | | | |
| CALC2 | Calculus II | 4 | | | | | | |
| CALC3 | Calculus III | 4 | | | | | | |
| DIFEQ | Differential Equations | 3 | | | | | | |
| COMSCI | Computer Science | 3 | | | | | | |
| ECON | Economics | 3 | | | | | | |
| COMP1 | English with a Focus on Writing | 3 | | | | | | |
| COMP2 | Literature with a Focus on Writing | 3 | | | | | | |
| ENGDRW | Engineering Graphics | 1 | | | | | | |
| WESCIV | Western Civilization | 3 | | | | | | |
| AMHIST | American History | 3 | | | | | | |
| OWDCIV | Other World Civilization | 3 | | | | | | |
| THEART | The Arts | 3 | | | | | | |

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:PSE Science Option
Advisor:
Entered: 2003 as a Transfer

Printed: May 9, 2006

**UPPER DIVISION COURSE REQUIREMENTS**

REQUIRED COURSES

**Junior Year - Fall Semester**

| ID | Name | Credits |
|---|---|---|
| CLL405 | Writing for Science Professionals | 2 |
| ESF200 | Information Literacy | 1 |
| FCH360 | Physical Chemistry I | 3 |
| PSE132 | PSE Orientation Seminar | 1 |
| PSE370 | Principles of Mass & Energy Balance | 3 |
| PSE371 | Fluid Mechanics | 3 |
| PSE300 | Introduction To Papermaking | 3 |
| PSE302 | Pulp and Paper Laboratory Skills | 1 |

**Junior Year - Spring Semester**

| ID | Name | Credits |
|---|---|---|
| FCH361 | Physical Chemistry II | 3 |
| WPE386 | Structure & Properties of Wood | 2 |
| WPE390 | Fiber Identification Lab | 1 |
| PSE350 | Pulping and Bleaching Processes | 3 |
| PSE351 | Pulping and Bleaching Lab | 2 |
| PSE372 | Heat Transfer | 3 |
| ELECT | Technical Elective * | 3 |

**Junior Year - Summer Semester**

| ID | Name | Credits |
|---|---|---|
| PSE304 | Mill Experience | 2 |

**Senior Year - Fall Semester**

| ID | Name | Credits |
|---|---|---|
| PSE465 | Paper Properties | 4 |
| PSE473 | Mass Transfer | 3 |
| PSE477 | Process Control | 3 |
| ELECT | Technical Electives * | 6 |
| ELECT | Technical Electives * | |

EARNED COURSES

| | | Transfer | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |

| | | Transfer | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |

| | | Transfer | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |

| | | Transfer | - - - ESF - - | | |
|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | Type |

Curriculum Plan Sheet continued on next page

Program of Study:PSE Science Option
Advisor:
Entered: 2003 as a Transfer

Printed: May 9, 2006

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Senior Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE467 | Papermaking Wet End Chemistry | 3 | | | | | | |
| PSE466 | Paper Coating & Converting | 2 | | | | | | |
| PSE468 | Papermaking Processes | 3 | | | | | | |
| ERE440 | Water Pollution Engineering | 3 | | | | | | |
| ELECT | Technical Electives * | 3 | | | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 67 | Required: | 66 | Required: | 133 |
| Earned: | | Earned: | | Earned: | |
| In Progess: | | In Progess: | | In Progess: | |
| Deficient: | | Deficient: | | Deficient: | |

## UPPER DIVISION FOOTNOTES

(*) At least 9 credit hours of electives must be selected from an advisor-approved sequence of technical courses. Examples of acceptable elective concentration areas are shown below.

Colloid and Surface Chemistry Instrumental Analysis
Polymer Chemistry Pollution Abatement
Applied Mathematics Computer Modeling
Management Mechanics
Engineering Design Materials Science
Independent Research Project

Curriculum Plan Sheet continued on next page

Program of Study:PSE Science Option
Advisor:
Entered: 2003 as a Transfer

Printed: May 9, 2006

**General Educational Requirements**

You must complete one course per category.

| Categories | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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:** | | | | | | | |
| EST296A | USHIS1 | USHIS2 | | | FOR296A | | |
| **For students scoring above 84 on the US History Regents:** | | | | | | | |
| EST361 | | | | | | | |
| **WESTERN CIVILIZATION** | | | | | | | |
| EIN471 | FOR203 | EURHIS1 | | | EURHIS2 | | |
| **OTHER WORLD CIVILIZATIONS** | | | | | | | |
| EST200 | | | | | | | |
| **HUMANITIES** | | | | | | | |
| CLL290 | LANCOM1 | LANCOM2 | | | LITCOMP | | |
| **THE ARTS** | | | | | | | |
| EFB296A | EIN205 | EIN206 | | | LSA182 | | |
| ARTHIS1 | MUSTH1 | ARTHIS2 | | | MUSTH2 | | |
| **BASIC COMMUNICATION** | | | | | | | |
| CLL190 | | | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:PSE Science Option Printed: May 9, 2006
Advisor:
Entered: 2003 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

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Freshman Year - Fall Semester** | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | | ID | Credits | College | Semester | Grade | Type |
| FCH150 General Chemistry Lec I | 3 | | | | | | | |
| FCH151 General Chemistry Lab I | 1 | | | | | | | |
| MAT295 Calculus I | 4 | | | | | | | |
| CLL190 Writing And The Environment | 3 | | | | | | | |
| PSE132 Orientation Seminar: PSE | 1 | | | | | | | |
| GENEDU General Education Elective | 6 | | | | | | | |
| GENEDU General Education Elective | | | | | | | | |
| **Freshman Year - Spring Semester** | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | | ID | Credits | College | Semester | Grade | Type |
| PHY211 Physics I | 3 | | | | | | | |
| PHY221 Physics Lab I | 1 | | | | | | | |
| FCH152 General Chemistry II | 3 | | | | | | | |
| FCH153 General Chemistry II Lab | 1 | | | | | | | |
| MAT296 Calculus II | 4 | | | | | | | |
| APM153 Computing Methods | 3 | | | | | | | |
| FOR207 Introduction To Economics | 3 | | | | | | | |
| **Sophomore Year - Fall Semester** | | | | | Transfer | - - - ESF - - | | |
| ID Name | Credits | | ID | Credits | College | Semester | Grade | Type |
| PSE370 Prin Mass/Energy Balance | 3 | | | | | | | |
| FCH221 Organic Chemistry I | 3 | | | | | | | |
| FCH222 Organic Chemistry Lab I | 1 | | | | | | | |
| PSE302 Pulp and Paper Laboratory Skills | 1 | | | | | | | |
| PSE300 Introduction to Papermaking | 3 | | | | | | | |
| GENEDU General Education Elective | 3 | | | | | | | |
| ERE225 Engineering Graphics | 1 | | | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES

**Sophomore Year - Spring Semester**

| ID | Name | Credits |
|---|---|---|
| CLL290 | Writing, Humanities & Envrn | 3 |
| FCH223 | Organic Chemistry II | 3 |
| FCH224 | Organic Chemistry Lab II | 1 |
| PHY212 | General Physics II | 3 |
| PHY222 | General Physics Lab II | 1 |
| GENEDU | General Education Elective | 3 |
| ELECT | Elective | 3 |

EARNED COURSES

| | | Transfer | | | - - - ESF - - | |
|---|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | | Type |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

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

## UPPER DIVISION COURSE REQUIREMENTS

REQUIRED COURSES

**Junior Year - Fall Semester**

| ID | Name | Credits |
|---|---|---|
| FCH360 | Physical Chemistry I | 3 |
| CLL405 | Writing for Science Professionals | 2 |
| ESF200 | Information Literacy | 1 |
| FCH380 | Analytical Chemistry I | 3 |
| ELECT | Elective * | 7 |
| ELECT | Elective * | |

**Junior Year - Spring Semester**

| ID | Name | Credits |
|---|---|---|
| FCH361 | Physical Chemistry II | 3 |
| WPE386 | Structure & Properties of Wood | 2 |
| WPE390 | Fiber Identification Lab | 1 |
| PSE350 | Pulping and Bleaching Processes | 3 |
| PSE351 | Pulpnig and Bleaching Laboratory | 2 |
| ELECT | Elective * | 4 |

EARNED COURSES

| | | Transfer | | | - - - ESF - - | |
|---|---|---|---|---|---|---|
| ID | Credits | College | Semester | Grade | | Type |
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Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

**UPPER DIVISION COURSE REQUIREMENTS**

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Junior Year - Summer Semester** | | | | | Transfer | | ESF | |
| ID Name | Credits | | ID Credits | | College | Semester | Grade | Type |
| PSE304 Mill Experience | 2 | | | | | | | |
| **Senior Year - Fall Semester** | | | | | Transfer | | ESF | |
| ID Name | Credits | | ID Credits | | College | Semester | Grade | Type |
| PSE465 Paper Properties | 4 | | | | | | | |
| ELECT Elective * | 12 | | | | | | | |
| ELECT Elective * | | | | | | | | |
| ELECT Elective * | | | | | | | | |
| ELECT Elective * | | | | | | | | |
| **Senior Year - Spring Semester** | | | | | Transfer | | ESF | |
| ID Name | Credits | | ID Credits | | College | Semester | Grade | Type |
| PSE466 Paper Coating & Converting | 3 | | | | | | | |
| PSE468 Papermaking Processes | 3 | | | | | | | |
| PSE467 Wet End Chemistry | 3 | | | | | | | |
| ELECT Elective * | 6 | | | | | | | |
| ELECT Elective * | | | | | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 68 | Required: | 64 | Required: | 132 |
| Earned: | | Earned: | | Earned: | |
| In Progess: | | In Progess: | | In Progess: | |
| Deficient: | | Deficient: | | Deficient: | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Printed: May 9, 2006

Entered: 2006 as a Freshman

**UPPER DIVISION FOOTNOTES**

* Elective Courses (14 - 18 credits)

Students completing the Paper Science Program must complete 14-18 credits of technical electives in order to satisfy the graduation requirements. Courses taken to satisfy the engineering elective above cannot also be used to satisfy the technical elective requirement. This technical elective requirement can be satisfied by comleting one of the college-wide minors listed below:

- Computer and Information Technology
- Entrepreneurship
- General Management Studies
- Marketing
- Construction Management
- Bioprocess Science

Student not completing one of the listed minors must complete at least 14 credits of Faculty-approved technical electives concenetration coursework in the following areas:

- Biology
- Chemistry
- Pollution abatement
- Computer modeling
- Mechanics
- Engineering design
- Materials science
- Forestry and forest management
- Biotechnology
- Wood science
- Other Faculty-approved areas

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Freshman

Printed: May 9, 2006

**General Educational Requirements**

You must complete one course per category.

| Categories | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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:Paper Science Printed: May 9, 2006
Advisor:
Entered: 2006 as a Freshman

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:Paper Science
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

## LOWER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Transfer | - - - ESF - - | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CHEM1 | General Chemistry w/Lab I | 4 | | | | | | |
| CHEM2 | General Chemistry w/Lab II | 4 | | | | | | |
| ORCHM1 | Organic Chemistry w/Lab I | 4 | | | | | | |
| ORCHM2 | Organic Chemistry w/Lab II | 4 | | | | | | |
| QUANT | Quantitative Analysis | 3 | | | | | | |
| PHYS1 | Physics w/Lab I | 4 | | | | | | |
| PHYS2 | Physics w/Lab II | 4 | | | | | | |
| CALC1 | Calculus I | 4 | | | | | | |
| CALC2 | Calculus II | 4 | | | | | | |
| COMSCI | Computer Science | 3 | | | | | | |
| ECON | Economics | 3 | | | | | | |
| COMP1 | English with a Focus on Writing | 3 | | | | | | |
| COMP2 | Literature with a Focus on Writing | 3 | | | | | | |
| ENGDRW | Engineering Graphics | 1 | | | | | | |
| WESCIV | Western Civilization | 3 | | | | | | |
| AMHIST | American History | 3 | | | | | | |
| OWDCIV | Other World Civilization | 3 | | | | | | |
| THEART | The Arts | 3 | | | | | | |
| ELECT | Elective | 6 | | | | | | |
| ELECT | Elective | | | | | | | |

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:Paper Science
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Junior Year - Fall Semester** | | | | | Transfer - - - ESF - - | | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| CLL405 | Writing for Science Professionals | 2 | | | | | | |
| ESF200 | Information Literacy | 1 | | | | | | |
| FCH360 | Physical Chemistry I | 3 | | | | | | |
| PSE132 | PSE Orientation Seminar | 1 | | | | | | |
| PSE370 | Principles of Mass & Energy Balance | 3 | | | | | | |
| PSE300 | Introduction To Papermaking | 3 | | | | | | |
| PSE302 | Pulp and Paper Laboratory Skills | 1 | | | | | | |
| ELECT | Elective * | 3 | | | | | | |
| **Junior Year - Spring Semester** | | | | | Transfer - - - ESF - - | | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| FCH361 | Physical Chemistry II | 3 | | | | | | |
| WPE386 | Structure & Properties of Wood | 2 | | | | | | |
| WPE390 | Fiber Identification Lab | 1 | | | | | | |
| PSE350 | Pulping and Bleaching Processes | 3 | | | | | | |
| PSE351 | Pulping and Bleaching Lab | 2 | | | | | | |
| ELECT | Elective * | 4 | | | | | | |
| **Junior Year - Summer Semester** | | | | | Transfer - - - ESF - - | | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE304 | Mill Experience | 2 | | | | | | |
| **Senior Year - Fall Semester** | | | | | Transfer - - - ESF - - | | | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE465 | Paper Properties | 4 | | | | | | |
| ELECT | Electives * | 12 | | | | | | |
| ELECT | Electives * | | | | | | | |
| ELECT | Electives * | | | | | | | |
| ELECT | Electives * | | | | | | | |

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

## UPPER DIVISION COURSE REQUIREMENTS

| REQUIRED COURSES | | | EARNED COURSES | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Senior Year - Spring Semester** | | | | | Transfer | | ESF | |
| ID | Name | Credits | ID | Credits | College | Semester | Grade | Type |
| PSE467 | Papermaking Wet End Chemistry | 3 | | | | | | |
| PSE466 | Paper Coating & Converting | 3 | | | | | | |
| PSE468 | Papermaking Processes | 3 | | | | | | |
| ELECT | Electives * | 6 | | | | | | |
| ELECT | Electives * | | | | | | | |

SUMMARIES

| Lower Division Credit Hours | | Upper Division Credit Hours | | Grand Summary Credit Hours | |
|---|---|---|---|---|---|
| Required: | 66 | Required: | 66 | Required: | 132 |
| Earned: | | Earned: | | Earned: | |
| In Progess: | | In Progess: | | In Progess: | |
| Deficient: | | Deficient: | | Deficient: | |

## UPPER DIVISION FOOTNOTES

* Elective Courses (14 - 18 credits)

Students completing the Paper Science Program must complete 14-18 credits of technical electives in order to satisfy the graduation requirements. Courses taken to satisfy the engineering elective above cannot also be used to satisfy the technical elective requirement. This technical elective requirement can be satisfied by comleting one of the college-wide minors listed below:

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- Entrepreneurship
- General Management Studies
- Marketing
- Construction Management
- Bioprocess Science

Student not completing one of the listed minors must complete at least 14 credits of Faculty-approved technical electives concenetration coursework in the following areas:

- Biology
- Chemistry
- Pollution abatement
- Computer modeling
- Mechanics
- Engineering design
- Materials science
- Forestry and forest management
- Biotechnology
- Wood science
- Other Faculty-approved areas

Curriculum Plan Sheet continued on next page

Program of Study:Paper Science
Advisor:
Entered: 2006 as a Transfer

Printed: May 9, 2006

**General Educational Requirements**

You must complete one course per category.

| Categories | ID | Name | Credits | Transfer College | ESF Sem | ESF Grade | ESF 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:Paper Science Printed: May 9, 2006
Advisor:
Entered: 2006 as a Transfer

INFORMATION ON HOW TO READ THIS PLAN SHEET

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May be a combination of ESF courses and transfer courses, including advanced placement credit. The

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

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FA - Fall term
SP - Spring tem
SU - Summer term

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

## C. Course Syllabi

**APM 153. Computing Methods for Engineers and Physical Scientists (3 credit hours)**
**Cornell, J.**

Catalog Description

Introduction to programming structures: flowcharts, language statements, and subprograms. Introduction to data structures: arrays, scalars, and others. Intorduction to data codes: number and characters, "natural" and binary. Introductions to algorithms at the procedural level. Spring.

Prerequisite(s): None. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Bioprocess Engineering Paper Science

Textbook

**MATLAB Programming for Engineers**, Third Edition by Stephen J. Chapman (Brooks Cole, Thomson Learning, 2004).

Objectives

After completing this course the student should be able to:
1. To design algorithms to solve problems in mathematics and logic;
2. To convert algorithms into a program in Matlab, Excel, Visual Basic, or MathCad;
3. To properly document your solution;

Topics Covered

Students use personal computers to write programs to solve basic problems. Emphasis will be on logical skills (divising solution algorithms, drawing flowcharts, writing code, and checking solutions) and on interacting with computer operating systems. Students will learn one programming language in depth to practice basic programming syntax and techniques and a second language at a less detailed level. Students will also use electronic mail and will be introduced to other application software as applicable.

Professional Component

The skills that are learned in this class will help with the problem solving that occurs in many of your subsequent engineering classes. The course contributes in a number of differents ways to the training of engineers for professional practice. First, it introduces students to some of the mathematical and computational tools that they will need in their subsequent courses and in their careers. In addition, it trains students to be able to think logically and precisely about the solutions to problems and presenting their solutions in a clear and concise manner.

Relation to Program Outcomes (Paper Engineering)

1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [x] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [x] understand the professional and ethical responsibility of an engineer (ethics);
8. [x] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G.M. Scott
Last approved: 2/7/1991
Revised Draft: 2/7/1991

**APM 485. Differential Equations for Engineers and Scientists (3 credit hours)**

Amato, W. S.

Catalog Description

First and second order ordinary differential equations, matrix algebra, eigen values and eigen vectors, linear systems of ordinary differential equations, numerical solution techniques and an introduction to partial differential equations. Spring.

Prerequisites: MAT 295, MAT 296, MAT 397.

Programs Requiring Course: Paper Engineering

Textbook

**Elementary Differential Equations and Boundary Value Problems** by W. E. Boyce and R. C. DiPrima, 6th Edition, John Wiley & Sons, Inc., New York (1997).

Objectives

To recognize different types of differential equations and formulate appropriate solution strategies.

Topics Covered

Classification of differential equations, first-order differential equations, second-order linear equations, Laplace transforms, systems of linear first-order equations, numerical methods.

Professional Component

APM 485 is a prerequisite for some of the later engineering courses in the Paper Engineering curriculum. The skills that are developed in this class help with the problem solving that occurs in many of subsequent engineering classes and contributes to the training of engineers for professional practice. It introduces students to some of the mathematical techniques that they will need in their subsequent courses and in their careers and also trains them to think logically and precisely about the solutions to problems.

Relation to Program Outcomes (Paper Engineering)

1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [D] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [F] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [F] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**ELE 231 Electrical Fundamentals I (3 credit hours)**

Phelps, F. W.

Course Description

Teaches an engineering method for analyzing, designing, building, and testing first order linear, dynamic, stationary circuits. The diode is the only non-linear device studied.

Prerequisite: Sophomore standing and completion of freshman math and physics requirements.

Programs that have this course as an elective: Paper Engineering

Textbook

**Electric Circuits Fundamentals** by Sergio Franco, Oxford University Press, 1995, ISBN: 0-19-513613-6

Objectives

Acquire the language and symbolism of circuit theory.
Learn to apply knowledge of basic physics to understand the behavior of current and voltage in planer circuits.
Become as mathematically rigorous as necessary.
Form and utilize a study group as an aid to efficient learning and for peer evaluation.
Understand the engineering approach to learning as a balance between mathematical modeling and physical insight.
Master the use of an electronic circuit simulator as a self evaluation tool.
Solve for unknown voltages and currents where the problem-solving process requires several steps.
Learn to use the extensive materials stored on the website as a self-testing tool.
Demonstrate an ability to design, build, and test real circuits in the laboratory.

Topics Covered

Behavior of resistive circuits with independent sources
Properties of basic electrical signals ; average and rms measures
I vs. V curves, circuit theorems, diode properties
Ideal transformers, simple power supplies
Dependent sources and operational amplifiers
First-order time-domain analysis of circuits with energy storage elements; transient, steady-state, and total response
Step and impulse response
Signal generators for common electrical signals
AC analysis, circuit response to single and multiple frequencies
Analysis and design of simple filters

Professional Component

ELE 231 teaches the fundamentals of electrical engineering a knowledge of which is very important in order to function efficiently in the environment of modern pulp and paper mills that have highly sophisticated machinery and advanced control systems.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**ERE 440. Water Pollution Engineering (3 credit hours)**
**Chatterjee, S.G.**

Catalog Description
Two hours of lecture and three hours of laboratory. Introduction to the physical, chemical and biological parameters of wastewater treatment processes and to the principles of the unit operations involved. Study of the design parameters and design procedures of wastewater treatment systems. Spring.

Prerequisite (s): PHY 211, PHY 212 Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering

Textbook
**Wastewater Engineering: Treatment, Disposal, and Reuse,** 4th edition
Metcalf & Eddy, McGraw-Hill, New York (2003)

Objectives
The goal of the course is to study the fundamental principles and engineering techniques for the treatment of wastewater.

Topics Covered
Overview of wastewater treatment
Sources and estimation of wastwater flowrates
Characteristics of wastewater
Unit operations
Reactor design
Biological growth kinetics
Biological reactors (aerated lagoon, activated sludge)
Visit to wastewater treatment facility

Professional Component
ERE 440 introduces the students to the primary and secondary treatment operations of wastewater. Such facilities are common in pulp and paper mills, which generate a large volume of effluent that needs to be adequately treated before release into the environment.

Relation to Program Outcomes (Paper Engineering)
1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**ERE 441. Air Pollution Engineering (3 credit hours)**
**Chatterjee, S.G.**

Catalog Description
Three hours of lecture and discussion. Study of the chemical, physical and meteorological principles of air pollution and its control. Local and global effects of air pollution. The atmospheric survey. Examination of the operating principles and design parameters of the various air pollution control systems. Air quality and emission standards. Fall.

Prerequisites: FCH 360, MAT 397, PSE 371.

Textbook

**Air Pollution Control - A Design Approach, 3rd edition, C. David Cooper and F. C. Alley, , Waveland Press, Prospect Heights, Illinois (2002).**

Objectives
The goal of the course is to study the fundamental principles of air pollution and the engineering and applied science concepts relevant to it.

Topics Covered
Overview of Air Pollution - introduction, types of pollutants, air quality standards, Clean Air Act, sources and effects of air pollution, global warming, stratospheric ozone depletion
Air Pollution and Meteorology - atmospheric physics, atmospheric chemistry (smog formation)
Atmospheric Dispersion Modeling - Gaussian plume model, fixed-box model
Air Pollution Control Devices - gravity settler, cyclone, electrostatic precipitator, fabric filter, gas adsorber, gas absorber, biofilter

Professional Component
ERE 441 introduces the elements of air pollution engineering, which knowledge is important in the operation of modern pulp and paper mills.

Relation to Program Outcomes (Paper Engineering)
1. [ ] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**FCH 150. General Chemistry I (3 credit hours)**

Teece, M. A.

Catalog Description

Three hours of lecture. This first semester general chemistry course is organized around the physical and chemical properties of matter. It introduces the atomic structure of elements, the kinds of bonds in chemical compounds, how atomic ratios in molecules form the basis for the stoichiometry of reactions, thermodynamics and discusses the principles of chemical reactivity. Fall.

Prerequisite: None.

Programs Requiring Course: Paper Engineering

Textbook

**Chemistry: The Science in Context** by Gilbert, Kirss , and Davies. 1st Edition, Norton Publishers ISBN 0-393-97531-2.

Objectives

Learn fundamental chemical concepts and principles.
Develop analytical skills.
Develop problem-solving skills.
Understand the essential role of chemistry in different disciplines.
Prepare the student for future science courses in chemistry, biology and engineering.

Topics Covered

Topics of FCH150 include Periodic Table, Lewis structures and polarity, intermolecular forces, chemistry of carbon, fats, polymers, natural products, thermodynamics, water, metals, and atmospheric chemistry.

Professional Component

FCH 150 is a chemistry course that prepares the student for PSE 350 (Pulping and Bleaching Processes) which is a fundamental subject related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [ ] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**FCH 151. General Chemistry Laboratory I (3 credit hours)**
Baird, A.

Catalog Description
Three hours of laboratory. Basic laboratory techniques will be emphasized through experiments dealing with: the density of solids and liquids, atomic ratios and mass combining ratios, atomic structure and the periodic table, calorimetry, chemical reactivity, geometric structure of molecules, formation of coordination compounds, and paper chromatography. Fall.

Prerequisite: FCH 150.

Programs Requiring Course: Paper Engineering

## Required Materials

FCH151 Lab Manual (available for purchase at the ESF BOOK FAIR)
Safety Goggles (available for purchase through INSTRUCTIONAL SUPPORT)
Lab Notebook (refer to page 6 of the lab manual for specific details)
Calculator

Objectives
This is the laboratory component of FCH 150 (General Chemistry Lecture I).

Topics Covered
EXP #1 – Introduction to Lab Techniques
EXP #2 – Solution Preparation
EXP #3 – Intermolecular Forces
EXP #4 – Molecular Models
EXP #5 – Preparation of Esters
EXP #6 – Formation of Polymers
EXP #7 – Synthesis of Aspirin
EXP #8 – Exothermic *vs*. Endothermic Reactions
EXP #9 – Acid Neutralizing Capacity
EXP #10 – Copper Patina
EXP #11 – Sunscreens

Professional Component
FCH 151 is a laboratory chemistry course that prepares the student for PSE 351 (Pulping and Bleaching Laboratory) which is a fundamental subject related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)
1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**FCH 152. General Chemistry II (3 credit hours)**

Stipanovic, A. J.

Catalog Description

Three hours of lecture. The second course in general chemistry continues the development of chemical reactivity by focusing on chemical kinetics and chemical equilibrium. Aqueous phase processes are emphasized and are applied to precipitation and solubility equilibria, acid/base dissociation phenomena, and fundamental electrochemical reactions. Spring.

Prerequisite: FCH 150.

Programs Requiring Course: Paper Engineering

Textbook

**Chemistry: The Science in Context** by Gilbert, Kirss , and Davies. 1st Edition, Norton Publishers ISBN 0-393-97531-2.

Objectives

Learn fundamental chemical concepts and principles.
Develop analytical skills.
Develop problem-solving skills.
Understand the essential role of chemistry in different disciplines.
Prepare the student for future science courses in chemistry, biology and engineering.

Topics Covered

Specific topics of FCH152 include the properties of atmospheric gases, ionic compounds, stoichiometry and balancing equations, solutions and their properties, energy and thermochemistry, the rate of reactions (kinetics), properties of acids, bases and salts, concepts in electrochemistry, and an introduction to nuclear chemistry.

Professional Component

FCH 152 is a chemistry course that prepares the student for PSE 350 (Pulping and Bleaching Processes) which is a fundamental subject related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [ ] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/2006

**FCH 153. General Chemistry Laboratory II (3 credit hours)**
Baird, A.

Catalog Description
Three hours of laboratory. Concepts of chemical kinetics and equilibrium processes will be reinforced through experiments in: titrimetric analyses, determinations of Ka and Ksp values, investi-gation of rate constants and reaction orders, buffer preparations, oxidation/reduction reactions and qualitative analyses. Spring.

Prerequisites: FCH 150, FCH 151. Co-requisite: FCH 152.

Programs Requiring Course: Paper Engineering

## Required Materials

Safety Goggles (available for purchase through INSTRUCTIONAL SUPPORT)
Lab Notebook
Calculator

Objectives
This is the laboratory component of FCH 152 (General Chemistry Lecture II).

Topics Covered
EXP #1 – Generating Hydrogen Gas
EXP #2 – Molar Mass of a Volatile Liquid
EXP #3 – Group Trends of the Periodic Table
EXP #4 – Determination of a Chemical Formula
EXP #5 – Acids, Bases, and Salts
EXP #6 – Acid/Base Titration
EXP #7 – Freezing Point Depression
EXP #8 – Nuclear Chemistry
EXP #9 – Calorimetry
EXP #10 – Chemical Kinetics
EXP #11 – Chemical Equilibrium
EXP #12 – Electrochemistry

Professional Component
FCH 153 is a laboratory chemistry course that prepares the student for PSE 351 (Pulping and Bleaching Laboratory) which is a fundamental subject related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)
1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/17/200

# FCH 360. Physical Chemistry I (3 credit hours)

Chatterjee, A. P.

Catalog Description

Three hours of lecture. Includes discussion on the properties of gases and liquids, laws of thermodynamics, solutions and colligative properties, and electrochemical cells. Fall.

Prerequisite: One year of college physics, differential and integral calculus.

Programs Requiring Course: Paper Engineering

Textbook

**Physical Chemistry** by P.W. Atkins, 7th Edition, W H Freeman & Co, 2001.

Objectives

To cover the thermodynamics of simple systems and of mixtures.

Topics Covered

Ideal Gases, Kinetic Theory of Gases, Real Gases, First Law of Thermodynamics: Heat, Work, and Energy, Work of Expansion and Heat Transfer, Adiabatic Processes and Enthalpy, Thermochemistry and Hess's Law, State Functions, Concept of Entropy, Second Law of Thermodynamics, Calculations of the Entropy Change, Temperature dependence of Entropy and the Third Law of Thermodynamics, Helmholtz and Gibbs Free Energies, Combined First and Second Laws, Maxwell Relations, Pressure and Temperature Dependence of the Free Energy, Chemical Potential, Real Gases, Fugacity, Introduction to Phase Diagrams for One-Component Systems, Responses of Phase Equilibria to Temperature and Pressure changes, Clapeyron Equation, Calculation of Phase Boundaries, Interfacial Tension, Joule-Thompson Effect, Volume Dependence of the Energy, Partial Molar Quantities, Thermodynamics of Mixing, Ideal and Real Mixtures, Raoult's and Henry's Laws, Colligative Properties, Simple Phase Diagrams, Phase Rule, One-component Phase Diagrams, Liquid-Vapor Mixture Phase Diagrams, Distillation, "Lever Rule, Liquid-liquid and Liquid-Solid Phase Equilibria, Eutectic Mixtures, Chemical Equilibria, Equilibrium Constants, Le Chatelier's Principle, Response of Equilibria to Pressure, Temperature Changes, Acid-Base Equilibria.

Professional Component

FCH 360 is a physical chemistry course that is a prerequisite of PSE 351 (Pulping and Bleaching Laboratory), which is a fundamental subject related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 6/5/2006

**FCH 361. Physical Chemistry II (3 credit hours)**
Dibble, T.

Catalog Description

Three hours of lecture. Includes discussion on electrochemistry, principles of quantum mechanics, statistical mechanics, chemical kinetics, and basic spectroscopy. Spring.

Prerequisite: FCH 360

Programs Requiring Course: Paper Engineering

Textbook

**Physical Chemistry** by P.W. Atkins, 7th Edition, W H Freeman & Co, 2001.

Objectives

To master fundamental chemical concepts within a rigorous and powerful mathematical framework.

To develop an intuition about physical and chemical processes.

To begin to integrate quantum mechanical thinking into analyses of molecular-level phenomena.

Topics Covered

Electrochemistry, Conductivity, Diffusion, Rate Laws, Elementary Reactions, Equilibria, Practical Termolecular Reactions, Collision Theory/Diffusion Control, Failures of Classical Physics, Wave-Particle Duality, Wave Function, Uncertainty Principle, Particle in a Box/Harmonic Oscillator, Tunneling, Quantum & Statistical Mechanics and Kinetics.

Professional Component

FCH 361 is a second course in physical chemistry and is a continuation of FCH 360 [which is the first physical chemistry course that is a prerequisite of PSE 351 (Pulping and Bleaching Laboratory), which is fundamental to the pulping and bleaching operations in the pulp and paper industry].

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 6/5/2006

**MAT 295. Calculus I (4 credit hours)**
Griffin, P.

Catalog Description

Analytic geometry, limits, derivatives, maxima-minima, related rates, graphs, differentials, exponential and logarithmic functions, mean-value theorem, integration.

Fall.

Prerequisites: Pre-calculus (e.g., MAT 194).

Programs Requiring Course: Paper Engineering

Textbook

**Calculus: Early Transcendentals** by J. Stewart, Edition 5e, Thomson, Brooks/Cole, 2003.

Objectives

To teach the elements of calculus to science and engineering majors, and to students in other disciplines who intend to take upper level mathematics courses.

Topics Covered

Covers concepts of functions, limits, differentiation, integration, and includes applications of these concepts such as graph sketching, optimization, linearization, and the computation of areas.

Professional Component

MAT 295 is the first of a three-semester calculus course in the Paper Engineering curriculum. It is a prerequisite for MAT 296 (Calculus II), MAT 397 (Calculus III) and APM 485 (Differential Equations). The skills developed in this class help with problem solving that occurs in many of subsequent engineering classes and contributes to the training of engineers for professional practice. It introduces students to some of the fundamental mathematical techniques that they will need in their subsequent courses and in their careers besides training them to think logically and precisely about solutions to problems.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [ ] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 6/3/2006

**MAT 296. Calculus II (4 credit hours)**
Coman, D.

Catalog Description

Integration: the definite integral and applications; trigonometric functions, methods of integration, improper integrals, L'Hospital's rule, infinite series, elementary differential equations, parametric equations, polar coordinates.

Spring.

Prerequisites: MAT 295

Programs Requiring Course: Paper Engineering

Textbook

**Calculus: Early Transcendentals** by J. Stewart, Edition 5e, Thomson, Brooks/Cole, 2003.

Objectives

To teach the elements of calculus to science and engineering majors, and to students in other majors who intend to take advanced courses in mathematics.

Topics Covered

Covers techniques of integration, applications of integration in a variety of contexts, exponential growth and decay, improper integrals, sequences and series (including power series, Taylor and Maclaurin series).

Professional Component

MAT 296 is the second of a three-semester calculus course in the Paper Engineering curriculum. It is a prerequisite for MAT 397 (Calculus III) and APM 485 (Differential Equations). The skills developed in this class help with problem solving that occurs in many of subsequent engineering classes and contributes to the training of engineers for professional practice. It introduces students to some of the fundamental mathematical techniques that they will need in their subsequent courses and in their careers besides training them to think logically and precisely about solutions to problems.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [ ] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 6/3/2006

**MAT 397. Calculus III (4 credit hours)**
Coman, D.

Catalog Description

Analytic geometry and vectors; functions of more than one variable, multiple integrals, partial differentiation, physical applications.

Fall.

Prerequisites: MAT 296

Programs Requiring Course: Paper Engineering

Textbook

**Calculus: Early Transcendentals** by J. Stewart, Edition 5e, Thomson, Brooks/Cole, 2003.

Objectives

To teach the elements of calculus to science and engineering majors, and to students in other majors who intend to take advanced courses in mathematics.

Topics Covered

Covers the concepts of vectors, vector valued functions, functions of several variables, partial derivatives and multiple integration.

Professional Component

MAT 397 is the third of a three-semester calculus course in the Paper Engineering curriculum. It is a prerequisite for APM 485 (Differential Equations). The skills developed in this class help with problem solving that occurs in many of subsequent engineering classes and contributes to the training of engineers for professional practice. It introduces students to some of the fundamental mathematical techniques that they will need in their subsequent courses and in their careers besides training them to think logically and precisely about solutions to problems.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [ ] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [ ] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] nderstand the professional and ethical responsibility of an engineer (ethics);
8. [ ] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 6/3/06

**PSE 132. Orientation Seminar: Paper Science and Engineering (1 credit hour)**
**Scott, G.M. Amidon, T.E.**

Catalog Description
Introduction to campus resources available to ensure academic success. Introduction to PSE as a field of inquiry and career path. Fall.

Prerequisite(s): None. Co-requisite(s): None
Course format: One lecture per week plus three day orientation session

Programs Requiring Course: Paper Engineering Paper Science

Textbook
None.

Objectives
After completing this course the student should be able to:
1. Understand the requirements and expectations of the PSE program and more fully understand the relationship between an education and a career.
2. Find the campus resources dedicated to helping the student achieve success in the PSE program.
3. Use the faculty and college resources in the PSE program.
4. Explain the basic aspects of the paper industry.
5. Explore the summer and co-op job opportunities that are available.
6. Discuss the ethical considerations of being an engineer.

Topics Covered
PSE 132 consists of a 1 hour per week lecture/discussion with a three day orientation session held at a field station in the Adirondacks. Students will register for this class during their first fall enrolled at ESF; however, the orientation session will be held the preceding spring (typically the end of May).

1. Introduction to the pulp and paper industry from both a technical standpoint and from the standpoint of future careers.
2. Introduction to paper and paper properties and testing.
3. Introduction to ESF curriculum, student life, college resources, etc.
4. Tours of a papermill and a forest (harvesting) operation.
5. Introduction to engineering ethics

Professional Component
PSE 132 introduces students to the paper industry, the field of engineering in general, and the resources and expectations of the educational process at SUNY-ESF. In the class, students are introduced to the accreditation process as well as the educational processes used at SUNY-ESF. The class time is also used to make the students familiar with the breadth of the research in Paper Engineering and its relation to societal needs. Engineering ethics is introduced through a video exercise and response by the students.

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [_] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [X] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [FA] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 9/16/1999
Revised Draft: 9/30/2005

**PSE 300. Introduction to Papermaking (3 credit hours)**
**Keller, D.S.**

Catalog Description

Historical and commercial consideration of the paper industry. Technology of pulping and papermaking with emphasis on a broad overview of the entire industry and curriculum. Introductory discussions of pulping, recycling, paper properties, and papermaking which is built on in subsequent PSE courses. Fall.

Prerequisite(s): None. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook

**Handbook for Pulp & Paper Technologists,** 3rd Edition
Gary A. Smook, Angus Wilde Publications, Inc., Vancouver (2002)

Objectives

After completing this course the student should be able to:
1. Have a basic knowledge and understanding of the paper industry, papermaking processes and paper grades.
2. Understand elementary paper technology and know sources of information in this area.

Topics Covered

This course covers the papermaking processes from tree harvesting to commercial products and emphasizes the differences in soft- and hardwoods and relates the industrial technologies and products to renewability, recyclability, and sustainability:
1. Paper grades and their uses.
2. Harvesting and procurement of raw materials.
3. Chemical, mechanical pulping methods, recycling and deinking.
4. Preparation of papermaking materials.
5. Paper and board machines.
6. Paper finishing operations.
7. Converting operations and trade.

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [_] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [_] well-developed written and oral communication skills (communication);
6. [X] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 9/16/1999
Revised Draft: 2/17/06

**PSE 302. Pulp and Paper Laboratory Skills (1 credit hours)**
**Burry, W.M. Keller, D.S.**

Catalog Description
Introduction to the laboratory skills necessary for subsequent PSE courses as well as necessary "survival" skills for their summer and coop work experiences. Skills covered include pulp sampling and analysis, freeness, consistency, handsheet preparation, and physical and optical testing. A demonstration run of the pilot paper machine is part of this course. Fall.

Prerequisite(s): None. Co-requisite(s): PSE 300
Course format: Three hours of laboratory per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook - none

Objectives
After completing this course the student should be able to:

1. Be able to sample and analyze pulp and paper according to industry methods.
2. Be able to perform beater curves, prepare and test handsheets, and analyze their results.
3. Understand the basic operation of the pilot scale paper machine.
4. Know how to write a concise and informative laboratory report.
5. Be able to Work in a team.

Topics Covered
PSE 302 is a skills and attitude course covering basic pulp and paper laboratory methods including beater curves, consistency, freeness, handsheet preparation, and handsheet testing. A demonstration run of the pilot paper machine is included in this course.

Professional Component
12/2/99. This action formalizes the laboratory that has been taught as part of PSE 300 for several years. 11/20/01. Health and Safety Considerations updated.

Relation to Program Outcomes (Paper Engineering)
1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [F] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [X] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 11/20/2001
Revised Draft: 2/17/06

**PSE 304. Mill Experience (2 credit hours)**
**Keller, D.S.**

Catalog Description
Twelve weeks full time pulp or paper mill employment approved by the Department between the Junior and Senior years. The student must submit a comprehensive report to fulfill this requirement. Summer.

Prerequisite(s): PSE 300, PSE 302. Co-requisite(s): None
Course format: Twelve weeks full-time pulp or paper mill employment

Programs Requiring Course: Paper Engineering Paper Science

Textbook - none

Objectives
After completing this course the student should be able to:
1. Have knowledge of the processes, equipment, methods as they are found in industry.
2. Relate his formal education to practical technology.
3. Gain practical experience which the student may use to advantage in later employment.

Topics Covered
The employment is 12 weeks duration following the Junior year. In extenuating circumstances, exceptions may be made.

Professional Component

Relation to Program Outcomes (Paper Engineering)
1. [_] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [D] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [D] understand the professional and ethical responsibility of an engineer (ethics);
8. [D] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 11/20/2001
Revised Draft: 2/17/06

**PSE 305. Co-op Experience (2 credit hours)**
**Keller, D.S.**

Catalog Description
Fall and Spring.

Prerequisite(s): PSE 300, PSE 302. Co-requisite(s): None
Course format: One semester full-time pulp or paper mill experience

Programs Requiring Course:

Textbook

Objectives
After completing this course the student should be able to:

Topics Covered

Professional Component

Relation to Program Outcomes (Paper Engineering)
1. [_] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [D] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [D] understand the professional and ethical responsibility of an engineer (ethics);
8. [D] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 11/20/2001
Revised Draft: 2/17/06

**PSE 350. Pulping and Bleaching Processes (3 credit hours)**
**Schroeder, L.R.**

Catalog Description
Technological and chemical consideration of pulping and bleaching of raw materials used in the paper industry. Includes consideration of the pulping and bleaching processes and related chemistry. Discussions of related operations, e.g. chemical recovery, are included. Spring.

Prerequisite(s): PSE 300, FCH 221, FCH 223. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook
**Handbook of Pulp and Paper Technology,** 3rd edition
Gary A. Smook, Angus Wilde Publications, Vancouver (2002)

Objectives
After completing this course the student should be able to:

1 Be knowledgeable of pulping and bleaching technology..
2. Understand the processes for pulping and bleaching of fibers.
3. Be prepared for advanced work in pulp and paper science.

Topics Covered
The course is divided into two main sections: processes for pulping woody and other fibrous materials, and processes for bleaching pulps from such materials. The technology and theory of these subjects will be covered. An introduction to the chemistry of raw material components is provided as a basis for understanding pulping and bleaching chemistry.

Professional Component
PSE 350 is one of the fundamental subjects related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)
1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 10/1/1999
Revised Draft: 5/9/2006

**PSE 351. Pulping and Bleaching Laboratory (2 credit hours)**
**Burry, W.M. Schroeder, L.R.**

Catalog Description
Discussion of: pulping and bleaching processes, effect of chemical and physical variables on the wood components and pulp properties, and the chemistry involved. Experiments in pulping, bleaching, and pulp evaluation. Spring.

Prerequisite(s): FCH 223, FCH 360. Co-requisite(s): PSE 350
Course format: One hour lecture and three hours laboratory per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook
- In-house generated laboratory manual.
- Selected topics from the series of Pulp and Paper Manufacture published by the Joint Textbook Committee of the Paper Industry and technical journals.
- TAPPI Standards used in the laboratory work.

Objectives
After completing this course the student should be able to:
1. Be familiar with pulping and bleaching laboratory methods.
2. Be able to evaluate, interpret, and present experimental data.
3. Be knowledgeable of the experimental methods for pulp evaluation.

Topics Covered
The course emphasis is on understanding pulping and bleaching processes and the evaluation of experimental results.

The experimental part of the course is divided into four major categories of work which are conducted as laboratory investigations:

1. Mechanical pulping.
2. Chemical pulping
3. Bleaching
4. Pulp evaluation

Professional Component
PSE 351, which is the laboratory component of PSE 350, is directly related to the pulping and bleaching operations in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)
1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 11/20/2001
Revised Draft: 5/9/2006

**PSE 361. Engineering Thermodynamics (3 credit hours)**
**Amato, W.S.**

Catalog Description
Principles of classical thermodynamics applied to engineering practice. First and second laws; heat effects; property functions and their correlation; physical and chemical equilibrium; solutions and mixtures; power and refrigeration cycles. Thermodynamic analysis of processes and systems via case studies and computer simulation. Spring.

Prerequisite(s): MAT 296, FCH 152, PHY 211. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Bioprocess Engineering

Textbook: Sonntag, R.E., Borgnakke, C., Van Wylen, G.J., **Fundamentals of Thermodynamics**, *6th Ed.*, John Wiley & Sons, Inc., Hoboken, N.J., 2003.

Objectives
After completing this course the student should be able to:
1. Understand the basic principles of thermodynamics normally covered in a first course in physical chemistry, with special relevance to engineering practice in the pulp and paper and related industries.
2. Know and understand the physical and chemical properties and equilibria, practically as they apply to practical devices and processes.
3. Have skills in problem analysis and solution via the methods of thermodynamics.
4. Demonstrate the relevance of thermodynamics to other engineering sciences and to the overall PSE curriculum.
5. Use thermodynamic criteria in quantitative evaluation of processes.
6. Use computer programs in applying thermodynamics to engineering calculations.

Topics Covered
PSE 361 focuses on the principles of thermodynamics applied to engineering problems. Concepts include:
1. Fundamental Concepts of Energy, Volume, Pressure, and Temperature.
2. Properties of a Pure Substance.
3. Work and Heat.
4. First Law of Thermodynamics for a Control Mass and Control Volume.
5. Second Law of Thermodynamics.
6. Entropy.
7. Second Law Analysis for a Control Volume.
8. Irreversibility and Availability.
9. Power and Refrigeration Systems.
10. Gas mixtures.
11. Thermodynamic Relations.
12. Chemical Reactions.
13. Phase Equilibrium and Chemical Equilibrium.

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [_] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: W.S. Amato
Last approved: 4/16/2006
Revised Draft: 4/16/2006

**PSE 370. Principles of Mass and Energy Balance (3 credit hours)**
**Scott, G.M.**

Catalog Description
Conservation of mass and energy applied to steady-state and dynamic process units and systems. Problem analysis and solution; computational techniques. Thermodynamic data and their use; real vs. perfect gases; steam properties; psychrometry. Fall.

Prerequisite(s): FCH 152, PHY 211. Co-requisite(s): MAT 296
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Bioprocess Engineering Paper Science

Textbook
Himmelblau, David M. and Riggs, James B. (2004). **Basic Principles and Calculations in Chemical Engineering**, Seventh Edition. Prentice Hall Professional Technical Reference, Upper Saddle River, NJ.

Objectives
After completing this course the student should be able to:
1. To explain the concepts of dimensions, units, psychrometry, steam properties, and conservation of mass and energy;
2. To solve steady-state mass and energy balance problems involving multiple process units and recycle/bypass/purge streams;
3. To solve and understand simple unsteady-state mass and energy balances;
4. To assess the quality and quantity of data given in engineering problems and discuss the quality of the solutions derived from the data given;
5. To solve more complicated problems using the software appropriate to the problem;
6. To present the solutions to engineering problems in both oral and written form in a clear and concise manner.

Topics Covered
Conservation of mass and energy applied to steady state and dynamic process units and systems. Problem analysis and solution; computational techniques. Thermodynamic data and their use; real vs perfect gases; steam properties; psychrometry.

Professional Component
PSE 370 provides students with an introduction to engineering calculations and problem solving. It is the first engineering course taken by students in the program. In addition to providing the tools and background for engineering practice (e.g., psychrometry, conservation of mass, etc.), the course provides an introduction to design calculations. Each student, potentially in a team setting, must solve an open-ended problem requiring a number of mass and energy balance calculations to solve a design issue around a papermaking operation. The students are required to present their findings clearly and concisely in an electronically-submitted report. They are expected to use the appropriate engineering calculation tools (Excel, Mathcad, Matlab, etc.) to solve the problem.

Relation to Program Outcomes (Paper Engineering)
1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [F] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G.Scott
Last approved: 2/20/2003
Revised Draft: 2/20/2003

**PSE 371. Fluid Mechanics (3 credit hours)**
**Ramarao, B.V.**

Catalog Description
Fluid statics. Principles of mass, energy and momentum balance. Bernoulli's equation. Application to pipe flows, flow measurement and porous media. Movement of particles in fluid media. Rheology of fluids and suspensions typical in the pulp and paper industry (pulps, black liquor, etc.). Filtration and sedimentation of fibrous and particulate suspensions. Characteristics of pumps. Flow systems with economic considerations. Fall.

Prerequisite(s): PHY 211, MAT 296, FCH 152. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Bioprocess Engineering

Textbook

Objectives
After completing this course the student should be able to:
1. Demonstrate competency in working with different units for measurement of force, work, power and other quantities of interest in fluid mechanics.
2. Determine viscosity of fluids, distinguish between kinematic and dynamic viscosities, demonstrate knowledge of the origin of viscosity in real fluids, Identify rheology of complex fluids, distinguish between Newtonian and non-Newtonian behavior, define viscoelasticity, Deborah number, apply these concepts to suspensions and fluids of interest in the pulp and paper industry: black liquor, pulp suspensions, coating suspensions. Define ideal and real fluids, identify what is vorticity, potential flow.
3. Calculate hydrostatic pressure in a fluid (incompressible and compressible), account for variation of fluid density with height in an atmosphere and thus show that gases can be treated as incompressible fluids for most practical small velocities, use pressure relations to calculate forces on submerged surfaces, state the Archimedes' principle, calculate the buoyancy force and its effect on submerged bodies, determine pressure differences using manometers, determine consequences on pressure of rigid body accelerations, describe and calculate pressure distribution in centrifuges, pressure screens, determine the thickness of pressure vessels to withstand hydrostatic pressures.
4. State the mass balance in integral form. Distinguish between point and average velocity over a cross section. State the mass balance in differential form for 1 dimension and for unsteady state. Apply the mass balance in integral form in a conduit of varying cross sections. Determine average velocity across an axi-symmetric cross section when the point velocity varies over it.
5. State the energy balance. State Bernoulli's equation. State the assumptions involved in Bernoulli's equation. Apply this equation for gravity driven flow out of an orifice (representing a headbox). State the engineering form of Bernoulli's equation (including frictional effects). Describe and distinguish applications of orifice and venturimeters. Other flow meters such as pitot tubes. Rotameters. Detailed design principles for orifice meters.
6. Analyze fluid friction and its consequences in flow through a pipe. State the definition of friction factor and its relationship to pressure drop. Define Reynolds' number and identify laminar and turbulent flows. Analyze the flow of a Newtonian incompressible fluid through a circular pipe under laminar flow to obtain the velocity distribution. Identify the effects of non-Newtonian rheology in pipe flow.
7. Analyze turbulent flows and fluid friction. Describe instantaneous and time averaged velocities, correlations, Reynolds' stresses, shear stresses in turbulent flows. Describe the universal velocity profile. Use friction fact charts to determine pipe friction and roughness. Drag reduction effects using polymers.
8. Analyze flow of pulp suspensions using head-loss curves. Describe drag reduction effects due to fibrous suspensions.
9. Determine losses in pipelines with fittings.
10. State the momentum balance on a fluid. Apply the momentum balance to determine forces on bends and pipes of varying cross sections.
11. Describe the flow over a sphere. Describe Stokes low and its validity. Define drag coefficient. Use drag coefficient to evaluate sedimentation velocities for spherical particles and cylinders (fibers). Describe the origin of drag crisis. Boundary layer development and separation from a body in flow. Formation of vortexes.
12. Describe flow through porous media. Describe and use the capillary model of a porous medium to obtain permeability. Derive and use the Ergun equation and Carman Kozeny equation. Specialization to fibrous media and filters.
13. Describe fluid moving machinery. Distinguish classes of pumps. Describe pump characteristics and pump tests. Define and use NPSH in pump selection.

Topics Covered

Fluid statics. Principle of continuity and mass balance. Energy balance and Bernoulli's equation. Application of energy balance to flow systems. Flow measurement devices. Momentum balance. Steady and unsteady flow of liquids and gases in pipelines, ducts, and porous media. Movement of particles in fluid media. Rheology of fluids and suspensions typical in the pulp and paper industry (pulps, black liquor, coating dispersions etc.). Filtration and sedimentation of fibrous and particulate suspensions. Characteristics of pumps. Flow measurement and flow system design with economic considerations.

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 11/20/2001
Revised Draft: 1/3/2006

**PSE 372. Heat Transfer (3 credit hours)**
**Francis, R.C.**

Catalog Description
The study of heat transfer including conduction, convection, radiation, and their applications in industry. Heater and heat exchanger design and selection, and industrial evaporation. Spring.

Prerequisite(s): PSE 370, PSE 371, Physics, chemistry, calculus. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook
"**Heat Transfer**", 9th ed., J.P. Holman, McGraw-Hill, 2002

Objectives
After completing this course the student should be able to:
Acquaint the student with the principles of heat transfer with special emphasis on applications in the paper industry.

Topics Covered
Mass and Energy Balances -with and without chemical reactions
Introduction to Conduction, Convection and Radiation
Conduction and Convection in Depth
Heat Exchanger Design

Professional Component
PSE 372 provides students with an introduction to the principles of heat transfer by conduction, convection and radiation. Instruction was provided on the kinetic theory of gases with review of the derivation of the relationships correlating root mean square velocity with temperature; viscosity and thermal conductivity with temperature (at low pressures). Heat transfer coefficient was determined for flow over a flat plate; three-body radiation problems were solved in class. The course concluded with heat exchanger design being taught in great detail; both in class and in the laboratory. The effectiveness of heat exchangers is of great economic significance to the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)
1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [X] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [X] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 11/20/2001
Revised Draft: 11/20/2001

**PSE 456. Management in the Paper Industry (3 credit hours)**
**Amidon, T.E.**

Catalog Description

Provides the student with interactive contact with active executives in the Paper and Allied industries. The student will develop and present studies of business cases in discussion forum to the class. An understanding of how general managers operate to manage an entire organization will be presented by visiting experts, class participation, group presentations, written papers, and examinations. Spring.

Prerequisite(s): None. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course:

Textbook

Objectives

After completing this course the student should be able to:
SKILLS:
1. To learn to make decisions in a pragmatic, results-oriented manner typical of a practitioner functioning in a real business environment.
2. To examine problems from the point of view of a generalist.
3. To analyze situations and identify core problems or issues within an organization.
4. To identify alternative policies and strategies based on types of analysis available to the general manager.
5. Develop and improve written and oral communication skills.
CONCEPTS:
1. To understand the significance of policy and strategy to the top manager and the organization.
2.To recognize the relationship of environments to strategic planning, policy formulation, and administration.
3.To interact with active senior managers from the industry concerning major problems and opportunities.
4. To learn about interrelationships among subsystems in organizations.

Topics Covered

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [] an ability to engage in life-long learning (life-long learning);
5. [] well-developed written and oral communication skills (communication);
6. [] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [] understand the professional and ethical responsibility of an engineer (ethics);
8. [] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 10/1/1999
Revised Draft: 10/1/1999

**PSE 465. Paper Properties (4 credit hours)**
**Keller, D.S.**

Catalog Description
Evaluation and study of the physical, optical, and chemical properties of paper and the interrelationships existing between paper manufacturing methods, papermaking additives test results and the ultimate properties desired in the finished paper. Fall.

Prerequisite(s): PSE 300. Co-requisite(s): None
Course format: Three hours of lecture, three hours of laboratory and discussion

Programs Requiring Course: Paper Engineering Paper Science

Textbook
**Papermaking Science and Technology**:
Book 16: Paper Physics Book Editor: Kaarlo Niskanen
TAPPI Press 1998

Objectives
After completing this course the student should be able to:
1. Demonstrate an understanding of the various physical, optical, and chemical properties of paper and the testing procedures used to determine these properties.
2. Know the relationships between paper manufacturing methods, papermaking chemicals, test results, and the ultimate properties desired in the finished paper.
3. Be able to analyze results in terms of fundamental properties of fiber systems and the various additives used in the papermaking process.

Topics Covered
The course is divided into three main sections: study of physical properties, evaluation of paper additives, and color. Theoretical aspects are covered in the lectures and practical application of these theories are studied in the laboratory work.

Professional Component

Relation to Program Outcomes (Paper Engineering)
1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [F] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [F] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 11/20/2001
Revised Draft: 2/17/06

**PSE 466. Paper Coating and Converting (3 credit hours)**
**Keller, D.S.**

Catalog Description
Evaluation and study of various coating materials and processes used by the paper industry. Introduction to polymers and their use in converting operations. Study of materials and equipment used in converting operations, fundamentals, and parameters which control their use, effects on final properties of papers. Spring.

Prerequisite(s): PSE 465. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook

Objectives
After completing this course the student should be able to:
1. Describe the coating processes and materials used by the paper industry to impart special properties to paper.
2. Discuss the applications of polymers and mechanical operations in converting and their effects.
3. Determine the effects of converting operations on the physical, optical, and chemical properties of paper in relation to their end use.

Topics Covered
The course examines the coating operation, including raw materials and processes. It includes other converting operations, such as paper and roll handling and finishing, printing, applications of polymers, calendering, etc. Theoretical aspects of these subjects are covered in the lectures and practical application of these subjects will be evaluated in the laboratory.

Professional Component

Relation to Program Outcomes (Paper Engineering)
1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [_] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [_] well-developed written and oral communication skills (communication);
6. [F] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [_] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: D.S. Keller
Last approved: 3/27/1980
Revised Draft: 3/12/2006

**PSE 467. Papermaking Wet End Chemistry (3 credit hours)**
**Ramarao, B.V.**

Catalog Description

Provides the student with the fundamental principles of Colloid and Surface Chemistry as it relates to the interaction of papermaking materials and chemical additives in the wetend of a papermachine system. The topics of retention of fine solids and dewatering are addressed in detail. Application of the various topics presented during the course are made during a Pilot Papermachine trial. Spring.

Prerequisite(s): Senior status in paper science and engineering or permission of instructor. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Science

Textbook

Objectives

After completing this course the student should be able to:

1. Apply classical principles of colloids and surfaces to "real-world" problems in papermaking.
2. Acquire skill in the application of techniques for the laboratory evaluation of retention and dewatering, including the action of retention and drainage aids.
3. Quantify levels of retention and rates of dewatering in papermachines.
4. Develop and report on a strategy for machine trials using chemical additives and evaluating relative performance levels.
5. Apply the techniques of trouble shooting problems during papermachine trials.

Topics Covered

1. Fundamental principles of colloid and surface chemistry which apply to the various interactions taking place in the paper stock suspension during sheet formation on the papermachine wetend.
2. Classification, synthesis, composition and handling of water soluble polymers and polyelectrolytes.
3. Understanding of the definitions, mechanisms, colloidal interactions and action of chemical additives related to the areas of:
    a. retention of fine solids
    b. dewatering in the wetend of a papermachine.
4. Basic approaches used in trouble shooting, with emphasis on and illustrations taken from the areas of retention and dewatering.

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [_] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 9/16/1999
Revised Draft: 9/16/1999

**PSE 468. Papermaking Processes (3 credit hours)**
**Scott, G.M.**

Catalog Description
Spring.

Prerequisite(s): PSE 300, PSE 370, PSE 465. Co-requisite(s): None
Course format: One hour of lecture and six hours of laboratory

Programs Requiring Course: Paper Engineering Paper Science

Textbook
Thorp, B.A. (ed) (1991). **Pulp and Paper Manufacture: Volume 7: Paper Machine Operations**, Series Editor, Kocurek, M.J. Third Edition, Tappi, Atlanta.

Objectives
After completing this course the student should be able to:

1. Understand the theory and practices involved in paper machine operations.
2. Know how paper machine operations affect the resulting properties of the paper and how to achieve those properties.
3. Gain practical laboratory experience in collection and analysis of data and develop material and energy balances on the pilot paper machines.

Topics Covered

1. Paper machine operations from a product design as well as an engineering perspective.
2. Design of instructor-specified grades of paper to be made on laboratory and pilot paper machine.
3. Analysis of data gathered during production of paper to be presented in a discussion-type forum including material and energy balances, paper evaluation, and discussion of design methods.

The lectures will be delivered by the Faculty of PSE with industry experts being brought in for specific topics. The lecture period will also be used for discussions of the paper machine runs. For the laboratory portion, the students are organized into groups to plan and carry out a paper machine run. During the run they perform different tasks involving stock preparation, wet end operation and drying. Each group must collect data and samples during the paper machine run, process this information, and present it to the class in a seminar-type discussion. A group report is required for each run. Assignments in various textbooks and current literature are made.

Professional Component
PSE 468 represents one of the two capstone design courses in the Paper Engineering curriculum. In this course, students must design both a product (4 given grades of paper) and well as a process (the conditions and operational parameters necessary to make the grades on our existing papermachines). In this task, in which the entire class acts as a team of engineers working towards a common goal, the students must design the grades of paper, and then scale-up their production on our two paper machines, justifying their decisions through proper experimental design along the way. The students are required to seek outside consultants from the paper industry, thus enforcing the need for self-directed learning and interaction with the industry. Students are required to produce both written and oral reports which are discussed at length in student-led seminars. Students evaluate their peers and student supervisors (360-degree evaluations) as to their performance in the semester-long project, emphasizing the ethical responsibilities of the engineer to perform their tasks.

Relation to Program Outcomes (Paper Engineering)

1. [_] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [D] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [D] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [F] an ability to engage in life-long learning (life-long learning);
5. [D] well-developed written and oral communication skills (communication);
6. [F] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [F] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 11/20/2001
Revised Draft: 11/20/2001

**PSE 473. Mass Transfer (3 credit hours)**
**Francis, R.C.**

Catalog Description
The study of mass transfer, humidification, air conditioning, drying, gas absorption, distillation, leaching, washing and extraction. Fall.

Prerequisite(s): PSE 370, PSE 371, PSE 372. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering Paper Science

Textbook
"**Unit Operations of Chemical Engineering**", 6th Edition, McCabe, Smith and Harriott, McGraw-Hill (2001)

Objectives
After completing this course the student should be able to:
1. To acquaint the students with the principles of mass transfer and its application with special emphasis to the paper industry.

Topics Covered
(1) Diffusion and Convective Mass Transfer
Fickian, Knudsen and Surface Diffusion
Convective Mass Transfer - analogies between momentum, heat and Mass transfer.

(2) Leaching
Introduction to Equilibrium and Operating Lines
Brownstock washing design using actual mill design data

(3) Humidification and Drying
Humidity and Humidity Chart
Free and Equilibrium Moisture of Substances
Constant and Falling-Rate Periods of Drying
Calculations of Steam, Air and Contact Area (number of dryer cans)
Required for Drying of Paper

(4) Gas Absorption
Optimum Flowrates and Pressure Drop
Design of Plate and Packed Towers

Professional Component
PSE 473 covers the basic principles of mass transfer and their application to design of process equipment critical to the pulp and paper industry. Two such processes are washing and drying while gas absorption will become more important to the pulp and paper industry as more mills practice black liquor gasification.

Relation to Program Outcomes (Paper Engineering)

1. [D] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [_] well-developed written and oral communication skills (communication);
6. [X] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G.Scott
Last approved: 2/20/2003
Revised Draft: 2/20/2003

**PSE 477. Process Control (3 credit hours)**
**Ramarao, B.V.**

Catalog Description

Presents an introduction to the principles of process control. Linear analysis, LaPlace transforms, and nonlinear simulation are presented and applied to feedback, feedforward, cascade and adaptive control. Examples of process simulation, accuracy and stability of control are drawn from paper industry processes. Fall.

Prerequisite(s): APM 485 (or equivalent). Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering

Textbook

Objectives

After completing this course the student should be able to:
CONCEPTS:
1. Provide a systems approach to combining previously-learned scientific and engineering principles to improve the student's understanding of process dynamics.
2. Provide the foundation of linear analysis from which contemporary process control has developed.
3. Present the principles of closed-loop feedback control.
4. Show how the simpler linear formulations can be applied to gain insight into the open-loop response and closed-loop control behavior of manufacturing processes (and more general systems).
5. Provide some actual experience in adapting the linear concepts to more realistic non-linear systems.

SKILLS:
1. Provide a basic understanding of the principles of process control systems analysis and applications.
2. Learn to apply the principles of process control. Linear analysis, LaPlace transforms, and nonlinear simulation are presented and applied to feedback, feedforward, cascade, and adaptive control.
3. Assess the accuracy and stability of control through examples drawn from paper industry processes.

Topics Covered

The course lectures emphasize fundamentals and logical development of principle

bases of process control. This is supplemented and supported by demonstrations of actual control equipment and processes, local field experiences as appropriate, student analysis and computer simulation exercises, and critical exercises concerning the accuracy and conceptual comparisons of models and real systems.

Professional Component

Relation to Program Outcomes (Paper Engineering)

1. [X] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [X] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [_] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [X] an ability to engage in life-long learning (life-long learning);
5. [X] well-developed written and oral communication skills (communication);
6. [_] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: G. Scott
Last approved: 11/20/2001
Revised Draft: 11/20/2001

**PSE 480. Engineering Design Economics (3 credit hours)**
**Chatterjee, S.G.**

Catalog Description
Steps of process design, engineering economic analysis, estimation of capital investment, operating costs, profitability measures, evaluation of alternatives, inflation. Modeling and computer simulation of process units and systems; use of software. Design exercises and case studies. Spring.

Prerequisite(s): PSE 370, MAT 296. Co-requisite(s): None
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering

Textbook
**Plant Design and Economics for Chemical Engineers,** 5th edition
Max S. Peters, Klaus D. Timmerhaus and Ronald E. West, McGraw-Hill, New York (2003)

Objectives
After completing this course the student should be able to:
1. Know the main steps involved in the execution of an engineering design project.
2. Understand and apply the techniques of engineering economics for the estimation of capital investment, annual production cost and profitability of a proposed project, and choose between alternatives.
3. Understand process design principles in a particular area (e.g., black liquor evaporation) if this is required in the class project.

Topics Covered
Major steps in chemical process design
Cost estimation - fixed and working capital requirements, annual production cost
Interest and investment costs
Taxes and insurance
Depreciation methods for fixed capital investment
Profitability estimation and evaluation of alternatives
Inflation
Class project: Students are required to do a project in which they apply the principles of engineering economics learnt in class to estimate capital investment, annual production costs and profitability indexes of a particular pulp and paper mill or perform a specific type of economic analysis of a particular part of the pulp and paper industry or develop the process design and capital cost estimation of any particular area of interest in the pulp and paper field (e.g, black liquor evaporation).

Professional Component
PSE 480 introduces the students to the elements of process design and engineering economics, which is vital for their future career in the pulp and paper industry. The students are expected to use appropriate engineering calculation tools like WinGEMS™ (a process simulator for the pulp and paper industry) if required for the execution of the class project. It also provides the concepts that enable the students to perform an economic analysis of their capstone design project in PSE 481 (Engineering Design), which is offered during the fall semester.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [F] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [ ] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [ ] an ability to engage in life-long learning (life-long learning);
5. [F] well-developed written and oral communication skills (communication);
6. [ ] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [ ] understand the professional and ethical responsibility of an engineer (ethics);
8. [X] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/6/1999
Revised Draft: 5/5/2006

**PSE 481. Engineering Design (3 credit hours)**
**Chatterjee, S.G. and Iribarne, J.**

Catalog Description
Design-project procedure; data sources and development. Application of simulation and computer-aided design to process synthesis and plant layout. Formulation and solution of original design problems. Fall.

Prerequisite(s): PSE 480, PSE 371, PSE 372. Co-requisite(s): PSE 473
Course format: Three hours of lecture per week

Programs Requiring Course: Paper Engineering

Textbook
**Plant Design and Economics for Chemical Engineers,** 5th edition
Max S. Peters, Klaus D. Timmerhaus and Ronald E. West, McGraw-Hill, New York (2003)
The students also use design and cost data and technical information obtained from Solvay Paperboard, external vendors and literature in order to solve the design problem.

Objectives
After completing this course the student should be able to:
1. Extend the study and application of engineering principles and methods to equipment design, experimental design, and process and plant design.
2. Learn design project procedure and provide experience in formulating and solving original design problems.
3. Conceptualize the main steps invoked in the execution of an engineering design project and gain confidence in engineering design by executing the class project.

Topics Covered
This capstone design course involves the execution of a real-world engineering design project at Solvay Paperboard, a paperboard mill located in Solvay, New York. Each design team maintains an engineering logbook containing all relevant approaches, data and calculations in an organized fashion. Every week, each team submits a brief written summary of its progress and makes a brief in-class presentation. There are extensive discussion and communication between the design teams, instructors, mill personnel, and external vendors with continuous monitoring of the progress of a design team towards the design goal. The results of the work of each team are summarized in a technical design report, which is submitted near the end of the semester. Two mid-semester progress reports are also required. In addition, at the end of the semester, each design team makes a presentation of its completed project to the Paper Science and Engineering department. The students undergo safety training at the mill so that they can operate safely in an industrial environment and professional and ethical responsibilities of engineers are communicated via videos and in-class discussion. Most classes are held at the mill site.

Professional Component
PSE 481 represents one of the two capstone design courses in the Paper Engineering curriculum. This capstone course focuses on the execution of an engineering design project (engineering analysis/design and cost/profitability estimation) at Solvay Paperboard. The design projects, which generally concern improving the efficiency of the mill in some area, are actual engineering projects, which are conducted under the guidance and supervision of the Engineering and Technical Services Manager of the mill who is a co-instructor of the course. The chief objective of this capstone design course is to provide a strong technical preparation for the student's career in the pulp and paper industry.

Relation to Program Outcomes (Paper Engineering)

1. [F] a sound knowledge of science and engineering as applied to paper science and engineering (sound knowledge);
2. [D] the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data (conceptualize);
3. [D] the ability to solve a real engineering problem in a team environment using appropriate design techniques (team problem solving);
4. [_] an ability to engage in life-long learning (life-long learning);
5. [D] well-developed written and oral communication skills (communication);
6. [D] the ability to work in an industrial position within the pulp, paper, or allied industries (industrial experience);
7. [X] understand the professional and ethical responsibility of an engineer (ethics);
8. [_] a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts (contemporary issues).

Prepared by: S. G. Chatterjee
Last approved: 9/16/1999
Revised Draft: 5/5/2006

## D. Faculty Resumes

**THOMAS E. AMIDON**
**FACULTY CHAIR**
CURRICULUM VITAE SUMMARY
FACULTY OF PAPER SCIENCE & ENGINEERING
SUNY COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Thomas E. Amidon, Faculty Chair

2. **Degrees with field, institution, and date**

| | |
|---|---|
| B.S., Forest Management, State University of New York College of Environmental Science and Forestry | 1968 |
| M.S., Forest Tree Improvement, State University of New York College of Environmental Science and Forestry | 1972 |
| Ph.D., Silviculture, State University of New York College of Environmental Science and Forestry | 1974 |

3. **Number of years service on this faculty: 6**
**Faculty Chair**
**2000-date**

4. **Other related experience**

| | |
|---|---|
| Laboratory Manager, International Paper | 1994-2000 |
| Manager, Primary Process Development, International Paper | 1989-1994 |
| Quality Improvement Process Facilitator, International Paper | 1987-1989 |
| Program Manager, International Paper | 1984-1987 |
| Manager, Forest Sciences, International Paper | 1982-1984 |
| Research Analyst, International Paper | 1980-1982 |
| Research and Senior Research Associate, International Paper | 1976-1980 |
| Instructor, State University of New York College of Environmental Science and Forestry | 1974-1976 |

5. **Consulting and Patents**

| | |
|---|---|
| International Paper | 2000 |
| International Paper | 1997 |
| International Paper | 1997 |
| International Paper | 1982 |

6. **State(s) in which registered**
None

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

Amidon, Thomas (April 2002). "New Forest Based Materials – New Approaches", *Solutions Magazine*

Amidon, Thomas (2002). "Setting the Industry Technology Agenda – Chapter 3.6.1 New Approaches"

Amidon, Thomas (2006). "The Biorefinery in New York: Woody Biomass Into Commercial Ethanol", *Pulp & Paper Canada*

Liu, Shijie; Amidon, Thomas; Francis, Raymond; Ramarao, Bandaru; Lai, Yuan-Zong; and Scott, Gary (2006). "From Forest Biomass to Chemical and Energy: Biorefinery Initiative in New York", *Industrial Biotechnology*

**8. Scientific and professional societies of which a member**

Technical Association of the Pulp and Paper Industry
Paper Industry Management Association

**9. Honors and awards**

The State University of New York for exemplary contributions to Research and Scholarship

**10. Institutional and professional service in the last five years**

| | |
|---|---|
| Technical Association of the Pulp and Paper Industry | |
| Session Chair | 2002 |
| Paper Industry Management Association, Chair | 2002 |
| Committee on Instruction | 2001 – |
| Academic Council | 2000 – |
| Feinstone Award Committee | 2001 – |

**11. Professional development activities in the last five years**

AF & PA/TAPPI Summit Team Leader – New Forest Based Materials I, Deployment II
Yearly Participant in ESF's Colloquium on Teaching
ESF Learning Action Forum – Writing and Curriculum
Leadership Development Process Seminar
Managing a Diverse Workforce Seminar

**SIDDHARTH G. CHATTERJEE**
**ASSOCIATE PROFESSOR**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Siddharth G. Chatterjee, Associate Professor

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| B.Tech., Chemical Engineering; Indian Institute of Technology, Kharagpur, India | 1982 |
| M.S., Chemical Engineering; Rensselaer Polytechnic Institute, Troy, NY | 1985 |
| Ph.D., Chemical Engineering; Rensselaer Polytechnic Institute, Troy, NY | 1987 |

3. **Number of years service on this faculty: 12**

| | |
|---|---|
| Associate Professor | 2001 – date |
| Assistant Professor | 1994 – 2001 |

4. **Other related experience:**

| | |
|---|---|
| Adjunct Professor, Chemical Engineering, Tufts University, Medford, MA | 1993 – 1994 |
| Senior Project Engineer, Koch Engineering Company, Wilmington, MA | 1989 – 1993 |
| Research Associate, Chemical Engineering, Syracuse University, Syracuse, NY | 1987 – 1989 |
| Teaching/Research Assistant, Rensselaer Polytechnic Institute, Troy, NY | 1982 – 1987 |
| Trainee Engineer, Metal Box Company Pvt. Ltd., Kolkata, India | 5/1981 – 8/1981 |

5. **Consulting and Patents:**

| | |
|---|---|
| Provisional patent application for biodiesel production from crude tall oil (USPTO) | 11/2005 |

6. **State(s) in which registered:**
None

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

Mittal, A., Kataria, T., Das, G. K., Chatterjee, S. G., "Evaporative Cooling of Water in a Small Vessel under Varying Ambient Humidity," accepted for publication, International Journal of Green Energy, 2006

Mittal, A., Iribarne, J., Rajan, K. G., Chatterjee, S. G., "Buildup of Dissolved Solids in a Paperboard Mill with Water Closure," in press, Progress in Paper Recycling, 15(3), May 2006

Chatterjee, S. G., Review of *Software Architectures and Tools for Computer Aided Process Engineering* (Eds. B. Braunschweig and R. Gani, Elsevier Science B.V., Amsterdam, 2002), Separation and Purification Technology, 35, 169-173 (2004)

Gupta, H., Chatterjee, S. G., "Parallel Diffusion of Moisture in Paper. Part 2: Transient Conditions," Ind. Eng. Chem. Res., 42(25), 6593-6600 (2003)

Gupta, H., Chatterjee, S. G., "Parallel Diffusion of Moisture in Paper. Part 1: Steady-State Conditions,", Ind. Eng. Chem. Res., 42(25), 6582-6592 (2003)

Chatterjee, S. G., "Comparison of Domain and Similarity Models for Characterizing Moisture Sorption Equilibria of Paper," Ind. Eng. Chem. Res., 40(1), 188-194 (2001)

8. **Scientific and professional societies of which a member:**
Indian Institute of Chemical Engineers
American Society of Engineering Education

9. **Honors and awards:**

| | |
|---|---|
| Tappi Empire State Section, Certificate of Appreciation | 2002 |

10. **Institutional and professional service in the last five years:**

| | |
|---|---|
| Chair, PSE Undergraduate Education Committee | 2005 – date |

| | |
|---|---|
| SUNY-ESF Committee on Instruction | 2005 |
| SUNY-ESF Committee on Research | 2003 – 2005 |
| Journal Manuscript/Proposal Reviewer | 2000 – date |
| Various PSE Committees (Safety, Awards, Curriculum Review, Equipment, Faculty Search, Chair Search, ABET) | 1994 – date |

11. **Professional development activities in the last five years**

| | |
|---|---|
| ABET Workshop, Terre Haute, IN | 2005 |
| Sabbatical Leave | 2004 |
| Yearly participant in ESF's Symposium on Teaching and Learning | 2001 – 2005 |
| ABET Workshop, Corning, NY | 2001 |

**RAYMOND C. FRANCIS**

**RESEARCH ASSOCIATE**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY – COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Raymond C. Francis, Research Associate

2. **Degrees with field, institution, and date**:

| | |
|---|---|
| B.A.Sc., Chemical Engineering, University of Toronto | 1982 |
| Ph.D., Chemical Engineering, University of Toronto | 1987 |

3. **Number of years service on this faculty:** 19

| | |
|---|---|
| Research Associate | 1987 – date |

4. **Other related experience**:

| | |
|---|---|
| Instructor/Graduate Student Advisor, University of Toronto | 1982 – 1984 |
| Consultant, Douglas Reeve & Associates, Toronto, Canada | 1984 – 1986 |

**5. Consulting and Patents:**

Consulting

| | |
|---|---|
| Specialty Minerals Inc. | 2002-2003 |
| Hercules Inc. | 2005 |
| Cheslik Consulting | 2006 – date |

**U.S. Patents**

Evans, T. D. and Francis, R. C., "Method for Brightening Chemical Pulp with Hydrogen Peroxide Using a Magnesium Compound in Silicate Solution" U.S. Patent 6,669,358 (2004).
Francis, R.C., Zhang, X.Z., and Troughton, N.A., "Ozone/Peroxymonosulfate Process for Delignifying a Lignocellulosic Material" U.S. Patent 5,411,635 (1995).
Francis, R.C. and Evans, D.B., "Method of Reducing Thermal and Light-Induced Brightness Reversion in Lignin-Containing Pulp." U.S. Patent 5,360,515 (1994).
Francis, R.C., Dence, C.W., and Alexander, T.C., "Method for Reducing Brightness Reversion in Lignin-Containing Pulps and Articles of Manufacture Thereof." U.S. Patent 5,080,l754 (1992).
Francis, R.C. and Reeve, D.W., "Process for the Oxidative Delignificaiton of Demethylated Chemical Pulp", U.S. Patent 4,729,817 (1988).

International Patent Applications

Francis, R.C., Nicholson, D.J., and Troughton, N.A., "Process and Chlorine-Free Composition (Dioxiranes) for Delignifying a Lignocellulosic Material and Pulp From", PCT Int. Appl. WO 94/18,386 (August 94). No objections filed; New Zealand Patent 262009 (1996) obtained before corporate sponsor (Solvay Interox) lost interest.

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

None

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

Francis, R. C., Hanna, R. B., Shin, S.-J., Brown, A. F., and Riemenschneider, D. E., "Papermaking characteristics of three *Populus* clones grown in the north-central United States", Biomass and Bioenergy, in press, available online at www.sciencedirect.com

Francis, R. C., Shin, S.-J., Omori, S., Amidon, T. E., and Blain, T. J., "Soda Pulping of Hardwoods Catalyzed by AQ and Substituted AQs", J. Wood Chem. Technol. 26 (2): June 2006

Manning, M.S., Henry, G.E., Omori, S. and Francis, R.C. " $D/P_M$ bleaching of hardwood kraft pulps" Presented at PAPTAC Annual Meeting, Montreal, February 9, 2006. To be published in J Pulp Pap. Sci 32 (2): June 2006.

Francis, R. C., Brown, A. F., Bosshart, R. P., Balch, S. E. and Waite, D. M., "Four Additional Hybrid Poplars with Papermaking Properties Superior to Aspen", Tappi J. 3 (11): 13

Francis, R. C., Brown, A. F., Hanna, R. B. and Kamdem, D. P., "The DN 30 Hybrid Poplar – A Fiber Source for High Strength Hardwood Pulps", Tappi J. 3 (2): 3 (2004).

Francis, R. C., Chaiarrekij, S. and Ramarao, B. V., "Preliminary Results on Hydrogen Peroxide Addition to Chlorine Dioxide Bleaching Stages", J. Wood Chem. Technol. 23 (2): 113 (2003).

Francis, R.C., Hausch, D.L., Xu, E.C. and Kamdem, D.P., "Hardwood Chemimechanical Pulps-Sulfonation Versus Hydrogen Peroxide Pretreatment", Appita J. 54:439 (2001).

Francis, R.C., Hausch, D.L., Granzow, S.G., Makkonen, H.P. and Kamdem, D.P., "Fiber Yield for Fully Bleached Kraft Pulps from Black Locust (Robinia pseudoacacia) and Silver Maple(Acer saccharinum)", Holz als Roh-und Werkstoff, 59:49 (2001).

8. **Scientific and professional societies of which a member:**

American Chemical Society (ACS)
American Society for Engineering Education (ASEE)
Pulp and Paper Technical Association of Canada (PAPTAC)
Technical Association of the Pulp and Paper Industry (TAPPI)

9. **Honors and awards**:

Certificates of Appreciation from TAPPI, Certificates of Appreciation from PAPTAC

**10. Institutional and professional service in the last five years:**

Various PSE Committees
Vice-chair of the TAPPI Wood Chemistry Committee
Advisory Board of the Journal of Wood Chemistry & Technology

**11. Professional development activities in the last five years:**

2004 Hardwood Industries Leadership Conference, Penn State University
ABET Conference, Baltimore (March 11, 2006)
Sabbatical at Penn State University that focused on energy from biomass

**D. Steven Keller**
**ASSOCIATE PROFESSOR**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** D. Steven Keller, Associate Professor

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| B.S., Chemistry; Syracuse University, Syracuse, NY | 1980 |
| Ph.D., Environ. Resources Engineering, Paper Physics | |
| SUNY College of Environmental Science and Forestry | 1996 |

3. **Number of years service on this faculty: 16**

| | |
|---|---|
| Associate Professor | 2001 - date |
| Assistant Professor | 1996 - 2001 |
| Research Staff | 1990 - 1996 |

4. **Other related experience**

| | |
|---|---|
| Associate Research Chemist, Otisca Industries, Syracuse , NY | 1982-1990 |
| Technical Service Coordinator, Champion Chemicals Inc. Houston TX | 1980-1982 |

5. **Consulting and Patents**

Eastman Kodak.
Nalco Chemical
Hansol Paper, Korea
Metso Paper, Finland
Heidelberg Digital LLC
Rochester Institute of Technology,

Method and System for Characterizing Streak Defects in Web Structures, inventors D.S. Keller and M. Kellomaki, US Non-Provisional Patent Application, Filed Sept. 2002, Pending

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

None.

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

"Paper Drying Technology", Chpt 8 in Water in Paper: A Conservation Training Compendium, ed. G. Banik and I. Brückle, Idziorek & Burgstaller, Fellbach, Germany (2005)

"Applications of Thickness and Apparent Density Mapping by Laser Profilometry to Characterize Paper Structure", Advances in Paper Science Technology, Trans. 13th Fund. Res. Sym., 2005, Cambridge, UK

Pawlak, J. J. and Keller, D. S., "The Compressive Response of a Stratified Fibrous Structure", Mechanics of Materials, 37, 1132-1142 (2005)

Pawlak, J. J.and D. S. Keller, "Relationships between the local sheet structure and z-direction compressive characteristics", J. Pulp and Paper Science, 30(9), 256-262 (2004)

Keller, D. S. Kellomäki, M., Pawlak, J., Hägglund J.-E.and Johansson, N., "Three Storage Phosphor Systems for β-radiographic Imaging of Paper", Nordic Pulp and Paper Research Journal, 19(2) 170-175 (2004)

Pawlak, J. J., and Keller, D. S., "Measurement of the local compressive characteristics of polymeric film and web structures using micro-indentation", Polymer Testing, 22(5), 515-528 (2003)

Sung Y.-J., and Keller, D. S., "Evaluation of Gloss Variation with a Novel Method", J. Korea TAPPI, 34(2), 73-83 (2002)

Burry, W. M. and Keller, D. S., "Effects of dehydration on the apolar surface energetics of inorganic paper fillers", J. Chromatography, 972(2) 235-245 (2002)

Pawlak, J. J. and D.S. Keller, "Analytical Technique for the Comparison of Paper Formation Imaging Methods", J. Pulp and Paper Sci., 27(5) 2001

Keller D. S. and Pawlak, J. J. "β-Radiographic Imaging of Paper Formation using Storage Phosphor Screens", J. Pulp and Paper Sci., 27(4) 2001

Keller D. S. and Luner, P ., "An Instrument for Electron Beam and Light Transmission Imaging of Mass Distribution in Paper and Fibrous Webs," Rev. Sci. Instruments, 69(6),98

Okayama, Kellomaki, M., Pawlak, J., Sung, Y.-J. and Keller, D. S., "Characterization of Non-Stationary Structural Non-Uniformities in Paper", The Science of Papermaking, Transactions of the 12th Fundamental Research Symposium, 2001, Oxford, UK

Uesaka, T., Retulainen, E., Mark, R.E., Paavilainen, L. and Keller, D.S. "Determination of Fiber-Fiber Bond Properties" with, in Handbook of Physical and Mechanical Testing of Paper and Paperboard, ed. R. E. Mark August 2001.

Keller, D. S., Paper, The World Book Encyclopedia, Chicago, IL, 2001,2002

8. **Scientific and professional societies of which a member**

American Chemical Society, Local Section Chair 2000
Technical Association of the Pulp and Paper Industry, Paper Physics Com. Sec.-2004-2005, Vice Chair-2006-2007
International Association of Scientific Papermakers
Society opf Rheology
Sigma Xi, Research Society
Fiber Society

9. **Honors and awards.**

| | |
|---|---|
| Edwin C. Jahn Graduate Student Fellowship | 1993 |
| Recognition as one of TAPPI Finest Faculty – Introduction to Paper Properties Course | 1999 |

10. **Institutional and professional service in the last five years**

| | |
|---|---|
| Chair, Subcommittee Instructional Quality | 2001 - date |
| Various PSE Committees | 1996 - date |
| Journal Manuscript/Proposal Reviewer | 1990 - date |
| Technical Association of the Pulp and Paper Industry Short Course Chairman: Intoduction to Paper Properties | 2000 – 2001 |
| Chair, 2002 Progress in Paper Physics Conference, Syracuse, NY | Fall 2002 |

11. **Professional development activities in the last five years**

Regular attendence of Tappi Paper Physics Conferences, Papermaking Fundamental Research Symposia, TAPPI Coating Conferences
Yearly participant in ESF's Colloqium on Teaching

**YUAN-ZONG LAI**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Yuan-Zong Lai, Senior Research Associate

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| B.S., Forestry, National Taiwan University – Taipei, Taiwan, Rep. of China | 1963 |
| M.S., Wood Chemistry, College of Forest Resources, University of Washington – Seattle | 1966 |
| M.S., Chemistry, Department of Chemistry, University of Washington – Seattle | 1967 |
| Ph.D., Wood Chemistry, College of Forest Resources, University of Washington – Seattle | 1968 |

3. **Number of years service on this faculty: 25**

| | |
|---|---|
| Senior Research Associate | 1981 - date |

4. **Other related experience**

| | |
|---|---|
| Assistant to Associate Professor, Michigan Technological University | 1975 - 1981 |
| Research Associate to Senior Research Associate, University of Montana | 1970 - 1975 |
| Post-doctoral Fellow, University of Washington | 1969 - 1970 |

5. **Consulting and Patents**

National Taiwan University
Taiwan Forest Research Institute
National Chung-Hsin University
Nanjing Forestry University

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

None.

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


Ko, C.-H. and Lai, Y.-Z., "Impacts of Aryl-Ether Cleavages in Alkaline Delignification of Softwood", *J. Wood Chem. Technol*., **21**: 53-56 (2001).

Wen, X., Lai. Y.-Z., Yang, R., and Zhai, H.," The Reactivity of Residual Kraft Lignin toward Non-Chlorine Bleaching Agents", In *Proceedings of 11th International Symposium on Wood and Pulping Chemistry*, Nice France, 2001, Vol. 1, pp. 159-162.

Wen, X., Lai. Y.-Z., Johnson, J., Nakas, J. P., and Tanenbaum, "The Significance of Benzylic Oxidation in Laccase-Assisted Delignification Reactions", In *Proceedings of 11th International Symposium on Wood and Pulping Chemistry*, Nice France, 2001, Vol. 3, pp. 353-355.

Yang, R., Wen, X., and Lai. Y.-Z., "The Reactivity of Etherified Lignin β-Aryl ether Model Dimers in Alkali-$O_2$ Systems", *In Proceedings of 11th International Symposium on Wood and Pulping Chemistry*, Nice France, 2001, Vol. 3, pp. 425-427.

Lai. Y.-Z., Ohtani, N., Saito, N., Kasuya, N., Yang, R., Xu, H., and Omori, S., "On the Developments of Chemical Methods for Determining Lignin Condensed Units", In *Proceedings of Grenoble Workshop on Advanced Methods for Lignocellulosics and Paper Products Characterization*, Grenoble, France, 2001, pp. 103-106.

Ohtani, Y. and Lai,Y.-Z., "Om the Determination of β-Aryl Ether Units in Wood Lignin by an Ozonation Method" *J. Wood Chem. Technol*. **23**: 293-303 (2003).

Yang, R., Wen, X., and Lai, Y.-Z., "An Overview of Side-Chain Oxidation on the Reactivity of Lignin Units" *In Proceedings of 13th International Symposium on Wood and Pulping Chemistry*, Madison Wisconsin, 2003,

Vol. I, pp. 33-36.

Kim, M., Yang, R., Went, X., Omori, S., Lai, Y.-Z., Nikes, J., and Athenaeum, "Understanding the Role of Alkaline Extraction in the Laccase-Assisted Delignification" *In Proceedings of 13th International Symposium on Wood and Pulping Chemistry*, Madison Wisconsin, 2003, Vol. II, pp. 117-120.

Shin S.-L, Schroeder, L. R., and Lai, Y.-Z., "Impact of Extractives on Lignin Determination in Kraft Pulps", *J. Wood Chem. Technol.* **24**: 139-151 (2004).

Lai, Y.-Z, "The Significance of Benzylic Oxidation in the Delignification Process", in *Proceeding of the 2nd International Symposium on Technologies of Pulping, Papermaking and Biotechnology on Fiber Plants*, October 13-14, 2004, Nanjing, China.

Shin S.-L, Schroeder, L. R., and Lai, Y.-Z., "Impacts of Residual Extractives on Lignin Determination in Kraft Pulps", in Proceedings of the *13th International Symposium on Wood and Pulping Chemistry*, Auckland, New Zealand, 2005 pp. 489-493.

Shin S.-L, Schroeder, L. R., and Lai, Y.-Z "Understanding Contributing Factors to Low Oxygen Delignification for Kraft Pulps", in Proceedings of the *13th International Symposium on Wood and Pulping Chemistry*, Auckland, New Zealand, 2005, pp. 359-363.

Shin S.-L, Schroeder, L. R., and Lai, Y.-Z., "Understanding Contributing Factors to Low Oxygen Delignification for Hardwood Kraft Pulps", *J. Wood. Chem. Technol.*, **26**: 5-20 (2006).

8. **Scientific and professional societies of which a member**

American Chemical Society
Division of Cellulose and Renewable Materials
Technical Association of the Pulp and Paper Industry

9. **Honors and awards.**

Certificate of Appreciation from TAPPI
Certificate of Appreciation from the University of Andes, Venezuela

10. **Institutional and professional service in the last five years**

| | |
|---|---|
| Various PSE Committees (Safety; Promotion; and Graduate Studies) | 1998 - date |
| Editorial Advisory Board, J. of Wood Chemistry and Technology | 1997 - date |
| College Committee on Research | 2005 - date |
| Journal Manuscript/Proposal Reviewer | 1985 - date |
| Chaired Technical Session at the *2nd International Symp. on Technologies of Pulping, Papermaking and Biotechnology on Fiber Plants* | 2004 |

11. **Professional development activities in the last five years**

Participant in Int. Symp. On Wood and Pulping Chemistry
Editorial Advisory Board, J. of Wood Chemistry and Technology

**SHIJIE LIU**
**ASSISTANT PROFESSOR**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Shijie Liu, Assistant Professor

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| Ph.D., Chemical Engineering, University of Alberta | 1992 |
| B.S., Chemical Engineering, Chengdu University of Science & Technology Now Sichuan University – Chengdu, P.R. China | 1982 |

3. **Number of years service on this faculty: 1.0**

| | |
|---|---|
| Assistant Professor | 2005 - date |

4. **Other related experience**

| | |
|---|---|
| Assistant Professor, Chemical Engineering, University of Alberta | 1996 – 2005 |
| Post Doctorate Fellow, University of Alberta | 1992 - 1996 |
| Teaching Assistant, University of Alberta | 1987 - 1991 |
| Research Assistant, Lanzhou Chemical & Machinery Research Institute | 1982 - 1987 |

5. **Consulting and Patents**

| | |
|---|---|
| Alberta Agricultural & Rural Development | 2004 - 2006 |
| Alberta Research Council | 2005 |
| Millarwestern Forest Products | 2002 - date |
| Alberta Pacific Forest Products | 2003 - date |
| Alberta Newsprint | 2002 - 2005 |

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

| | |
|---|---|
| Alberta, Canada | 1994 - date |

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

**Shijie Liu**, Thomas E. Amidon, Raymond C. Francis, Bandaru V. Ramarao, Yuan-Zong Laiand Gary M. Scott 2006. "From Forest Biomass to Chemicals and Energy: Biorefinery Initiative in New York", Industrial Biotechnology, in press.

Yang, L. and **Liu, S.** 2005 "Kinetic Model for Kraft Pulping Process", *Ind. Eng. Chem. Res.***,** *44*, 7078-7085.

Ha, Z., Ring, Z. and **Liu, S.** 2005 "Derivation of Molecular Representations of Middle Distillates", *Energy & Fuels*, **19**(6): 2378 - 2393.

Ha, Z., Ring, Z. and **Liu, S.**, 2005 "Estimation of Isomeric Distributions in Petroleum Fractions", *Energy & Fuels*, **19**(4), 1660-1672.

C. L. Gallant, H. Q. Yin, **S. Liu**, J.P. Heggers, R.E. Langford, M.E. Olson, D.A. Hart, R.E. Burrell, 2005, "A Comparison of *In Vitro* Disc Diffusion and Time-Kinetic Assays for the Evaluation of Antimicrobial Wound Dressing Efficacy", *Wound Repair and Regeneration*, **13** (4), 412-421.

G. Li, Y. Lin, **S. Liu**, H. Rui, X. Yang, 2005, "A Finite Difference Non-overlapping Non-matching Domain Decomposition Algorithm for Heat Equation", *Dynamics of Continuous, Discrete and Impulsive Systems Series* **B:** *Applications & Algorithms*, accepted.

Ha, Z., Ring, Z. and **Liu, S.**, 2005 "QSPR models for boiling points, specific gravities and refraction indices of hydrocarbons", *Energy & Fuels*, **19**, 152-163.

Masliyah, J.H., Afacan, A., **Liu, S.** 2005 "Flow through a tube with an annual porous medium layer", *J. Porous Media*, 8(2), 193-210.

Sanders, R.S., Razzaque, M.M., Nandakumar, K., Masliyah, J.H., Afacan, A. and **Liu, S.** 2004 "Bubble size distribution for dispersed air-water flows in a 100 mm horizontal pipeline" *Can. J. Chem. Eng.*, **82**(4), 858-864.

**Liu, S.** 2004 "A Simplistic Mechanistic Model and Effect of Consistency on Alkaline Peroxide Brightening of Mechanical Pulps", *Chem. Eng. Sci.*, **59**, 4375-4381.

**Liu, S.** 2004 "Parametric Estimation and Error Structure", *Dynamics of Continuous, Discrete and Impulsive Systems Series* **B:** *Applications & Algorithms*, **11**, 1-28.

**Liu, S.** 2003 "Chemical Kinetics of Alkaline Peroxide Brightening of Mechanical Pulps", *Chem. Eng. Sci.*, **58**, 2229-2244

**Liu, S.**, Zhu, Z. and Masliyah, J.H. 2003 "Effect of dispersion on particle segregation due to sparged air in a hydrocyclone", *Canadian Chem. Eng. J.*, **81**, 549-556.

Razzaque, M.M., Afacan, A., **Liu, S.**, Nandakumar, K., Masliyah, J.H. and Sanders, R.S. 2003 "Bubble size and coalescence dominant regime of turbulent air-water flow through horizontal pipes" *Int. J. Multiphase Flow*, **29**, 1451 – 1471.

Ha, Z. and **Liu, S.**, 2002 "Settling Velocities of Polydisperse Concentrated Suspensions", *Can. J. Chem. Eng.*, **80**, 783-790.

**Liu, S.** and Ha, Z. 2002 "Prediction of Random Packing Limit for Multimodal Particle Mixtures", *Powder Technol.*, **126**, 283-296.

8. **Scientific and professional societies of which a member**

American Institute for Chemical Engineers
American Society for Engineering Education
Pulp and Paper Technical Association of Canada
Society for Biological Engineering
Technical Association of the Pulp and Paper Industry

9. **Honors and awards.**

| | |
|---|---|
| PACWEST, Speaker Award | 2003 - 2005 |
| Second Best Paper, PAPTAC Western Branch | 2002 |
| Certificate of appreciation, PAPTAC Western Branch | 2003, 2004 |
| Certifiate of Appreciation, Canadian Society for Chemical Engineers | 1996 |
| Province of Alberta Graduate Fellowship, University of Alberta | 1991 - 1992 |
| Captain Greenhalgh Graduate Memorial Scholarship | 1989 - 1990 |
| The first place award, Universities and Colleges Graduation Thesis Exhibitions, Province of Sichuan, Chongqing, China | 1982 |

10. **Institutional and professional service in the last five years**

| | |
|---|---|
| Committee Member at Large, ESF Faculty Council | 2006 - date |
| Various PSE Committees | 2005 – date |
| Chair, PAPTAC nonwood fibres committee | 2004 – date |
| Vice Chair, PAPTAC nonwood fibres committee | 2003 – 2004 |
| Co-Chair, PAPTAC-TAPPI nonwood fibres symposium, Montreal | 2003 - date |
| Co-Chair, Field of Fibres Symposium, Edmonton, Canada | 2003 |
| Co-Chair, Industrial Mathematics Symposium, Edmonton, Cananda | 2003 |

11. **Professional development activities in the last five years**

AIChE meetings, annual
PAPTAC paperweek, annual
TAPI pulping conferences, annual
PACWEST conferences, annual
PAPTAC Western Brunch Meetings, annual
Other conferences

**BANDARU V. RAMARAO**
**PROFESSOR**
**ASSOCIATE DIRECTOR**
**EMPIRE STATE PAPER RESEARCH INSTITUTE**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Bandaru V. Ramarao, Professor & Associate Director: Empire State Paper Research Institute.

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| B.Tech., Chemical Engineering; University of Madras, Madras, India | 1980 |
| M.S., Chemical Engineering; Clarkson University, Potsdam NY. | 1982 |
| Ph.D., Chemical Engineering; Clarkson University, Potsdam, NY | 1986 |

3. **Number of years service on this faculty: 18**

| | |
|---|---|
| Professor | 1997-current |
| Associate Professor | 1992-1997 |
| Assistant Professor | 1988 – 1992 |

4. **Other related experience:**

| | |
|---|---|
| Adjunct Professor, Chemical Engineering, Syracuse University, Syracuse NY | 1988-current |
| Senior Fellow, Department of Chemical Engineering, National University Of Singapore, Singapore. | 1995-1995 |
| Research Associate, Chemical Engineering, Syracuse University, Syracuse, NY | 1985 – 1988 |
| Teaching/Research Assistant, Clarkson University, Potsdam, NY | 1980 – 1985 |

5. **Consulting and Patents:**
B. V. Ramarao. 'A method to determine pulp specific surface area, specific volume and compressibility characteristics on-line.' U. S. Patent, 5,954,922. (1999). Successfully commercialized with many units operating at industrial locations. This has spawned further modified instruments, which are in successful operation at pulp and paper industry and research center locations in North America, Europe, China and South America.

6. **State(s) in which registered:**
None

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

47. A. Massoquette, S. Lavrykov, B. V. Ramarao, A. Goel and S. Ramaswamy. 'The effect of pulp refining lateral and transverse moisture diffusion in paper.' Tappi J., 4, 12, 3-8, 2005.
46. B. V. Ramarao and C. Tien. 'Analysis of fine particle migration and retention in cake filtration.' Ind. Engng. Chem. Research., 44, 1200-1210, 2005.
45. A. Massoquete, S. Lavrykov and B. V. Ramarao. 'Non-Fickian nature of moisture diffusion in paper.' Journal of Pulp and Paper Sci.,31, 3, 121-127, 2005.
44. S. Lavrykov and B. V. Ramarao. 'Axi-symmetric pore-fiber model for transport processes in paper.' Nordic Pulp and Paper Res. J., 19, 3, (2004).
43. S. Lavrykov and B. V. Ramarao. 'Transient hygroexpansion of paper: Experimental Results and Mathematical Model', Nordic Pulp and Paper Res. J., 19, 2, 183-90 (2004).
42. S. Ramaswamy, M. Gupta, A. Goel, U. Aaltosalmi, M. Kataja, A. Koponen and B. V. Ramarao. 'The 3 D structure of fabric and its relationship to liquid and vapor transport.' Coll. Surf., A: Phys. Chem. Eng. Asp., 241, 323-333, (2004).
41. B. V. Ramarao, A. Massoquete, S. Lavrykov and S. Ramaswamy. 'Moisture transport in paper materials in the hygroscopic range and characteristics of diffusion parameters.' A review. DRT - Drying Technology, 21, 10, 2007-2056, (2003).
40. Chi Tien and B. V. Ramarao. AIChE Journal , 48(10), 2417-2418 (2002).

39. R. C. Francis, S. Chaiarrekij and B. V. Ramarao. J. Wood Chem. Tech., 23, 2, 113-129 (2003).
38. J. Liesen, B. Hojjatie, D. Coffin, S. Lavrykov, B. V. Ramarao, H. Beckham. Ind. Engng. Chem. Res., 41, 25, 6555-6565 (2002).
37. S. K. Mohan and B. V. Ramarao. 'A comprehensive study of self-induced torque amplification in rotary viscous couplings.' Trans. ASME, J. Tribology, 125, 110-120(2003).
36. S. Das and B. V. Ramarao. Sep. Pur. Technol. 28, 149-160 (2002).
35. S. Huang, A. Goel, S. Ramaswamy, B. V. Ramarao and D. Choi. APPITA Journal, 55, 3, 230-234(2002).
34. A. Bandyopadhyay, B. V. Ramarao, S. Ramaswamy. Coll.Surf. A, Phys.Chem.Engng,206,455(2002).
33. A. Bandyopadhyay, B. V. Ramarao and E. Shih. J. Imaging Sci. Tech. 45, 6, 1-14, (2001).
33. A. Goel, M. Tzanakakis, S. Huang, S. Ramaswamy, D. Choi, B. V. Ramarao Tappi J., 84, 5, 72-80(2001).

8. **Scientific and professional societies of which a member:**

Member, National Working Group, Nanotechnology in the Forest Products Industry. TAPPI.
American Institute of Chemical Engineers. AIChE.

9. **Honors and awards:**

NASA - Space Alliance Technology Opportunity Program (SATOP). Advised a small business on filter media. SATOP listed this as a success story and was extensively carried in the newsmedia in Florida. SATOP Award: Best partner in SATOP Alliances awarded to SUNY ESF, 2003.

University of Madras, India. Dr. M. A. Govinda Rau Gold Medal and Alagappa Chettiar Memorial Prize Award for student graduating at the top of the B. Tech. Class with best academic record. (Out of approximately 150 students).

10. **Institutional and professional service in the last five years:**

| | |
|---|---|
| Associate Director, Empire State Paper Research Institute | 2003-current |
| PSE Faculty Graduate Studies Chair | 2004-current |
| PSE Appointment Promotions and Tenure Committee Chair | 2004-current |
| PSE Undergraduate Education Committee, Member | |

Journal Manuscript/Proposal Reviewer – Separations & Purification Technology, AIChE Journal, Colloids and Surfaces, Journal of Colloid and Surface Science, Packaging Technology, Tappi Journal, Journal of Pulp and Paper Science.

11. **Professional development activities in the last five years**

Member, National Working Group, Nanotechnology in the Forest Products Industry. TAPPI.
Program Committee Member & Session Chair. 'Biomimetics and self-assembly'. Nanotechnology in the Forest Products Industry Conference, Atlanta GA 2006.
AIChE, Programming Chair, Forest Products Division, Group 17. 2005-2007.
Session Co-Chair. 'Nanotechnology in the Forest Products Industry.' AIChE Annual Meeting, Cincinnati OH 2005.
9th World Filtration Congress. American Filtration & Separation Society. New Orleans, LA:
Session Chair:: Paper Making and Rheology of Suspensions. 2004.
Tappi International Paper Physics Conference – Victoria BC, Canada. 2003.
Member, Meeting Program Committee.
Tappi & PAPTAC – Progress in Paper Physics – An International Seminar. Syracuse, NY 2002
Program Chair.
Session Chair. 'Fluid Mechanics and Rheology in the Forest Products Industry.' AIChE Annual Meeting, Reno, NV (2001).
Session Chair. 'Transport Processes in the Forest Products Industry.' AIChE Annual Meeting, Dallas TX (1999).
Session Chair. 'Transport Processes in the Forest Products Industry.' AIChE Annual Meeting, Miami Beach, FL (1998).
Program Chair. Symposium on Moisture Interactions with Paper Materials. Empire State Paper Research Institute, Syracuse, NY. 1998.

**GARY M. SCOTT**
**ASSOCIATE PROFESSOR**
**CURRICULUM VITAE SUMMARY**
**FACULTY OF PAPER SCIENCE AND ENGINEERING**
**SUNY - COLLEGE OF ENVIRONMENTAL SCIENCE & FORESTRY**
**SYRACUSE, NY 13210**

1. **Name and Academic Rank:** Gary M. Scott, Professor

2. **Degrees with field, institution, and date:**

| | |
|---|---|
| B.S., Paper Science and Engineering / Computer Information Systems, University of Wisconsin--Stevens Point | 1988 |
| M.S., Computer Sciences, University of Wisconsin | 1991 |
| Ph.D., Chemical Engineering, University of Wisconsin | 1993 |

3. **Number of years service on this faculty: 8.5**

| | |
|---|---|
| Professor | 2005 - date |
| Associate Chair | 2002 - date |
| Associate Professor | 2000 - 2005 |
| Assistant Professor | 1998 - 2000 |

4. **Other related experience**

| | |
|---|---|
| Instructor/Graduate Student Advisor, University of Wisconsin | 1994 - 1998 |
| Research Chemical Engineer (GS-13), U.S. Department of Agriculture | 1993 - 1998 |
| Research Assistant, University of Wisconsin | 1992 - 1993 |
| Teaching Assistant, University of Wisconsin-Madison | 1992 |
| Research Fellow, University of Wisconsin-Madison | 1988 - 1992 |
| Process Engineer Intern, Flambeau Paper Corporation | 1997 |
| Teaching Assistant, University of Wisconsin-Stevens Point | 1986 - 1988 |
| Faculty Assistant, University of Wisconsin-Stevens Point | 1983 - 1988 |
| Laborer, Mosinee Paper Corporation, Pulp and Paper Division | 1983 - 1986 |

5. **Consulting and Patents**

| | |
|---|---|
| ServiceCore | 2006 - date |
| Solvay Paperboard | 2003 - date |
| Biopulping International, Inc. | 1998 - date |
| GL&V Black Clawson-Kennedy | 1998 |
| Seoul National University, Visiting Lecturer | 1998 |
| Beloit Corporation | 1998 |
| Moore Research Center | 1999 |
| Weyerhaeuser Company | 1999 |
| Burrows Paper, Short Course Instructor | 2000 |
| Deferiet Paper Company | 2000 |
| Ahlstrom Machinery Corporation | 2001 |

Biopulping Industrial Wood Waste. Patent #6,402,887. 11 June 2002.
Method for Producing Pulp. Application #20030041985. 6 March 2003.
New Products and Processes from an Integrated Forest Biorefinery. 28 April 2006.

6. **State(s) in which registered**
None.

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

Akhtar, Masood; Scott, Gary M.; Swaney, Ross E.; and Shipley, David F. (2000). "Biomechanical pulping: a mill-scale evaluation," *Resources, Conservation, and Recycling*, 28, pp. 241-252.

Scott, Gary M. and Akhtar, Masood (2001). "Biotechnological Applications of Lignin-Degrading Fungi (White-Rot Fungi)," In: *Biopolymers, Volume 1: Lignin, Humic Substances and Coal*, Wiley-VCH, pp. 181-207.

Scott, Gary M. (2001). "On-Line Testing of Paper," In: *Handbook of Physical Testing of Paper*, Volume 2, Marcel Dekker, New York.

Scott, Gary M.; Akhtar, Masood; Swaney, Ross E.; and Houtman, Carl J. (2002). "Recent Developments in Biopulping Technology at Madison, WI," In: *Biotechnology in the Pulp and Paper Industry*, L. Viikari and R. Lantto (Editors), Elsevier Science B.V., Amsterdam, pp. 61-71.

Fei Jiang, Puapong Kongsaeree, Rose Charron, Curtis Lajoie, Haowen Xu, Gary Scott, and Christine Kelly 2006). "Production and Separation of Manganese Peroxidase from Heme Amended Yeast Cultures" (submitted).

Shijie Liu, Raymond C. Francis, Gary M. Scott and Thomas E. Amidon (2006). "A Kinetic Study on Hot-Water Extraction of Woodchips" (submitted).

Arthur J. Stipanovic, Jennifer S, Haghpanah, Thomas E. Amidon, Gary. M. Scott, Vincent Barber, and Kunal Mishra (2006). "Opportunities for Hardwood Hemicellulose in Biodegradable Polymer Blends" (submitted).

8. **Scientific and professional societies of which a member**

American Society for Engineering Education
Technical Association of the Pulp and Paper Industry

9. **Honors and awards.**

| | |
|---|---|
| Tappi Pulping Division, Certificate of Appreciation | 1999 |
| ACEEE Summer Study on Energy Efficiency in Industry, Best Poster | 1999 |
| U.S. Department of Agriculture, Excellence in Technology Transfer | 1998 |
| Federal Laboratory Consortium, Excellence in Technology Transfer | 1998 |
| Secretary of Agriculture Honor Award | 1997 |
| Tappi Pulping Conference High Impact Paper Award, 3rd Place | 1996 |
| United States Department of Agriculture, Certificate of Merit | 1994 - 1997 |
| National Science Foundation Fellowship | 1989 - 1992 |
| Department of Chemical Engineering Schulte Prize | 1988 - 1992 |
| Wisconsin Alumni Research Foundation Fellowship | 1988 - 1989 |
| UW-Stevens Point Albertson Medallion | 1988 |
| Letters and Science Achievement Award | 1988 |
| TAPPI Technical Achievement Award | 1988 |
| TAPPI Finishing \& Converting Paul Smith Scholarship | 1987 |
| Paper Science Foundation Scholarship | 1983 - 1988 |
| Mosinee Paper Corporation Norman S. Stone Scholarship | 1983 - 1987 |

10. **Institutional and professional service in the last five years**

| | |
|---|---|
| Joachim Center Program Advisory Board | 2005 - date |
| Joachim Endowment Financial Advisory Board | 2004 - date |
| Scientific Advisory Board, *Biopulping International* | 2001- date |
| Chair, Committee on Instruction | 2001 - 2003 |
| Middle States Accreditation Steering Committee | 2000 - 2002 |
| Development of General Education for PSE and ESF | 1999 - 2000 |
| Various PSE Committees | 1998 - date |
| International Editorial Board, *Korean Tappi* | 1998 - date |
| International Advisory Board, *Progress in Paper Recycling* | 1994 - date |
| Journal Manuscript/Proposal Reviewer | 1993 - date |
| Technical Association of the Pulp and Paper Industry | |

11. **Professional development activities in the last five years**

| | |
|---|---|
| Yearly participation Tappi Pulping Conference and other conferences | |
| Yearly participant in ESF's Colloqium on Teaching | |
| ABET Workshop | 2000, 2005 |

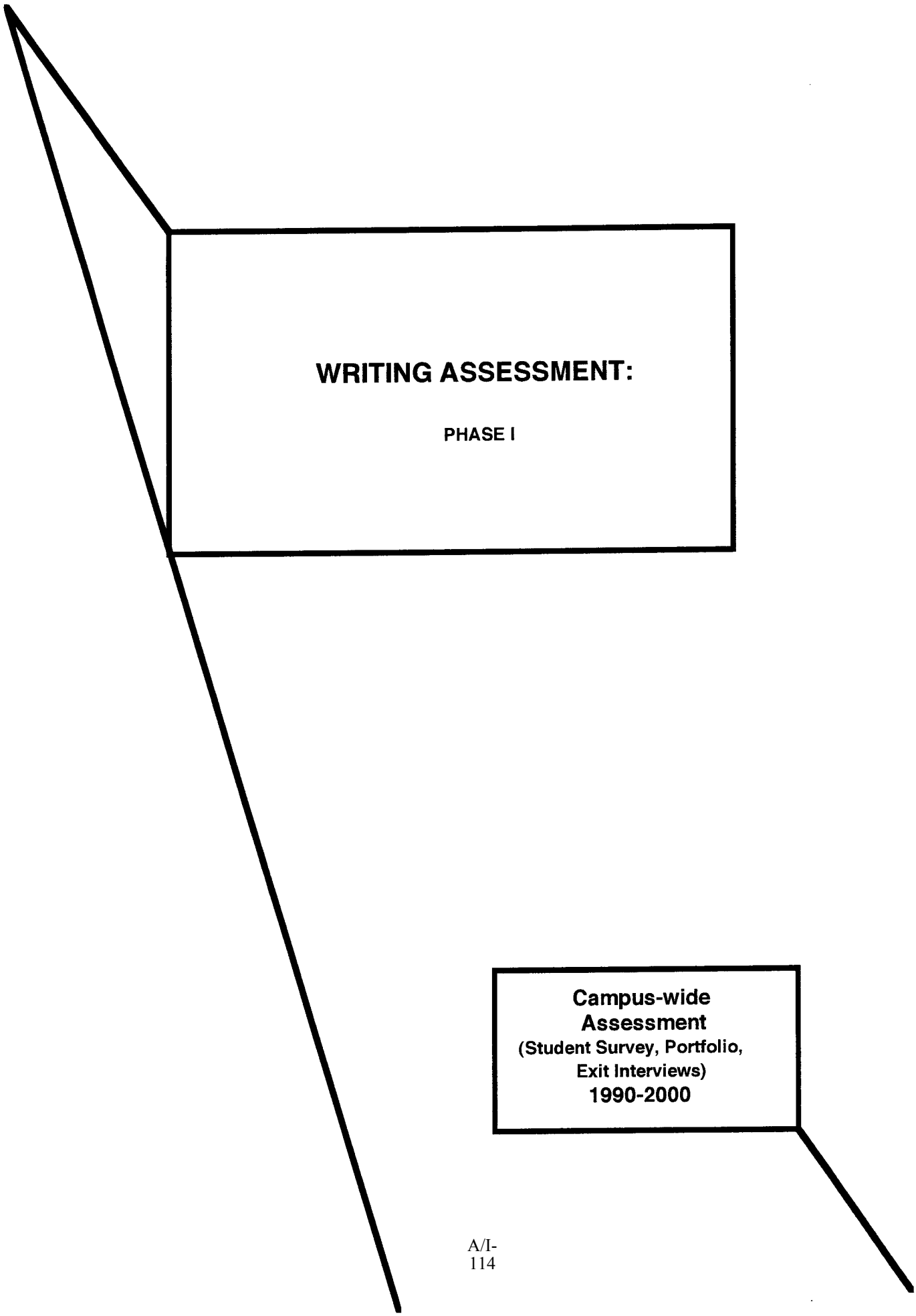
## E. Writing Assessment Report

# WRITING ASSESSMENT:

## PHASES I, II & III
## (1990-Present)

PREPARED FOR SUNY ESF BY
THE WRITING PROGRAM

Patrick Lawler (Director),
Janine DeBaise, Benette Tiffault
Environmental Studies
Spring 2009
SUNY ESF


WRITING ASSESSMENT:
PHASE I
Campus-wide
Assessment
(Student Survey, Portfolio,
Exit Interviews)
1990-2000

## A BRIEF OVERVIEW OF PHASE I :

The Writing Program's original assessment plan called for four sources of data collection divided into three categories:

- Category 1: Quantitative--through a self-evaluation inventory
  Data Collection: Attitude and Skill Survey

- Category 2: Process oriented--representative texts & reflective pieces
  Data Collection: Portfolio collection--focus group

- Category 3: Responsive Constructivist Evaluation--interviewing stakeholders
  Data Collection: Exit Interviews & Faculty Survey

During the first round of evaluation, we collected and analyzed the data and generated a report from our findings. Table 1 represents a summary of the findings and actions taken.

**THE WRITING PROGRAM**
**Phase I Assessment:**

**Outcomes/Instruments/ Feedback/Actions**

**Patrick Lawler**

**Environmental Studies**

| OUTCOME | OUTCOME STATEMENTS | INSTRUMENT/ METHOD | METHOD USED FOR: COURSES | METHOD USED FOR: CAMPUS | FEEDBACK | ACTIONS |
|---|---|---|---|---|---|---|
| Basic Skills | Students will be able to express themselves clearly with a minimum of errors. | Student survey & Portfolio | ATTITUDE AND SKILL SURVEY | PORTFOLIO COLLECTION | Students can use assistance with basic skills | WRITING RESOURCE CENTER |
| Rhetor-ical Skills | Students will be able to write in their fields with respect to a variety of audiences. | Portfolio | CLASS PORTFOLIO | PORTFOLIO COLLECTION | Rhetorical skills need to be introduced in basic courses | CLL 190 CLL 290 |
| Critical Thinking | Students will be able to critique and analyze their own writing and the writing of others. | Student survey & Portfolio | ATTITUDE AND SKILL SURVEY & CLASS PORTFOLIO | PORTFOLIO COLLECTION | Critical thinking needs to be emphasized | CRITICAL THINKING EMPHASIZED IN ALL CLL COURSES |
| Student Satisfac-tion | Students will be satisfied about their development as writers. | Student survey & Exit Interviews | ATTITUDE AND SKILL SURVEY | EXIT INTERVIEWS | Students need more writing opportunities | DEVELOP LIT. OF NATURE & OTHER CLL COURSES/ WID |
| Affective Develop-ment | Students will respond positively to writing. | Student survey & Portfolio | ATTITUDE AND SKILL SURVEY & CLASS PORTFOLIO | EXIT INTERVIEWS | Students need more writing opportunities | DEVELOP LIT. OF NATURE & OTHER CLL COURSES/WID |



**Table 1: Assessment Phase I**

# WRITING ASSESSMENT:

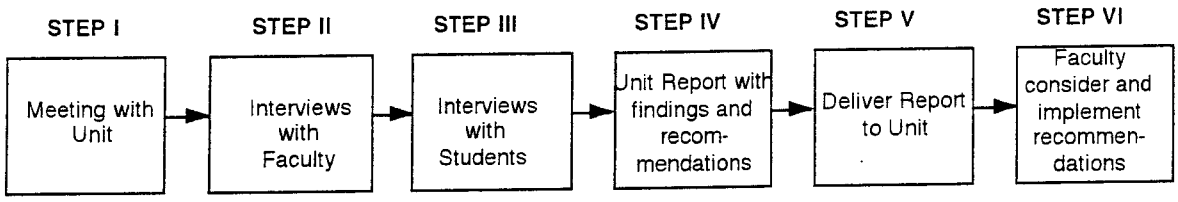
## PHASE II

**Faculty Unit Assessment**
**(Faculty & Student Interviews)**
**2000-2006**

## A BRIEF OVERVIEW OF PHASE II :

The Writing Program's second phase of Assessment began in fall 2000 and focuses on academic units. We are conducting interviews with faculty and students. The qualitative data gathered will be used by each academic unit and the Writing Program to continue to improve the ways by which ESF students learn to write in their fields of study.

The following graphic represents a six-step approach to Phase II Assessment:




We have completed assessment of two of our academic units--Paper Science and Landscape Architecture. The enclosed report includes the qualitative data, the interpretation of the data, and our recommendations. Table 2 represents a summary of the findings and recommended actions.

# THE WRITING PROGRAM
## Phase II Assessment:
### Outcomes/Instruments/ Feedback/Actions

Patrick Lawler, Janine DeBaise, Benette Tiffault

| OUTCOME | OUTCOME STATEMENT | INSTRUMENT/ METHOD | FEEDBACK | ACTIONS |
|---|---|---|---|---|
| **Basic Skills** | Students in the specific discipline will be able to express themselves with a minimum of errors. | Faculty Interviews/ Student Interviews | Students can use assistance with basic skills. | COURSES: Teacher intervention in the writing process/ UNIT: Communication handbook developed |
| **Rhetorical Skills** | Students in the specific discipline will be able to communicate with respect to a variety of audiences. | Faculty Interviews/ Student Interviews | Rhetorical skills introduced in variety of courses. | COURSES: Faculty workshops presented/ UNIT: Identify Writing Intensive Courses |
| **Critical Thinking** | Students in the specific discipline will be able to critique and analyze their own writing and the writing of others. | Faculty Interviews/ Student Interviews | Critical thinking emphasized in curriculum. | COURSES: Faculty workshops/ UNIT: Identify courses where communication skills can be emphasized |
| **Student Satisfaction** | Students in the specific discipline will be satisfied with their development as writers. | Faculty Interviews/ Student Interviews | Students provided with more writing opportun ties in curriculum. | COURSES: Emphasize writing to learn/ UNIT: Identify Writing Intensive Courses |
| **Affective Development** | Students in the specific discipline will respond positively to writing. | Faculty Interviews/ Student Interviews | Students provided with more writing opportunities in curriculum. | COURSES: Use informal and formal writing situations/ UNIT: Identify Writing Intensive Courses |



Table 2: Assessment Phase II

## Writing Assessment Overview

**Janine DeBaise**
**Benette Whitmore**

### Introduction

For a campus-wide assessment of student writing, we interviewed students (juniors and seniors) and faculty in each unit to assess the quantity and type of writing students were required to do. Data included information about the writing students do for specific courses, the types of guidance and feedback they get, and the ways in which writing is -- or isn't -- an integral part of learning at ESF.

For the most part, faculty and students saw writing as an essential part of the curriculum and the ability to write well as critical to success beyond the classroom. Both faculty and students said that writing was integral to their careers. The majority of faculty see writing as linked to critical thinking. Most saw writing both as a way to learn and as a way to communicate disciplinary knowledge.

Faculty agreed that students will do a great deal of writing in their careers. Although these answers differed a bit by unit, types of writing generally included: letters, memos, e-mails, grant proposals, press releases, public service announcements, speeches, newsletters, brochures, reviews, abstracts, environmental impact statements, web pages, academic essays, technical reports, journal articles, pieces of legislation, policy, and research papers. Even students who get jobs as technicians will someday have to keep notebooks, write e-mails, and write reports for supervisors. They will have to write up procedures, present their ideas in writing, keep notes, or convey results. Students who go onto grad school will be writing up formal research. They will write journal articles, grant proposals, patents, briefs, book reviews, or textbooks.

### Faculty reactions

The commitment to writing demonstrated by some of the faculty at ESF seems to rise from personal convictions rather than an institutional dedication to the teaching of writing. One faculty member noted that units do not require writing objectives to be part of formal course descriptions. Faculty include writing in their courses at their own discretion.

Time (or lack of it) is a major factor in deciding how much writing some of the faculty are able to incorporate into their courses -- and how much feedback they can give to

students. Several faculty members said that high enrollment in a course can limit how much individual feedback they can give on student papers. Some find ways to work around this problem by, for example, giving those students who especially want to work on writing skills the option of handing rough drafts in for professor comments. Other faculty say that they can afford to give graduate students individual help on papers but the number of students in undergraduate courses makes that option difficult.

Most of the faculty felt the students could use more guidance and could benefit from more writing but were worried about how time-consuming it can be to add writing to a course. The demanding technical content of many of the science courses leaves little time for writing exercises. Many of the faculty said that they wished the students were better writers: 75 percent of the Paper Science Engineering faculty, for instance, felt the students could use more feedback and guidance.

Many of the science faculty acknowledged that writing becomes more important after a student leaves college: While the students are at college, the teachers are more interested at looking the data, making sure the students have gotten the numbers right. Once the student leaves college, s/he will no longer be tested on the data. It will be assumed that the data is correct. They will have to write convincing arguments and present the data. Several teachers noted this difference between writing for college courses and writing after college. Students get the perception that the huge focus of their learning is on getting the technical data correct -- and of course, this is important -- but what students do not realize is how important writing will be after they leave college.

Almost all faculty cited the same problem: to adequately respond to student papers, especially if the papers are to go through multiple drafts, is time-consuming. Class size is the factor that determines how much writing can be incorporated into a course.

**Student data**

Many students in highly technical programs such as Paper Science Engineering or Chemistry expressed frustration with the tightness of their schedules – leaving little room for taking an elective literature or writing course -- and all said that time was an issue. They rarely have time to revise or proofread or write more than one draft.

Over half the Environmental Studies seniors interviewed, for example, said that they had not been asked to write often enough during their college career. Although they get a good deal of writing in the courses they take within the unit and the CLL courses give them solid experience with such things as peer review and multiple drafts, these students have traditionally taken many courses from other units or Syracuse University. The

science and math courses especially give them little chance to improve their writing. Commitment to writing within courses needs to be campus-wide.

Some courses, especially courses such as social science, include a great deal of writing, both formal and informal. Students are required to use writing as a way of learning, analyzing, and thinking critically. Students write papers to demonstrate disciplinary knowledge. Some courses at ESF include a wide range of writing.

But students complained about the lack of writing in many of the more technical courses they take elsewhere on the campus. Most of the hard science courses require little writing -- one lab report usually -- and student knowledge is tested through multiple choice tests. Some courses in the curriculum -- courses such as calculus, chemistry, and statistics -- require no writing at all. Students felt frustrated by the approach taken in the hard science classes. Many students said they would like to see, for example, a chemistry theory course that required some writing rather than the current general chemistry course that seems intended for chemists. Several students expressed their frustration with large lecture hall classes and multiple choice tests, which they felt did not encourage writing or thinking.

Many of the seniors had taken courses at Syracuse University and they said that the amount of writing required varied from course to course. The SU Geology course, for example, requires no writing and students are evaluated by multiple choice tests.

**Problems identified by faculty or students:**

• Students no longer arrive at ESF with the writing skills and the critical thinking skills needed for success in their careers. Writing and thinking are important skills which faculty need to teach.

• How much writing the students do in each course and what kind of feedback they get on that writing varies from course to course, from teacher to teacher. Some faculty incorporate writing into their courses because they feel strongly that writing is essential to intellectual development, but no unit has an official requirement or standard regarding writing across the curriculum efforts. Only one unit on campus—Environmental Resources and Forest Engineering— has created a handbook for faculty and students on writing and communication standards appropriate to their discipline. Faculty across campus said that they would like to see a stronger institutional statement emphasizing the importance of writing.

• Many of the faculty said that they didn't know what other faculty on campus did in their courses -- or how much writing students were required to do in other courses. Several said they would like to know what was happening in other courses so that the effort to teach students to write could be a more integrated group effort.

• Students felt that writing was an integral part of the some of the courses they took but that other courses require little or no writing.

• Incoming students often use a "cut and paste" approach to writing lab reports.

• Student in science courses rarely revise their writing because they don't have time to and the revision process is not built into their assignments.

• Many ESF students will be going into fields that require specialized kinds of writing, like chemistry. The kinds of technical writing done on this campus pose special kinds of challenges when it comes to teaching undergraduates to write well.

• Adding writing assignments -- and giving feedback to student writing -- is time-consuming for faculty especially if the class size is large. Many of the classes students take during their first two years at ESF are large lecture classes. Class size is a key factor in determining how much writing a teacher will require.

• Multiple drafts, revision, peer review, and proofreading -- although recognized by students as valuable parts of the writing process -- are very time-consuming for the student as well. Students felt lack of time was a factor in the intensive and highly technical programs at ESF.

**Strengths:**

• Small class size in upper level courses helps junior and seniors to focus more intently on their writing skills than in lower division courses. Upper level courses are often small so that teachers can take the time to respond to student writing without an overwhelming burden of paper grading.

• Most of the faculty commented that they respond mainly to the content of student writing: responding to content is very important feedback which helps students see writing as a way of communicating disciplinary knowledge.

• Students at ESF are sometimes given opportunities for collaborative writing.

• Both faculty and students think that writing is critical for student success outside college.

• Students seem eager for opportunities to improve their writing.

• Many units encourage students work closely with faculty. The senior research project in Chemistry, for example, which leads to a student writing a research paper, gives the senior students an opportunity to work closely with faculty on a writing project.

**Areas to be improved/Recommendations:**

• Class size, especially for the introductory courses taken by first and second year students, is a factor in how much writing will be included in the course and how much feedback the students will get on their writing. Discussions about class size should be included in faculty conversations about new or existing courses, especially for first year students.

• Students get most of the feedback on their writing on a final, graded draft. Most students acknowledged that they merely skim these comments on their papers. More feedback during the writing process, so that students can be forced to re-think their ideas and revise their writing, would help improve writing and critical thinking skills. Instructors could be encouraged to spend most of their time looking at drafts and spend the least amount of time on the final copy, reading that final copy merely for the purpose of giving it a grade. Instructors don't need to hugely increase the amount of time they spend on student papers; they need merely to shift their focus to a point earlier in the writing process.

• Students who are given clear guidelines when writing is assigned -- expected format, expectations as far as length and depth and content, clear guidelines for documentation, some discussion of audience and purpose, and time to look at writing samples -- feel more comfortable writing and usually do a better job. Some instructors do provide this guidance. A handbook for students and faculty (much like the handbook used by Environmental Resources and Forest Engineering) could help set uniform standards for each unit.

•Some teachers give clear guidelines, expectations, and samples while other teachers leave this up to the student. The unit may want to make writing a bigger part of the conversation about teaching that goes on.

• Faculty and students think that students need to work more on their writing during their first two years so that by junior year, they have solid writing skills.

•Faculty could incorporate more informal writing -- short, ungraded summaries, explanations, memos, journal entries, or reflective statements -- into their courses.

• Both faculty and students felt that learning to write clearly and concisely is important. Frequent short writing assignments could be integrated into classes. Students who are asked to summarize a reading or explain a concept in a paragraph would be practicing the same type of concise writing required in the industry. This need not be time-consuming for instructors. Instructors would not have to grade these every time: students can be asked on occasion to read them aloud or respond to each other's work.

• Students could have more opportunities to look at each other's papers and help each other with their writing. Peer review would work well with a group of students who know each other well. Many of the students already have access to student papers from other years; faculty could actually use this to their advantage.

• Faculty should encourage students to use the Writing Resource Center in Moon Library as needed at all stages of their writing process. Although most faculty and students were aware of the Writing Center, some students did not know that this resource exists. Most students who used the Writing Center were satisfied with their experience and returned for additional tutoring sessions on subsequent assignments.

• Faculty may want to consider choosing key courses to be writing intensive to ensure that all students get the writing experience they need before graduating.

| WRITING ASSESSMENT PROJECT: CONSTRUCTION MANAGEMENT & WOOD PRODUCTS ENGINEERING | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing and Communication Experiences in the CM/WP Curriculum** | Despite many attempts to solicit responses to this survey, only two faculty members and two students chose to participate. These numbers were lowest of all units surveyed and should be taken into account when interpreting this data.<br><br>Those faculty and students surveyed named a few writing and communication experiences outside of CLL courses, but the overall sense from students was that they did a minimal amount of writing. Students stated they did quite a number of oral presentations, but that a public speaking course would be "incredibly helpful." | Assignments with writing and communication requirements should be more present in the CM/WP curriculum. Students should have solid experience writing for different audiences, purposes, and contexts. This varied scope of writing assignments should be an integral part of the curriculum.<br><br>It may be useful to incorporate more oral presentations into courses, and to provide students with formal feedback on their presentations. A workshop for faculty on ways to respond to student presentations may be helpful. |
| **Writing in the Profession** | Both faculty members who responded to the survey believed writing to be central to success in the CM/WP profession. Also, both students surveyed said they understood that writing and other communication skills are essential to their success in the field. | Faculty should begin to emphasize the connection between strong writing/ communication skills and professional success. |
| **Writing as a Process** | Both students recognized writing as a process, but this knowledge came from their work in CLL courses where the writing process was continually emphasized, and where revisionwas integral to many assignments. | All faculty should consider adding more writing assignments, along with incorporating ways drafting into writing assignments. Additional writing projects would contribute to developing students' confidence and expertise in writing. Peer workshops are a strategy for emphasizing the writing process. |

| WRITING ASSESSMENT PROJECT: CONSTRUCTION MANAGEMENT & WOOD PRODUCTS ENGINEERING, p. 2 | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing and Communicating to Learn** | The two faculty respondents stated that it is important for their students to gain competency in writing and communication skills. Both students said they sometimes use writing to help them reflect and learn, and to think critically. | Students need 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 if they are not doing so already. |
| **Feedback on student writing** | One faculty member stated, "I know the students need help with their writing, but unfortunately, I'm too impatient to help them myself."<br><br>Another faculty said, "We probably should take a serious look at our student's writing skills and develop a serious program to address them." | 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.<br><br>100% of students were familiar with your Communications Handbook, and they felt it was an outstanding document. | Teachers should review their assignments to make sure they express clear guidelines and expectations for writing.<br><br>It would be useful to create a Communications Handbook, such as the one used in FNRM. |
| **Resources for Writing** | Neither student used the Writing Center as a support. However, one student said she would have utilized this service if one of her teachers had suggested it. | Faculty should consider referring their students to the Writing Resource Center at all stages of the writing process. |

**Environmental Studies**
**Assessment of Writing**

| AREA | ASSESSMENT | RECOMMENDATION |
|---|---|---|
| **Attitudes towards Writing** | Faculty are committed to teaching students to improve their writing.<br><br>Both faculty and students say that writing is essential to their careers. | Faculty should continue to integrate writing into the core courses of the curriculum to reflect this attitude.<br><br>Formal course descriptions could reflect this commitment to writing. |
| **Quantity of Writing** | Students felt that the amount of writing they did varied from course to course and semester to semester.<br><br>Over half the seniors (58%) said that they had not been asked to write often enough. | Although students do a great deal of writing in the courses they take within the department, many felt they did not do enough writing in courses offered by other departments or SU, especially science courses. |
| **Writing as Learning** | Both faculty and students were able to articulate the ways in which writing is learning.<br><br>Students felt that writing as learning was not incorporated in the science courses they take from other departments. | Because many of the courses taken by ES students are taught through other departments, any writing across the curriculum plan must be campus wide. |
| **Collaboration and Peer Review** | Students have ample opportunity for collaborative writing. The CLL courses give them solid experience with peer review. | Because students learn to do peer review in their CLL course, other instructors could take advantage of peer review as a way to give students in a large class more feedback on their writing. |

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| **Writing as Communication** | Students and faculty saw writing as an important way to communicate disciplinary knowledge. | Class size must be kept small if students are to get enough practice using writing as a way to communicate disciplinary knowledge. |
| **Writing Guidelines** | Students said that most teachers gave clear guidelines, usually a full page handed out during class, for writing assignments. | A collection of written assignment guidelines could be a valuable way for faculty to see what students do in other courses. |
| **Writing as Process** | The concept of writing as a process was reflected in many of the courses within the department, but not in all courses across both campuses. Most students participated in peer review and worked with drafts in their CLL courses. | Faculty could be encouraged to work multiple drafts into the assignment schedule when possible. Because ES students take a number of courses from other departments, a writing across the curriculum (WAC) initiative would need to be campus wide. |
| **Formal Writing** | Most of the courses within the department required at least one substantial formal paper. Students were frustrated that so many of these papers were due at the same time – at the very end of the semester. | Faculty should continue this commitment to formal writing. Whenever possible, they could make an effort to shift long formal papers to the middle of the semester rather than the end. |
| **Feedback** | Students would like to see more feedback on their writing. Most of the seniors (92%) felt their writing had improved during their time at ESF. | Faculty and teaching assistants should be encouraged to shift the amount of feedback they give to an earlier point in the writing process to allow students to incorporate that feedback in their revisions. |

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| **Resources for Writing** | Most (92%) were aware that ESF has a Writing Center. Students who had used the Writing Center: 8%. Students who had volunteered at the Writing Center: 25% Several students commented that the Moon Library staff had been very helpful when they were doing research for papers. | Faculty should continue to encourage students to seek help with writing at the ESF Writing Center and to make use of the Moon Library staff when researching paper topics. |

| WRITING ASSESSMENT PROJECT: ENVIRONMENTAL RESOURCES & FOREST ENGINEERING | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing and Communication Experiences in the ER/FE Curriculum** | All of the faculty and every student interviewed named writing and communication skills as essential to success in the ER/FE curriculum. They named a range of writing and communication experiences, including professional writing (lab reports, reports, proposals, posters, and specifications); academic writing (essays, research papers); and reflective writing (journals and reading responses). Students recognized graphs and charts as important communication tools. Although students feel they get some practice in public speaking, around 90% would like to have more experiences in this area. About 50% of students surveyed commented they would like to have a technical writing course, but at the same time, they see no place for it in the rigorous curriculum. | A substantial range of writing assignments is present in the ER/FE curriculum. Students have solid experience writing for different audiences, purposes, and contexts. This varied scope of writing assignments should continue.<br><br>It may be useful to incorporate more oral presentations into courses, and to provide students with formal feedback on their presentations. A workshop for faculty on ways to respond to student presentations may be helpful.<br><br>Adding a course in technical writing geared specifically for this major may be something to consider in the future. FEG 489 is doing some good work in this area, but students feel a need for something more. |
| **Writing in the Profession** | 100% of faculty believed writing to be central to success in the ER/FE profession. Also, 100% of students said they understood from their teachers that writing and other communication skills are essential to their success in the field. | Faculty should continue to emphasize the connection between strong writing/ communication skills and professional success. |
| **Writing as a Process** | Most students (85%) recognized writing as a process, but about 50% felt there were not always ample opportunities to revise their papers as part of the assignment, except in CLL courses where the writing process was consistently emphasized. | All faculty should consider ways to include multiple drafts as part of their writing assignments. They could also use peer workshops as a strategy to engage in the writing process. Additional time for writing projects would contribute to developing students' confidence and expertise in writing. |

| WRITING ASSESSMENT PROJECT: ENVIRONMENTAL RESOURCES & FOREST ENGINEERING, p. 2 | | |
|---|---|---|
| **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; interperting 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.<br><br>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.<br><br>Continue to promote the use of your unit's Communications Handbook. It sets an excellent standard that other units on the 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. |

**Paper Science & Engineering**
**Writing Assessment**

| AREA | ASSESSMENT | RECOMMENDATION |
|---|---|---|
| **Attitudes towards Writing** | Both faculty and students felt strongly that writing is important to the program and in the industry. Most of the students (88%) felt that writing was important to the program. | Faculty should continue to integrate writing into the core courses of the curriculum to reflect this attitude. |
| **Quantity of Writing** | Students spend an average of 9 hours each week writing. The program requires a substantial number of written labs and reports. | Faculty should continue this commitment to writing. |
| **Writing as Learning** | Over 75 percent of the students and 100 percent of the faculty see writing as an important component of learning. | Faculty could incorporate more informal writing – short, ungraded summaries, explanations, memos, journal entries, or reflective statements – into their courses. |
| **Collaboration and Peer Review** | Students have ample opportunity for collaborative writing. | More opportunities for peer review could be incorporated into the core curriculum. |
| **Writing as Communication** | Both students and faculty felt that feedback on writing focuses on content. Both saw writing as an important way to communicate disciplinary knowledge. | Faculty should continue to focus on content of students' writing, demanding accuracy, precision, and clarity. |

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| **Writing Guidelines** | Some teachers in the unit give clear guidelines, expectations, and writing samples while other teachers leave this up to the students. | Uniform department standards could be achieved through a handbook for students that could include format for labs, reports, memos, abstracts – and discussion of writing standards in the industry. |
| **Writing as Process** | Shortage of time in this highly technical, content-heavy program does not allow for multiple drafts or revision. | Faculty could work time for multiple drafts into the assignment schedule whenever possible. |
| **Formal Writing** | Students get a good deal of practice writing formal reports and labs. They have many opportunities to present their ideas to an audience. Students need more practice writing short concise one-page pieces of formal writing. | Faculty should continue this commitment to formal writing. A shift towards frequent short concise pieces of formal writing such as abstracts and one-page memos (rather than lengthy research papers) is recommended. |
| **Feedback** | Students get some feedback on their writing but it is almost always on final graded drafts. More than half of the seniors (62 percent ) felt their writing had improved during their time at ESF. | Faculty and teaching assistants should be encouraged to shift the amount of feedback they give to an earlier point in the writing process to allow students to incorporate that feedback in their revisions. |
| **Resources for Writing** | Most (88 percent) of the students did not know that ESF has a writing center. | Faculty should encourage students to seek help with writing at the ESF Writing Center. |

| WRITING ASSESSMENT PROJECT: FOREST AND NATURAL RESOURCES MANAGEMENT | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing and Communication Experiences in the FNRM Curriculum** | All of the faculty and every student interviewed named writing and communication skills as essential to success in the FNRM curriculum. They named a range of writing and communication experiences, including professional writing (e.g., lab reports, reports, proposals, management plans, environmental impact statements); academic writing (e.g., essays, research papers); and reflective writing (e.g., journals and reading responses). Students recognized graphs and charts as important communication tools.<br><br>Although students feel they get practice in the public speaking course, most would like to have more experiences in this area. | A substantial range of writing assignments is present in the FNRM curriculum. Students have solid experience writing for different audiences, purposes, and contexts. This varied scope of writing assignments should continue.<br><br>It may be useful to incorporate more oral presentations into courses, and to provide students with formal feedback on their presentations. A workshop for faculty on ways to respond to student presentations may be helpful. |
| **Writing in the Profession** | 100% of faculty believed writing to be central to success in the FNRM profession. Also, 100% of students said they understood from their teachers that writing and other communication skills are essential to their success in the field. | Faculty should continue to emphasize the connection between strong writing/ communication skills and professional success. |
| **Writing as a Process** | Most students (90%) recognized writing as a process, but about 50% felt there were not always ample opportunities to revise their papers as part of the assignment, except in CLL courses where the writing process was consistently emphasized. | All faculty should consider ways to include multiple drafts as part of their writing assignments. They could also use peer workshops as a strategy to engage in the writing process. Additional time for writing projects would contribute to developing students' confidence and expertise in writing. |

| WRITING ASSESSMENT PROJECT: FOREST AND NATURAL RESOURCES MANAGEMENT, p. 2 | | |
|---|---|---|
| **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.<br><br>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** | Eighty percent 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 they have a lot of content-related information to cover, 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** | Sixty percent of the students felt teachers gave "fairly clear" guidelines for writing assignments, while 40% felt there could be improvement in this area. | It may be useful for teachers to review their writing assignments to make sure they express clear guidelines.<br><br>Perhaps FNRM should develop a Communications Handbook for your students and faculty, which outlines expectations for various types of documents produced in this major. |
| **Resources for Writing** | Fifty percent of students said they have used the ESF Writing Center, and they felt their Writing Center experience was worthwhile. Three faculty members said they have referred students to the Writing Center and had good results.. | Faculty should consider referring their students to the Writing Center at all stages of the writing process. |

**Chemistry**
**Writing Assessment**

| AREA | ASSESSMENT | RECOMMENDATION |
|---|---|---|
| **Attitudes towards Writing** | Both faculty and students felt strongly that writing is important to the program and in the field of chemistry. Most of the students (83%) felt that writing was important to the program. | Faculty should continue to integrate more reading and writing into the core courses of the curriculum to reflect this attitude. |
| **Quantity of Writing** | Most students (67%) felt that they had done enough writing in their courses. The program requires a substantial number of written labs and reports although the bulk of these come in the junior and senior year. | Some of the writing the students do needs to be shifted into the first two years so that by the beginning of the junior year, students know how to write a report. |
| **Writing as Learning** | Most of the students (93%) and 100 % of the faculty see writing as an important component of learning. Some chemistry courses contain little or no writing. | Faculty could incorporate more informal writing – short, ungraded summaries, explanations, memos, journal entries, or reflective statements – into their courses. |
| **Writing as Communication** | Both students and faculty felt that feedback on writing focuses on content.<br><br>Both saw writing as an important way to communicate disciplinary knowledge. | Faculty should continue to focus on content of students' writing, demanding accuracy, precision, and clarity. |

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| **Writing Guidelines** | Some teachers in the unit give clear guidelines, expectations, and writing samples while other teachers leave this up to the students. | The department needs to make a discussion about writing part of the conversation about teaching. |
| **Writing as Process** | Shortage of time in this highly technical, content-heavy program does not allow for multiple drafts or revision. | Faculty could work time for multiple drafts into the assignment schedule whenever possible. |
| **Formal Writing** | Students get practice writing formal reports and labs. They have opportunities to present their ideas to an audience. | Faculty should continue this commitment to formal writing |
| **Feedback** | Students get some feedback on their writing but it is almost always on final graded drafts. More than half (58%) felt their writing had improved during their time at ESF. The senior research project gives students an opportunity to work closely with a faculty member on a writing project. | Faculty and teaching assistants should be encouraged to shift the amount of feedback they give to an earlier point in the writing process to allow students to incorporate that feedback in their revisions. |
| **Resources for Writing** | None of the students knew that ESF has a writing center. | Faculty should encourage students to seek help with writing at the ESF Writing Center. |

| WRITING ASSESSMENT PROJECT: LANDSCAPE ARCHITECTURE | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing in the LA curriculum** | All of the faculty and every student viewed writing as essential to success in the LA curriculum. They named a range of college writing experiences, including professional writing (reports, proposals, letters, memos, construction documents, concept statements, goals and objectives); academic writing (essays, research papers); critical writing (literature reviews); and reflective writing (journals and reading responses). | A substantial range of writing assignments is present in the LA curriculum. Students have experience writing for different audiences, purposes, and contexts. This scope of writing assignments should continue. |
| **Writing in the profession** | 100% of faculty believed writing to be central to success in the LA profession. Also, 100% of students said they understood from their teachers that writing skills are essential to their success in the field. | Faculty should continue to emphasize the connection between strong writing skills and professional success. |
| **Writing as a process** | Due to rigorous demands of studios and coursework in this major, students felt they had little time to devote to writing assignments. About 90% of the students believed writing projects were rushed. All faculty wanted their students to see writing as a process, saying they stressed drafting and revising, yet 80% of students perceived writing to have the lowest priority in relation to other work. About 30% of the faculty felt students resisted writing projects. | All faculty should consider ways to include multiple drafts as part of their writing assignments. They could also use peer workshops as a strategy to engage in the writing process. Additional time for writing projects would contribute to developing students' confidence and expertise in writing. |
| **Writing to learn** | Faculty commented that they use writing in their classes to help students elaborate on graphic expression, to flesh out ideas before making decisions, and to convey complex ideas. Most students said they use writing to help them reflect and learn, and to think critically. | The message that writing is a valuable skill which helps students discover and learn is important, and teachers should continue to emphasize this concept. |

| WRITING ASSESSMENT PROJECT: LANDSCAPE ARCHITECTURE. p. 2 | | |
|---|---|---|
| **Area** | **Assessment** | **Recommendations** |
| **Writing-across-the-curriculum initiatives** | All of the students valued writing assignments that were linked with studio design projects, saying that these connections made writing seem more relevant. The model they referred to is the fourth year studio design class and CLL 410. About 80% of the students said they would like to see better communication among ESF faculty in this regard. | Whenever appropriate, writing-across-the-curriculum initiatives should be explored and implemented. |
| **Feedback on student writing** | Almost 90% of the faculty expressed frustration because they spent a tremendous amount of time responding to student writing, yet they recognized little to no improvement in writing skills. | Faculty could benefit from workshops on strategies for grading student writing. Workshops on designing writing assignments could also be useful. |
| **Writing guidelines** | About 60% of the students felt teachers gave clear guide-lines, expectations, and writing samples, but 40% of the students would like more guidance in this area. | Uniform department standards could be achieved through a handbook for students and faculty that includes formats for various documents, as well as a discussion of writing standards in the profession. |
| **Resources for writing** | All faculty said they have referred students to the Writing Resource Center. About 90% of the students had used the Writing Center, and most felt the feedback they received was worthwhile. | Faculty should continue to refer students to the Writing Resource Center at all stages of the writing process. |

March 1, 2002

**Environmental & Forest Biology**
**Assessment of Writing**

| AREA | ASSESSMENT | RECOMMENDATION |
|---|---|---|
| **Attitudes towards Writing** | Both faculty and students say that writing is essential to their careers. Most faculty talked about how important publishing was to their careers.<br><br>Most of the students (83%) said that writing was an integral part of their college career. | Faculty should continue to integrate writing into the core courses of the curriculum to reflect this attitude.<br><br>Faculty should continue to stress the connection between strong writing skills and success in the field. |
| **Quantity of Writing** | Students felt that the amount of writing they did varied from course to course and semester to semester. Some courses require a lot of writing, while others have none at all. | The amount of writing in each course seems to be up to each professor. Faculty efforts to include writing in courses could be more consistent and coordinated so that students get the clear message that teaching students to write well is a priority in the department.<br><br>Students could be required to take a certain number of writing intensive courses. |
| **Writing as Learning** | Both faculty and students were able to articulate the ways in which writing is learning.<br><br>Students felt that writing as learning was not incorporated in some of their science courses.<br><br>Many students expressed their frustration with multiple choice tests. | The department needs to take a closer look at their courses to find ways in which writing can be incorporated as a learning strategy.<br><br>Faculty could incorporate more informal writing – summaries, explanations, journal entries, or reflective statements – into their courses. |

| | | |
|---|---|---|
| **Collaboration and Peer Review** | The CLL courses give them solid experience with peer review and collaboration. | Because students learn to do peer review in their CLL course, other instructors could take advantage of peer review as a way to give students in a large class more feedback on their writing. |
| **Writing as Communication** | Students and faculty saw writing as an important way to communicate disciplinary knowledge. Students felt frustrated by large lecture courses in which they did very little writing. | Class size must be kept small if students are to get enough practice using writing as a way to communicate disciplinary knowledge. |
| **Writing Guidelines** | Some faculty in the department make use of guidelines from professional journals such *The Journal of Wildlife Management* or *The Journal of Mammalogy.* Others do have clear guidelines for writing lab reports. | Encouraging students to follow the guidelines of professional journals is a good strategy in teaching them how to adapt their writing to a specific audience. |
| **Writing as Process** | The concept of writing as a process was reflected in many of the courses within the department. Students were given opportunities for revision in many of their courses. Most students participated in peer review and worked with drafts in their CLL courses. | Faculty should continue this commitment to multiple drafts and revision. |

| | | |
|---|---|---|
| **Formal Writing** | The students wrote formal essays for many of their general education courses and many lab reports. Many students said they wished they had learned to write a formal lab sooner so that they would be confident writing lab reports by junior year. | Faculty should continue this commitment to formal writing. Since incoming students often have no experience writing a formal lab report, faculty could talk about which courses in the first and second year incorporate the teaching of that skill. |
| **Feedback** | Students would like to see more feedback on their writing in science courses. Some felt that a "sink or swim" approach is used in some of the hard science courses. Many spoke highly of the feedback they received in CLL courses. | Science faculty need to be aware that teaching writing should be part of any course they teach. Faculty and teaching assistants should be encouraged to shift the amount of feedback they give to an earlier point in the writing process to allow students to incorporate that feedback in their revisions. |
| **Resources for Writing** | Most (83%) were aware that ESF has a Writing Center. Students who had used the Writing Center: 17%. Many had also gotten some help from Moon Library staff on research papers. | Faculty should continue to encourage students to seek help with writing at the ESF Writing Center and to make use of the Moon Library staff when researching paper topics. |

# WRITING ASSESSMENT:

**PHASE III**

## (GEN ED BASIC COMMUNICATION)

**PATRICK LAWLER**
**WRITING PROGRAM DIRECTOR**
**Campus-wide Assessment**
**(External Review)**
**2004-Present**

SUNY
COLLEGE OF ENVIRONMENTAL SCIENCE
AND FORESTRY
SYRACUSE, NY

ENVIRONMENTAL STUDIES
WRITING PROGRAM

# EXTERNAL PORTFOLIO REVIEW
# SUNY GEN ED ASSESSMENT IN BASIC COMMUNICATION
SPRING 2004 - PRESENT

STATE UNIVERSITY OF NEW YORK
COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
SYRACUSE, NY

PATRICK LAWLER
ENVIRONMENTAL STUDIES
WRITING PROGRAM

## BACKGROUND OF UNIT'S ESF ASSESSMENT ACTIVITIES (Phase I, II, and III):

The Writing Program has been actively engaged with Assessment since 1990. We have been investigating possible assessment strategies, determining outcomes, implementing various methods, evaluating results, modifying when appropriate. As a result, we have refined activities and advocated changes based on the information we have gathered through three phases of assessment.

For ten years, we were involved with Phase I of Assessment which was campus-wide and involved student and faculty surveys, portfolio collection, and exit interviews. After evaluating our results, we made recommendations and implemented appropriate actions which included the creation of courses and a writing center.

We entered Phase II of Assessment in the year 2000 where we have focused on the academic units--interviewing faculty and students. We are in the final stages of data collection and will be compiling the information and submitting a report at the end of the spring 2005 semester.

Phase III of Assessment began in fall 2002 and is a Gen Ed Communication Assessment, involving portfolio collection and external review. We have completed the portfolio collection, constructed a rubric, concluded the external review, and analyzed the data. The following report contains the methodology, results, and recommendations.

## METHODOLOGY:

As a part of the overall General Education initiative, SUNY requires that we assess Basic Communication on the ESF campus. To accomplish this we collected portfolios in our CLL 190 sections.

Our criteria were established according to the Interpretive Guidelines presented in the Report of the Provost's Advisory Task Force on General Education. I modified our rubric by combining the student learning outcomes for Basic Communication with the two competencies. (See attached "Communication Skills Learning Outcomes.") Thus, five areas were established to be evaluated: Research, Critical Thinking, Coherent Text Production, Text Revision, and Oral Presentations. Given these areas for consideration, I directed the CLL190 instructors to devise and collect assignments that would demonstrate the following:

1. Argumentation: The assignment used for the portfolio would be argumentative which was interpreted in an expansive manner. We were not suggesting the one-dimensional

Baker five-paragraph essay. Rather we were proposing something less reductive and polarizing. We did not think exclusively in terms of pro and con; rather we emphasized critical thinking skills with a whole range of possibilities where options might be considered and a spectrum of alternatives recommended. The key consideration was that our students would engage in critical thinking and support their ideas. A logical topic area for this essay would be an environmental issue.

2. Research: Evidence needed to be provided that indicated students researched their topics.

3. Revision: The portfolio would reflect a process-oriented approach to improving writing. A number of drafts would be included with comments from instructor and/or peer group.

4. Oral Presentation: Evaluations of an oral presentation would be included.

At the conclusion of the semester the portfolios were collected and were assessed by outside reviewers using the attached rubric. The external reviewers were Faith Plvan, Carolyn Hanlon, and Maureen Puetzer. They are affiliated with Syracuse University and have considerable administrative and teaching experience. Out of 125 collected portfolios, we selected at random twenty-five folders to use as our focus group. Each portfolio received the attention of two reviewers who ranked the material based on the performance standard established prior to the review.

The goal is to "derive evidence from the application of such assessment programs to show that the intended learning outcomes are being achieved; and use the results of assessment programs to improve the quality and effectiveness of General Education programs" (Implementation Guidelines for State University of New York Baccalaureate Candidate General Education Requirement, 1999).

RESULTS:

The attached "Summary of Individual Portfolio Rankings" provides the details of the external review. Each portfolio was ranked according to the following performance standard:

4. Exceeding
3. Meeting
2. Approaching
1. Not meeting

Each reviewer totaled the performance standard for each outcome statement and then the totals were averaged.

The attached "Portfolio Review Outcomes Matrix" provides a summary of the assessment results with average totals for each outcome area. For each of the Outcome Areas the averages are as follows:

| | |
|---|---|
| Research | 2.85 |
| Critical Thinking | 2.55 |
| Coherent Text Production | 2.77 |
| Text Revision | 2.72 |
| Oral Presentations | 2.90 |

RECOMMENDATIONS:
The following recommendations and ideas were compiled from the external reviewers at the conclusion of the assessment and during follow-up discussions and meetings.

1. Critical Thinking
Though there was an interdisciplinary approach evidenced in the portfolios, generally there needed to be more context with more evidence of audience analysis and concern for implications and significance. The reviewers commented that most of the students went beyond pure reporting and took positions that they supported with some evidence of critical thinking.

2. Research
As low-level research the results were very good--but the reviewers would like to have seen more diversity. There was a heavy reliance on the internet, and the reviewers suggested that many of the topics in the portfolios would have benefited by references from journals and/or books.

3. Audience
According to the reviewers our students could have been more aware of audiences' needs, expectations, and objections.

4. Revision
Sometimes there was more emphasis on sentence-level correction rather than on significant revision.

5. Oral Presentations
There should be more consistency on the evidence that is provided for this area. Perhaps a common evaluation form would be useful.

These ideas will be shared with Writing Program instructors, and it should be noted that many of these areas (audience analysis, research, and critical thinking) are focused upon in more depth in CLL290.

CONCLUSIONS:
At the level at which the students were considered (end of first semester first year), the rankings were quite high. Out of a perfect score of 20.0 (all exceeding), our students scored 13.8--an average of 2.76 per category which is on the threshold of meeting the performance standard. This External Review confirms we are on the right track with preparing our students in Basic Communication. Information will be shared with CLL 190 instructors and administrators. We will be preparing to assess CLL290 over the summer.

External Portfolio Review for SUNY Gen Ed Assessment in Basic Communication
NUMBER OF PORTFOLIOS: 25 out of 125 20%
DATE: 2/28/2004
REVIEWERS: Faith Plvan, Carolyn Hanlon, Maureen Puetzer

# PORTFOLIO REVIEW OUTCOMES MATRIX

SUNY ESF
ENVIRONMENTAL STUDIES:
THE WRITING PROGRAM
PATRICK LAWLER
EXTERNAL PORTFOLIO REVIEW :

| OUTCOME | OUTCOME STATEMENT | PERFORMANCE STANDARD | | % | AVERAGE TOTALS | SUMMARY |
|---|---|---|---|---|---|---|
| **Research** | Students will research a topic, develop an argument, and organize supporting details. | **4.Exceeding** | Student demonstrates thorough understanding of processes/concepts of research and provides new insights. | 4 | | **Twenty-five portfolios reviewed. A total of three external reviewers. Each portfolio considered by two reviewers.** |
| | | **3.Meeting** | Student demonstrates complete and accurate understanding of processes/concepts of research. | 50 | | |
| | | **2.Approaching** | Student demonstrates incomplete and inaccurate understanding of processes/concepts of research. | 46 | | |
| | | **1.Not Meeting** | Student demonstrates severe misconceptions about processes/concepts of research. | 0 | 2.85 | |
| **Critical Thinking** | Students will identify, analyze, and evaluate arguments as they occur in their own or others' work. Students will develop well-reasoned arguments. | **4.Exceeding** | Student demonstrates thorough understanding of processes/concepts of critical thinking and provides new insights. | 10 | | **Out of 250 rankings (5x2x25), there were 2 instances when the reviewer gave a 1 ranking. There were 14 instances when the reviewer gave a 4 ranking, and 140 instances of a 3 ranking or above** |
| | | **3.Meeting** | Student demonstrates complete and accurate understanding of processes/concepts of critical thinking. | 46 | | |
| | | **2.Approaching** | Student demonstrates incomplete and inaccurate understanding of processes/concepts of critical thinking. | 40 | | |
| | | **1.Not Meeting** | Student demonstrates severe misconceptions about processes/concepts of critical thinking. | 4 | 2.55 | |
| **Coherent Text Production** | Students will produce coherent texts within college-level written forms. | **4.Exceeding** | Student demonstrates thorough understanding of processes/concepts of coherent text production and provides new insights. | 6 | | |
| | | **3.Meeting** | Student demonstrates complete and accurate understanding of processes/concepts of coherent text production. | 56 | | |
| | | **2.Approaching** | Student demonstrates incomplete and inaccurate understanding of processes/concepts of coherent text production. | 38 | | |
| | | **1.Not Meeting** | Student demonstrates severe misconceptions about processes/concepts of coherent text production. | 0 | 2.77 | |
| **Text Revision** | Students will demonstrate the ability to revise and improve written texts. | **4.Exceeding** | Student demonstrates thorough understanding of processes/concepts of text revision and provides new insights. | 6 | | **Out of 25 portfolios 8 met or exceeded. 100% were at least approaching** |
| | | **3.Meeting** | Student demonstrates complete and accurate understanding of processes/concepts of text revision. | 68 | | |
| | | **2.Approaching** | Student demonstrates incomplete and inaccurate understanding of processes/concepts of text revision. | 26 | | |
| | | **1.Not Meeting** | Student demonstrates severe misconceptions about processes/concepts of text revision. | 0 | 2.72 | |
| **Oral Presentations** | Students will develop proficiency in oral discourse, and evaluate an oral presentation according to established criteria. | **4.Exceeding** | Student demonstrates thorough understanding of processes/concepts of oral presentations (delivery and evaluation) and provides new insights. | 6 | | **TOTAL PORTFOLIO 13.8 Out of possible total of 20.0** |
| | | **3.Meeting** | Student demonstrates complete and accurate understanding of processes/concepts of oral presentations regarding delivery and evaluation. | 68 | | |
| | | **2.Approaching** | Student demonstrates incomplete and inaccurate understanding of processes/concepts of oral presentations regarding delivery and evaluation.. | 26 | | |
| | | **1.Not Meeting** | Student demonstrates severe misconceptions about processes/concepts of oral presentations regarding delivery and evaluation.. | 0 | 2.90 | |



**Table: Assessment Phase III**

# CAMPUS REPORT (Page 2)

| Knowledge and Skills Areas Competencies | Learning Outcome | Information | | | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | Date of Assessment Semester/Year | Students Assessed | | % Exceeding Standards | % Meeting Standards | % Approaching Standards | % Not Meeting Standards |
| | | | n | % | | | | |
| Other World Civilizations | Knowledge of either a broad outline of world history, **or** the distinctive features of the history, institutions, economy, society, culture, etc., of one non-Western civilization | 5/05/03 | 35 | 26% | 63 | 16 | 21 | 0 |
| Humanities | Knowledge of the conventions and methods of at least one of the humanities in addition to those encompassed by other knowledge areas required by the General Education program | | | | | | | |
| The Arts | Understanding of at least one principal form of artistic expression and the creative process inherent therein | | | | | | | |
| Foreign Language | Basic proficiency in the understanding and use of a foreign language | | | | | | | |
| | Knowledge of the distinctive features of culture(s) associated with the language they are studying | | | | | | | |
| Basic Communication | Produce coherent texts within common college-level written forms | 2-28-2004 | 25 | 20% | 6 | 56 | 38 | 0 |
| | Demonstrate the ability to revise and improve such texts | | | | 6 | 68 | 26 | 0 |
| | Research a topic, develop an argument, and organize supporting details | | | | 4 | 50 | 46 | 0 |
| | Develop proficiency in oral discourse | | | | 6 | 68 | 26 | 0 |
| | Evaluate an oral presentation according to established criteria | | | | 6 | 68 | 26 | 0 |
| Critical Thinking (Reasoning) | Identify, analyze, and evaluate arguments as they occur in their own or other's work | April and September 2003 | 40 | | 20 | 20 | 20 | 40 |
| | Develop well-reasoned arguments | | | | | | | |
| Information Management | Perform the basic operations of personal computer use | | | | | | | |
| | Understand and use basic research techniques | | | | | | | |
| | Locate, evaluate and synthesize information from a variety of sources | | | | | | | |

# SUMMARY OF INDIVIDUAL PORTFOLIO RANKINGS

External portfolio Review for Gen Ed Assessment in Basic Communication
Submitted by Patrick Lawler/Spring 2004
Reviewers: Faith Plvan, Carolyn Hanlon, Maureen Puetzer

| PORTFOLIO Number | OUTCOMES Reseach | Critical Thinking | Coherent Text | Text Revision | Oral | TOTAL | TOTAL AVERAGE |
|---|---|---|---|---|---|---|---|
| 1. | 3.5 | 3.5 | 3 | 3 | 3.5 | 16.5 | |
| | 3 | 3 | 3 | 3 | 3 | 15 | 15.75 |
| 2. | 2.5 | 3 | 3.5 | 4 | 3 | 16 | |
| | 3 | 2 | 3 | 4 | 3 | 15 | 15.5 |
| 3. | 3 | 4 | 3.5 | 3.5 | 3 | 17 | |
| | 3 | 2.5 | 2.5 | 2.5 | 3 | 13.5 | 15.25 |
| 4. | 2.5 | 2.5 | 2.5 | 2.5 | 3 | 13 | |
| | 3 | 2 | 2 | 3 | 3 | 13 | 13 |
| 5. | 2 | 1 | 2.5 | 2 | 3 | 10.5 | |
| | 2.5 | 1.5 | 2 | 2.5 | 3 | 11.5 | 11 |
| 6. | 2.5 | 2.5 | 2.5 | 2.5 | 3 | 13 | |
| | 3 | 2 | 2.5 | 3 | 2.5 | 13 | 13 |
| 7. | 2.5 | 2.5 | 2.5 | 2.5 | 3 | 13 | |
| | 2.5 | 2,5 | 2.5 | 3 | 3 | 13.5 | 13.25 |
| 8. | 3 | 2 | 2.5 | 1 | 3 | 11.5 | |
| | 2.5 | 2 | 3 | 1.5 | 4 | 13 | 12.25 |
| 9. | 2.5 | 1.5 | 2 | 2 | 2 | 10 | |
| | 2.5 | 2 | 2 | 2.5 | 2.5 | 11.5 | 10.75 |

| PORTFOLIO Number | OUTCOMES Reseach | Critical Thinking | Coherent Text | Text Revision | Oral | TOTAL | TOTAL AVERAGE |
|---|---|---|---|---|---|---|---|
| 10. | 3 | 2.5 | 2.5 | 3 | 3 | 14 | |
| | 3 | 2 | 3 | 2 | 3 | 13 | 13.5 |
| 11. | 4 | 3.5 | 4 | 4 | 3 | 18.5 | |
| | 4 | 4 | 4 | 4 | 3 | 19 | 18.75 |
| 12. | 3 | 3.5 | 3 | 3 | 2.5 | 15 | |
| | 3 | 2.5 | 3.5 | 3 | 2 | 14 | 14.5 |
| 13. | 3 | 3 | 3 | 3 | 3 | 15 | |
| | 3 | 2.5 | 2.5 | 3 | 3 | 14 | 14.5 |
| 14. | 2 | 2 | 2 | 2 | 2.5 | 10.5 | |
| | 2 | 2 | 2 | 2 | 2.5 | 10.5 | 10.5 |
| 15. | 3 | 3 | 3.5 | 3 | 3 | 15.5 | |
| | 3 | 3 | 3 | 3 | 3.5 | 15.5 | 15.5 |
| 16. | 2.5 | 2 | 2.5 | 2.5 | 2 | 11.5 | |
| | 3 | 3 | 3 | 2 | 2.5 | 13.5 | 12.5 |
| 17. | 2.5 | 2 | 2 | 2 | 3 | 11.5 | |
| | 3 | 2 | 2 | 2 | 2 | 11 | 11.25 |
| 18. | 2 | 2 | 2 | 2 | 2.5 | 10.5 | |
| | 3 | 2.5 | 2 | 2 | 2.5 | 12 | 11.25 |
| 19. | 2 | 2 | 3 | 3 | 3 | 13 | |
| | 3 | 2.5 | 3 | 3 | 2.5 | 14 | 13.5 |

| PORTFOLIO Number | OUTCOMES Reseach | Critical Thinking | Coherent Text | Text Revision | Oral | TOTAL | TOTAL AVERAGE |
|---|---|---|---|---|---|---|---|
| 20. | 3 | 2 | 3 | 2 | 4 | 14 | |
| | 3.5 | 3.5 | 3.5 | 3 | 4 | 17.5 | 15.75 |
| 21. | 3 | 3 | 3 | 3 | 3 | 15 | |
| | 3 | 3 | 3 | 3 | 3 | 15 | 15 |
| 22. | 2.5 | 3 | 3 | 3 | 3 | 14.5 | |
| | 2.5 | 2.5 | 3 | 3 | 3 | 14 | 14.25 |
| 23. | 3 | 3 | 3 | 3 | 3 | 15 | |
| | 3 | 3 | 3 | 3 | 3 | 15 | 15 |
| 24. | 3 | 2.5 | 2.5 | 2.5 | 3 | 13.5 | |
| | 2.5 | 2 | 2.5 | 2 | 3 | 12 | 12.75 |
| 25. | 4 | 3 | 3 | 4 | 3 | 17 | |
| | 3.5 | 3.5 | 3.5 | 3 | 3 | 16.5 | 16.75 |

## F. General Education Assessment Report

### Revised Plan for Assessing Student Learning Outcomes in General Education: Meeting Strengthened Campus-based Goals

**SUNY College of Environmental Science and Forestry**

Approved by the College Faculty, February 2, 2006

ESF concluded its first three-year general education assessment cycle with the 2004-05 academic year. The following table, based on preliminary discussions, outlines a second cycle implementation plan intended to reflect lessons learned in the first cycle and changing SUNY System guidelines and expectations.

ESF's refocused General Education assessment plan will focus faculty and administrative time, energy and attention on the following areas:

- Mathematics
- Basic Communications
- Critical Thinking
- Academic Environment

Rationale:

1. There are unique challenges to assessing general education at ESF:

   - ESF has a significant population of transfer students who come to ESF from as many as 50 different institutions each year both from within and outside SUNY, as well as beyond the borders of New York State. Approximately 50% of our undergraduate students enter as first year students while the other 50% enter as transfer students. The large transfer population makes general education assessment especially vexing: it is difficult to collect and feed information back into course improvement and selection processes.
   - A significant percentage of general education courses are provided to our students from outside the direct control of our faculty and administration. With the exception of natural science and basic communication, a significant percentage of our general education courses are provided through an accessory instructional contract through our sister institution, Syracuse University.
   - Another challenge stems from the fact that our faculty does not include the entire breadth of disciplinary knowledge required of students as set forth in the SUNY General Education guidelines. This impacts our ability both to set threshold levels and assess student attainment.

2. The data we are collecting to inform General Education accomplishments and improvements is rather "thin". This is to say that, in contrast to some other SUNY schools, we are basing our results and recommendations on data derived from one and at most two courses in each of the various General Education areas.

3. ESF's curricula, including our General Education program, reside in the context of (A) expatiations and parameters established by ABET, SAF, ASLA and other accrediting and certifying bodies, (B) doctoral education and research, and (C) our specialized mission.

4. A General Education assessment effort that focuses time, energy and attention on those outcomes areas that are truly and explicitly pertinent to all undergraduate programs will have greater efficacy in terms of both the information it yields and the follow-up considerations and actions to which it leads.

5. All other General Education outcome areas will remain an important and valued part of our undergraduate education and will be considered within and as part of Academic Program review.

6. This plan adheres to the guidelines and expectations for "Strengthened" Campus-based General Education Assessment.

| Cycle | Outcome Area | Course or Other Assessment Approach | SUNY Outcomes | Lead Faculty | Faculty Chair | Costs |
|---|---|---|---|---|---|---|
| Every three years beginning 2006 - 07 | Mathematics | ACT (nationally-normed instrument). Administered in a designated class(s) TBA (as per SUNY guidelines). | Students will show competence in:<br>▪ Interpret and draw inferences from mathematical models such as formulas, graphs, tables, and schematics;<br>▪ represent mathematical information symbolically, visually, numerically and verbally;<br>▪ employ quantitative methods such as arithmetic, algebra, geometry, or statistics to solve problems;<br>▪ estimate and check mathematical results for reasonableness; and<br>▪ recognized the limits of mathematical and statistical methods. | Abdel-Aziz | Dawson | SUNY |
| Every three years beginning 2006 - 07 | Critical Thinking | ACT (nationally-normed instrument).<br>Administered in a designated class(s) TBA (as per SUNY guidelines). | **Students will:**<br>▪ Identify, analyze, and evaluate arguments as they occur in their own or others' work<br>▪ Develop well-reasoned arguments. | Beal | Leopold | SUNY |
| Every three years beginning 2006 - 07 | Basic Communications | ACT (nationally-normed instrument).<br>Administered in two class sessions w/the same population a designated class(s) TBA (as per SUNY guidelines). | Students will:<br>▪ Produce coherent texts within common college-level written forms.<br>▪ Demonstrate the ability to revise and improve such texts | Lawler | Smardon | SUNY |
| Every two years continuing from 2004 - 05 | Academic Environment | National Survey of Student Engagement (NSSE). | NA | Bongarten | NA | SUNY |

**ASSESSMENT OF STUDENT LEARNING OUTCOMES**

**IN GENERAL EDUCATION**

**CAMPUS REPORT**

**Campus:** SUNY ESF **Academic Year:** 2004-05

{*specify name of branch campus, if relevant*}

| Knowledge and Skills Areas / Competencies | Learning Outcome | Information | | | Results[1] | | | |
|---|---|---|---|---|---|---|---|---|
| | | Date of Assessment Semester/Year[2] | Students Assessed | | % Exceeding Standards | % Meeting Standards | % Approaching Standards | % Not Meeting Standards |
| | | | n | %[3] | | | | |
| Mathematics[4] | Arithmetic, Algebra, Geometry | | | | | | | |
| | Data analysis, Quantitative reasoning | 7/8/02 | 154 | 88% | 27 | 18 | 25 | 30 |
| Natural Sciences | Understanding of the methods scientists use to explore natural phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical analysis | Fall 2003 | 111 | 79 | 52 | 26 | 15 | 7 |

[1] Each student should be counted only once and the four percentages should total 100%. System Administration will combine category results, as appropriate, for aggregate reporting purposes; for example, "meeting" and "exceeding" as "meeting and exceeding."

[2] Enter the previous date, the current date or the planned date, whichever is appropriate.
[3] As a percentage of the students enrolled in courses intended to address this learning outcome.
[4] The five explicit learning outcomes in Mathematics in the *Implementation Guidelines* should be grouped, for reporting purposes, as two outcomes: [Arithmetic, Algebra, Geometry] and [Data analysis, Quantitative reasoning].

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Application of scientific data, concepts, and models in one of the natural sciences | Fall 2003 | 30 | 21 | 47 | 10 | 13 | 30 |
| Social Sciences | Understanding of the methods social scientists use to explore social phenomena, including observation, hypothesis development, measurement and data collection, experimentation, evaluation of evidence, and employment of mathematical and interpretive analysis | 2004-05 | 122 | 99 | 23.5 | 41.5 | 25 | 10 |
| | Knowledge of major concepts, models and issues of at least one discipline in the social sciences | 2004-05 | 119 | 99 | 38 | 34.25 | 20 | 8 |
| American History | Knowledge of a basic narrative of American history: political, economic, social, and cultural, including knowledge of unity and diversity in American society | | | | | | | |
| | Knowledge of common institutions in American society and how they have affected different groups | | | | | | | |
| | Understanding of America's evolving relationship with the rest of the world | | | | | | | |
| Western Civilization | Knowledge of the development of the distinctive features of the history, institutions, economy, society, culture, etc., of Western civilization | Spring 2004 | 114 | 96.6 | 36.75 | 40 | 12.25 | 11 |
| | Relate the development of Western civilization to that of other regions of the world. | Spring 2004 | 114 | 96.6 | 49 | 24.5 | 15 | 11.5 |

**ASSESSMENT OF STUDENT LEARNING OUTCOMES**

**IN GENERAL EDUCATION**

**CAMPUS REPORT (Page 2)**

| Knowledge and Skills Areas / Competencies | Learning Outcome | Information | | | Results | | | |
|---|---|---|---|---|---|---|---|---|
| | | Date of Assessment | Students Assessed | | % | % | % | % |
| | | Semester/Year | n | % | Exceeding | Meeting | Approaching Standards | Not Meeting |
| Other World Civilizations | Knowledge of either a broad outline of world history, **or** the distinctive features of the history, institutions, economy, society, culture, etc., of one non-Western civilization | 5/05/03 | 35 | 26% | 63 | 16 | 21 | 0 |
| Humanities | Knowledge of the conventions and methods of at least one of the humanities in addition to those encompassed by other knowledge areas required by the General Education program | Spring 2005 | 30 | 20% | 10 | 63 | 27 | 0 |
| The Arts | Understanding of at least one principal form of artistic expression and the creative process inherent therein | Spring 2004 | 19 | 38% | 10.5 | 32 | 47 | 10.5 |
| Foreign Language | Basic proficiency in the understanding and use of a foreign language | | | | | | | |
| | Knowledge of the distinctive features of culture(s) associated with the language they are studying | | | | | | | |
| Basic Communication | Produce coherent texts within common college-level written forms | 2-28-04 | 25 | 20% | 6 | 56 | 38 | 0 |
| | Demonstrate the ability to revise and improve such texts | | | | 6 | 68 | 26 | 0 |
| | Research a topic, develop an argument, and organize supporting details | | | | 4 | 50 | 46 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Develop proficiency in oral discourse | | | | 6 | 68 | 26 | 0 |
| | Evaluate an oral presentation according to established criteria | | | | 6 | 68 | 26 | 0 |
| Critical Thinking (Reasoning) | Identify, analyze, and evaluate arguments as they occur in their own or other's work | April and September 2003 | 40 | | 20 | 20 | 20 | 40 |
| | Develop well-reasoned arguments | | | | | | | |
| Information Management | Perform the basic operations of personal computer use | NA | NA | | NA | NA | NA | NA |
| | Understand and use basic research techniques; locate, evaluate, and synthesize information from a variety of sources | Spring 2005 | 24 | 38% | 8.3 | 83.3 | 8.3 | 0 |

# SUNY College of Environmental Science and Forestry

## Provost's Advisory Committee On Effectiveness

## April 29, 2002

## Introduction

The College of Environmental Science and Forestry (ESF) has a long tradition of strong programs based on mathematics, natural science, social science, basic communications, critical thinking, and information management. While many students explored a broader range of knowledge with their electives, the SUNY General Education requirements now insure that all students have additional breadth to their undergraduate programs. The ESF faculty has embraced general education and the assessment of results. We are looking at assessment both narrowly, as defined by GEAR, and broadly, as encouraged by Middle States and several professional accreditation boards that review ESF undergraduate programs.

The assessment strategy presented in this document focuses on the results ESF and SUNY expect from the core general education requirements. The assessment is in the first and second years. For each area of knowledge and each criterion, ESF is developing a direct measure of student learning. In all cases, the measurements have face validity and reliability. Many are on going and measures will be available every year. Where the measurements used require panels and other more costly methods, statistically valid samples will be taken every three years.

The ESF faculty intends to learn from its GEAR assessment process. This new knowledge will help improve the courses and experiences used to fulfill its general education requirement. More important, this assessment system will be integrated into college and program assessment and learning systems that span the four-year curricula. All the professional programs and chemistry have capstone or integrative experiences in the senior year. These are being used to assess overall educational results, especially with regard to critical thinking and information management.

In each program, capstone courses also provide opportunities to assess learning and retention of specific concepts and skills that are important to professional practice. In Forest and Natural Resource Management, for example, students are expected to integrate quantitative, ecological, and economic concepts in context of measurement, vegetation manipulation, and public participation actions. All the applied engineering programs integrate design with science and mathematics in their final projects.

We believe our proposed assessment of learning outcomes will demonstrate objectively the results of our general education strategy and plan. Indeed, we are confident that the ESF general education program will demonstrate results considerably in excess of meeting our own high standard. However, we also expect to learn a great deal from the assessments that will lead to educational improvements across the college and in all programs.

## A Framework for Assessing

## Student Learning Outcomes in General Education

The following section describes a framework for assessing student learning outcomes in general education at SUNY ESF. The framework is intended to address each of the eight criteria the General Educational Assessment Review (GEAR) Group will use to evaluate this plan's comprehensiveness and rigor (as outlined in the GEAR Group's *Review Process Guidelines).* The eight GEAR criteria, in effect, represent a process model for the assessment of General Education learning outcomes and program improvement.

1. **Objectives for student learning in General Education relate directly to the student learning outcomes defined in the *Implementation Guidelines* of the Provost's Advisory Task Force on General Education**.

   For each knowledge, skill and competency area, ESF has adopted the General Education learning outcomes as defined in the *Implementation Guidelines* of the Provost's Advisory Task Force on General Education. In some cases, additional and more specific learning objectives were determined to be consistent with the spirit and intent of the Task Force's overarching General Education outcomes.

2. **Programmatic activities intended to accomplish the campus' objectives for student learning in General Education are described.**

   The programmatic activities and courses that relate to, and are likely to result in, the achievement of the campus programmatic objectives are outlined. As described in *General Education Program and Implementation Plan at SUNY College of Environmental Science and Forestry* (21 December 1999; modified 14 August 2000):

   > The College Faculty adopted the following 9 Guiding Principles in developing the design of one campus-wide general education program that incorporates alternative curricula for each undergraduate major. Each curricula will meet the required outcomes standards and build on an appropriate portion of the general education requirement within their professional or science curricula, thereby reinforcing and enriching, rather than diverting from mission and accreditation concerns.

   a. Each specialized ESF program has always included a rich array of general education learning outcomes, with exceptional strength and depth in the natural science along with fully integrated competencies in critical thinking and information management. The depth and breadth of specific requirements in mathematics, social sciences, humanities and communications have varied according to program needs.
   b. Beginning in the fall 2000 semester each entering first year undergraduate at ESF will, as a degree requirement, satisfy nine of the ten knowledge areas and both competency areas of the State University General Education Requirement. These requirements will also go into affect for transfer students to ESF beginning in the fall 2002 semester.

c. The College has no formal campus-wide knowledge requirement for proficiency, understanding, and use of a foreign language and knowledge of the distinctive features of culture(s) associated with such foreign language.

d. Each student will demonstrate knowledge in 9 General Education areas through learning outcomes in at least 27 credit hours of coursework. All students will attain competency in critical thinking and information management throughout their academic programs.

e. Of the 27 credit hours dedicated to the nine areas of the State University General Education Requirements, no more than 3 credit hours may be accounted for in any single knowledge area.

f. Each ESF degree program has its unique rationale for general education that delineates the philosophy of their program's general education content and approach to student learning.

*g.* The general and specialized education components of each ESF degree program are design with the success of transfer students in mind. Accordingly, no more than 6 credit hours of general education coursework are expected to be at the upper division level.

*h.* Faculty collaboration in the design of ESF general education has helped develop a rich array of general education coursework and learning outcomes appropriate to our specialized programs. When great breadth or more likely greater depth is appropriate to the curriculum and student educational needs the wide array of more traditional arts and sciences offering at neighboring Syracuse University is utilized.

*i.* Competencies in both critical thinking (reasoning) and information management are infused throughout the ESF general education program. In Bachelor of Science programs the development of competencies will be given emphasis in the knowledge areas of mathematics, natural sciences, social sciences and basic communication.

3. **The measures developed to assess student learning are designed to provide credible evidence of the extent to which students have achieved the learning outcomes or skills stated in the objectives.**

   The measures selected to assess student learning relate directly to the learning outcomes as stated. This is evidenced by the specific assessment measures described in the plans for each outcome as submitted in this document. Generally two types of assessment are used: direct testing and qualitative portfolio reviews by independent experts. Issues of validity, reliability, and sampling are addressed with respect to each general education requirement category in the attached narratives and matrices.

4. **The plan proposes standards to which student performance relative to the learning outcomes in the objectives can be compared.**

   For each learning objective, the standard has been defined to indicate the level of student performance the faculty considers as "exceeding," "meeting," "approaching," and "not meeting" the standards. Both rubrics and quantitative standards will be employed as described in the attached plans for assessing each outcome.

5. **The anticipated results of the assessment are able to affirm the degree to which the learning objectives have been achieved and thus make it possible to identify areas that need to be addressed in order to improve learning.**

   An annual review of assessment results will be made by a faculty and administrative General Education assessment committee. Results will be shared with the executive committee of faculty governance, the Provost, and the academic council (which includes all faculty department chairs).

The General Education assessment committee will be composed of faculty and administrative representatives involved with development of the assessment plan. It will include liaisons with the faculty governance curriculum review committee and the Associate Dean for Instructional Quality Improvement.

Specific recommendations for programmatic improvement will be initiated on the faculty (departmental) level following existing protocol for curricular change. Any programmatic changes based on assessment results will be reviewed by the College faculty curriculum committee, faculty governance and the General Education assessment committee.

6. **The assessment plan has been reviewed and approved through the appropriate curriculum and faculty governance structures.**

   The ESF assessment plan has been reviewed and endorsed by the following groups:

   a. The Provost's Advisory Committee on Effectiveness (PACE)
   b. The Faculty Governance committee on instruction and subcommittee
   c. Faculty Governance

7. **The plan adheres to the timetable established by the GEAR Group and agreed to by the University Provost.**

   The implementation of the ESF General Education assessment pilot program follows the spirit of the GEAR Groups three-year schedule for the assessment of learning outcomes.

| | |
|---|---|
| 2002/03 | Mathematics |
| | Natural Sciences |
| | Critical Thinking |
| 2003/04 | Western Civilization |
| | Basic Communications |
| | Other World Civilizations |
| | The Arts |
| 2004/05 | American History |
| | Information Management |
| | Humanities |
| | Social Sciences |

8. **The assessment process includes provisions for evaluating the assessment process itself and disseminating assessment results to the appropriate campus community.**

   The general education assessment process will be evaluated by the Provost's Advisory Committee on Effectiveness, the General Education assessment committee, faculty governance Executive Committee, and faculty involved in measuring learning outcomes. These groups will consider the quality of information gathered and the process itself. Modifications, as appropriate, will be made to our assessment process based on this feedback.

   In addition, the results of annual assessments will be disseminated widely as described in item number 5 above. Any feedback from Faculty units based on dissemination of annual assessment results will also be considered.

## *PACE Membership*

### Faculty Governance

S. Shannon, Executive Chair

Valerie Luzadis, Executive Committee Member

Gary Scott, Chair, Committee On Instruction

D. Steven Keller, Chair, Committee on Instruction – Subcommittee on Instructional Quality Charles

Maynard, Chair, Committee on Research

Dudley Raynal, Chair, Committee on Public Service

**Academic Council**

James Hassett, Chair, Faculty of Environmental Resources and Forest Engineering

Richard Smardon, Chair, Faculty of Environmental Studies

William Bentley, Chair, Faculty of Forestry

**Administration**

Robert Frey, Dean, Instruction and Graduate Studies
Edwin White, Dean, Research
Horace Shaw, Director, Continuing Education
Maureen Fellows, Director, Information Technology and Institutional Planning
Julie White, Associate Dean, Student Life and Experiential Learning
Chuck Spuches (Chair), Associate Dean, Educational Outreach, Instructional Quality Improvement, and Instructional Technology

**References**

General Education Program and Implementation Plan at SUNY College of Environmental Science and Forestry (21 December 1999). Prepared by the College's Academic Council, Administration, and Faculty Chairs, in conjunction with the College's Faculty Committee on Instruction and Subcommittee on General Education.

General Education Assessment Review (GEAR) Group: *Review Process Guidelines* (November 9, 2001).

## G. Surveys

## I. Summer/Co-Op Employer Evaluation

## College of Environmental Science and Forestry

**Faculty of Paper Science and Engineering**

**Syracuse, New York**

**Employer Evaluation Form**

Student Name: Michael Sanger Record No. 144

Company: MeadWestvaco Corp.

Work Period: 2004.3 Fall

Supervisor: Albert Miller, Engineering Aide Team Leader

Signature: _____ Date _____

Telephone Number: _____

**Instructions:** The immediate supervisor should evaluate the student objectively, comparing him/her with other students of comparable academic level, with other personnel assigned the same or similar jobs.

**ACADEMIC PREPAREDNESS**

Did you find the student's academic preparation adequate for your needs?

☐ Yes ☐ No ☐ Not Sure

In which areas would you like to see more proficiency?

☐ Technical knowledge ☐ Verbal communication skills

☐ Technical writing ☐ Hands-on knowledge

☐ Computer skills ☐ Safety

☐ Teamwork skills ☐ Others (please list)

_____

If you care to make any comments on the following topics (or your own) relative to the student's academic preparedness, please do so here:

Work habits:

Safety awareness:

Accepting responsibility:

Ethical responsibility:

Communicating with e-mail, etc.

Total quality concepts:

Fundamentals of math, science, and engineering:

Broad societal issues regarding the paper industry ("big picture"):

**PROFESSIONAL WORK HABITS**

**Relations with others**

- ☐ Exceptionally well accepted
- ☐ Works well with others
- ☐ Gets along satisfactorily
- ☐ Has difficulty working with others
- ☐ Works very poorly with others

**Dependability**

- ☐ Completely dependable
- ☐ Above average in dependability
- ☐ Usually dependable
- ☐ Sometimes neglectful or careless
- ☐ Unreliable

**Attendence**

- ☐ Regular
- ☐ Irregular

**Attitude-Application to work**

- ☐ Outstanding in enthusiasm
- ☐ Very interested and industrious
- ☐ Average in diligence and interest
- ☐ Somewhat indifferent
- ☐ Definitely not interested

**Ability to learn**

- ☐ Learns very quickly
- ☐ Learns readily
- ☐ Average in learning
- ☐ Rather slow to learn
- ☐ Very slow to learn

**Punctuality**

- ☐ Regular
- ☐ Irregular

**Judgement**

- ☐ Exceptionally mature
- ☐ Above average in making decisions
- ☐ Usually makes the right decision
- ☐ Often uses poor judgement
- ☐ Consistently uses poor judgement

**Quality of work**

- ☐ Excellent
- ☐ Very good
- ☐ Average
- ☐ Below average
- ☐ Very poor

What are the student's major strengths?

What specific areas of improvement may help the student's advancement?

**OVERALL PERFORMANCE:**

| Outstanding | + Very Good - | + Average - | + Marginal - | + Unsatisfactory - |
|---|---|---|---|---|
| ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ ☐ | ☐ ☐ | ☐ |

Did the student's performance improve during the course of the internship?

☐ Yes ☐ No If Yes, how has the student improved?

If a position would be available at the time, does this student have potential for permanent employment with your company upon graduation?

☐ Yes ☐ No ☐ Too soon to evaluate

Is your company hiring permanent employees within the next year?

☐ Yes ☐ No ☐ Unsure

Please return form to: Prof. Gary M. Scott
Faculty of Paper Science and Engineering
College of Environmental Science and Forestry
State University of New York
One Forestry Drive
Syracuse, NY 13210

## II. Exit Survey

### I. General Information

Graduation Date: _____

Program of Study: _____ Paper Science

(check all that apply) _____ Paper Engineering

_____ Management Minor

_____ Computer and Information Technology Minor

_____ Construction Management Minor

GPA (to date): _____

Age: _____

Sex: _____ Male

_____ Female

Plans after graduation: ____ I have accepted a job

Employer: _____

Location: _____

____ I have not accepted a job but am considering offers

____ I have not accepted a job but am still looking

____ I am not currently looking for employment

____ I am going to graduate school

University: _____

Department: _____

Degree sought: _____

## II. Industrial Work Experience (Previous Employment, summer jobs, and Co-ops)

| Dates of Employment | Employer | Location | Comments |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

## III. Permanent Employment Information

Number of on-campus interviews: _____

Number of second interviews resulting from on-campus interviews: _____

Number of other interviews not as a result of an on-campus interview: _____

Number of job offers received: _____

Salary range of offers: _____

Salary of accepted offer (if accepted): _____

Reasons for accepting offer:

**IV. Selection of PSE and SUNY-ESF.** Please rate the following reasons for your selection of PSE at SUNY-ESF.

| Factor | Not Important | | | | Very Important |
|---|---|---|---|---|---|
| Cost | 1 | 2 | 3 | 4 | 5 |
| Admission Standards | 1 | 2 | 3 | 4 | 5 |
| Size | 1 | 2 | 3 | 4 | 5 |
| Social Atmosphere | 1 | 2 | 3 | 4 | 5 |
| Location | 1 | 2 | 3 | 4 | 5 |
| Career Potential | 1 | 2 | 3 | 4 | 5 |
| Academic Reputation | 1 | 2 | 3 | 4 | 5 |
| Availability of Scholarship or Financial Aid | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Advice of Parents, Relatives, or Friends | 1 | 2 | 3 | 4 | 5 |
| Advice of High School or Community College Personnel<br>Key Person's Name: | 1 | 2 | 3 | 4 | 5 |
| To Be With Friends | 1 | 2 | 3 | 4 | 5 |
| Other (Specify): | 1 | 2 | 3 | 4 | 5 |

**V. College Environment.** Please give us your perception of the overall campus environment.

| **Factor** | **Rating** | | | | |
|---|---|---|---|---|---|
| | **Dissatisfied** | **Neutral** | **Satisfied** | **Very Satisfied** | |
| Academic Environment | | | | | |
| Testing and grading system | 1 | 2 | 3 | 4 | 5 |
| Course content in PSE | 1 | 2 | 3 | 4 | 5 |
| Instruction in PSE | 1 | 2 | 3 | 4 | 5 |
| Out-of-class availability of instructors | 1 | 2 | 3 | 4 | 5 |
| Attitude of faculty towards students | 1 | 2 | 3 | 4 | 5 |
| Variety of courses offered in PSE | 1 | 2 | 3 | 4 | 5 |
| Availability of technical electives in PSE | 1 | 2 | 3 | 4 | 5 |
| Availability of general electives | 1 | 2 | 3 | 4 | 5 |
| Availability of advisor | 1 | 2 | 3 | 4 | 5 |
| Value of information provided by advisor | 1 | 2 | 3 | 4 | 5 |
| Admissions | | | | | |
| General Admissions Procedure | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Accuracy of college information you received before enrolling | 1 | 2 | 3 | 4 | 5 |
| College catalog and admissions publications | 1 | 2 | 3 | 4 | 5 |
| Registration | | | | | |
| General registration procedures | 1 | 2 | 3 | 4 | 5 |
| Availability of the courses that you want at times you can take them | 1 | 2 | 3 | 4 | 5 |
| Academic calendar for this college | 1 | 2 | 3 | 4 | 5 |
| Billing and fee payment procedures | 1 | 2 | 3 | 4 | 5 |
| Facilities in PSE | | | | | |
| Classrooms | 1 | 2 | 3 | 4 | 5 |
| Laboratories | 1 | 2 | 3 | 4 | 5 |
| Computer laboratory | 1 | 2 | 3 | 4 | 5 |
| General Campus | | | | | |
| Opportunities for student employment | 1 | 2 | 3 | 4 | 5 |
| Opportunities for personal involvement in campus activities | 1 | 2 | 3 | 4 | 5 |
| Campus media | 1 | 2 | 3 | 4 | 5 |
| Professors | | | | | |
| Class preparation | 1 | 2 | 3 | 4 | 5 |
| Understanding of the course material | 1 | 2 | 3 | 4 | 5 |
| Presentation style | 1 | 2 | 3 | 4 | 5 |
| Quality of lectures | 1 | 2 | 3 | 4 | 5 |
| Quality of classroom discussion | 1 | 2 | 3 | 4 | 5 |
| Organization of lectures | 1 | 2 | 3 | 4 | 5 |
| Teaching enthusiasm | 1 | 2 | 3 | 4 | 5 |
| Respect given to students | 1 | 2 | 3 | 4 | 5 |
| Availability outside of class | 1 | 2 | 3 | 4 | 5 |
| Fairness of exams | 1 | 2 | 3 | 4 | 5 |
| Fairness of grading | 1 | 2 | 3 | 4 | 5 |

| | | | | | |
|---|---|---|---|---|---|
| Quantity of work for classes | 1 | 2 | 3 | 4 | 5 |
| Promptness of paper and exam grading | 1 | 2 | 3 | 4 | 5 |
| Course objectives stated clearly | 1 | 2 | 3 | 4 | 5 |
| Generation of interest in subject matter | 1 | 2 | 3 | 4 | 5 |
| Other (Specify) | 1 | 2 | 3 | 4 | 5 |
| Interview Process for permanent jobs | | | | | |
| Quantity of companies interviewing | 1 | 2 | 3 | 4 | 5 |
| Sign up process | 1 | 2 | 3 | 4 | 5 |
| Evening information sessions | 1 | 2 | 3 | 4 | 5 |
| On campus interview location / setup | 1 | 2 | 3 | 4 | 5 |
| After interview follow-up by companies | 1 | 2 | 3 | 4 | 5 |
| Interview process for summer / coop positions | | | | | |
| Quantity of companies interviewing | 1 | 2 | 3 | 4 | 5 |
| Sign up process | 1 | 2 | 3 | 4 | 5 |
| Interview | 1 | 2 | 3 | 4 | 5 |
| On campus interview location / setup | 1 | 2 | 3 | 4 | 5 |
| After interview follow-up by companies | 1 | 2 | 3 | 4 | 5 |

**VI. Professional Experience.** Please tell us of your professional engagement beyond the classroom.

Are you a member of any professional organizations (check all that apply)?

____ Tappi ____ AIChE

____ Pima ____ Other (please indicate) _____

Have you engaged in professional development activities, such as conferences, leadership summits, short courses, symposia, specialized training, etc., either through the college or as part of your work experience? If so, what have you attended?

**VII. Paper Engineering Program Outcomes.** In conjunction with the accreditation process by EAC/ABET and the continuous improvement processes implemented in the programs, the Faculty of Paper Science and Engineering would like your feedback on how the program met the published outcomes for each of the programs. For the program that you graduated from, please indicate, for each of the program outcomes, your assessment of how you met that outcome. Also indicate which course or courses touched significantly on that outcome. If necessary, refer to the list of courses elsewhere later in this survey.

**By the time of graduation, each student in Paper Engineering will have:**

| Program Outcome | Self Assessment | Courses |
|---|---|---|
| 1. a sound knowledge of science and engineering as applied to paper science and engineering; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 2. the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 3. the ability to solve a real engineering problem in a team environment using appropriate design techniques; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 4. an ability to engage in life-long learning; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 5. well-developed written and oral communication skills; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 6. the ability to work in an industrial position within the pulp, paper, or allied industries; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome. | |

| | | |
|---|---|---|
| | ___ I fully satisfied this outcome. | |
| 7. an understanding of the professional and ethical responsibility of an engineer; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 8. a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts. | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |

**VII. Paper Science Program Outcomes.** In conjunction with the accreditation process by EAC/ABET and the continuous improvement processes implemented in the programs, the Faculty of Paper Science and Engineering would like your feedback on how the program met the published outcomes for each of the programs. For the program that you graduated from, please indicate, for each of the program outcomes, your assessment of how you met that outcome. Also indicate which course or courses touched significantly on that outcome. If necessary, refer to the list of courses elsewhere later in this survey.

**By the time of graduation, each student in Paper Science will have:**

| **Program Outcome** | **Self Assessment** | **Courses** |
|---|---|---|
| 1. a sound knowledge of physical sciences and elementary engineering and how they apply to the technology of the pulp, paper, and allied industries; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 2. the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 3. the ability to work within a team environment; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome. | |

| | | |
|---|---|---|
| | ___ I fully satisfied this outcome. | |
| 4. an ability to engage in life-long learning; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 5. well-developed written and oral communication skills. | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| *6. the ability to work in an industrial position within the pulp, paper, or allied industries;* | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 7. an understanding of the professional and ethical responsibility of an industrial scientist; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |
| 8. knowledge of the environmental and resource management concerns facing the industry; | ___ I did not meet this outcome.<br>___ I am approaching this outcome.<br>___ I minimally met this outcome.<br>___ I fully satisfied this outcome. | |

**VIII. Paper Engineering Program Objectives.** In conjunction with the accreditation process by EAC/ABET and the continuous improvement processes implemented in the programs, the Faculty of Paper Science and Engineering would like your feedback on how the program met the published objectives for each of the programs. For the program that you graduated from, please indicate, for each of the program objectives, your assessment of how the overall program satisfied these objectives over the entire curriculum.

**The objectives of the Paper Engineering Program are to produce graduates who, during their first few years after graduation:**

| **Program Objective** | **Program Assessment** |
|---|---|
| 1. have a sound background in fundamental science and engineering principles as applied to paper science and engineering; | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 2. understand related societal issues such as environmental protection, occupational health and safety, resource management, and appropriate business skills; | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 3. are well-rounded professionals in terms of teamwork, communication, and problem solving; | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 4. are well-prepared for engineering practice in paper science and engineering; | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 5. have developed life-long learning skills or abilities. | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |

**IX. Other Questions.**

During your summer work experiences and co-op positions, what have you had to learn that was not directly addressed in the curriculum?

From your previous work experience and from your job interviews, how can the curriculum be improved to better meet the needs of you and the employers?

If you were going to do it all over again, would you still choose the PSE curriculum? If not, why not?

In your opinion, what are the strengths and/or weaknesses of this program?

## X. Questions on Specific Courses

To help PSE assess the effectiveness of courses in the curriculum, please rate the following courses with respect to both the content of the course and the instruction given. Use a numerical rating from **1** to **5**, where **1** is poor and **5** is excellent. Also indicate the name of the instructor for the course at the time you took it. If you did not take the class, please write **N/A** in the Instructor column.

| Course Number | Course Title | Instructor (Name) | Content Rating (1 to 5) | Instructor Rating (1 to 5) | Your Grasp of Course Content (1 to 5) | Relevance to PSE Curriculum (1 to 5) |
|---|---|---|---|---|---|---|
| CLL 200 | Library Research | | | | | |
| CLL 405 | Writing for Science Professionals | | | | | |
| ERE 440 | Water Pollution Engineering | | | | | |
| FCH 360 | Physical Chemistry I | | | | | |
| FCH 361 | Physical Chemistry II | | | | | |
| PSE 300 | Introduction to Papermaking | | | | | |
| PSE 302 | Pulp and Paper Laboratory Skills | | | | | |
| PSE 350 | Pulping and Bleaching Processes | | | | | |
| PSE 351 | Pulping and Bleaching Laboratory | | | | | |
| PSE 370 | Principles of Mass and Energy Balances | | | | | |
| PSE 371 | Fluid Mechanics | | | | | |
| PSE 372 | Heat Transfer | | | | | |
| PSE 465 | Paper Properties | | | | | |
| PSE 466 | Paper Coating and Converting | | | | | |
| PSE 467 | Papermaking Wet End Chemistry | | | | | |
| PSE 468 | Papermaking Processes | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| PSE 473 | Mass Transfer | | | | | |
| PSE 477 | Process Control | | | | | |
| WPE 386 | Structure and Properties of Wood | | | | | |
| WPE 390 | **Fiber Identification: Laboratory** | | | | | |
| | | **Instructor (Name)** | **Content Rating (1 to 5)** | **Instructor Rating (1 to 5)** | **Your Grasp of Course Content (1 to 5)** | **Relevance to PSE Curriculum (1 to 5)** |
| | **Engineering Courses** | | | | | |
| APM 395 | Probability and Statistics for Engineering | | | | | |
| ELE 394 | Electrical Laboratory for Non-Electrical Engineering Students | | | | | |
| ERE 221 | Electrical Science I | | | | | |
| ERE 223 | Statics and Dynamics | | | | | |
| ERE 362 | Mechanics of Materials | | | | | |
| PSE 361 | Engineering Thermodynamics | | | | | |
| PSE 480 | Engineering Economics | | | | | |
| PSE 481 | Engineering Design | | | | | |
| | **Management Courses** | | | | | |
| PSE 456 | Management in the Paper Industry | | | | | |
| FOR 360 | Principles of Management | | | | | |
| | **Other Courses** | | | | | |
| | | | | | | |

**III. Alumni Survey**

**10 April, 2006**

<name>

<company>

<address>

<city>, <state>  <zip>

Dear PSE Alumni:

I hope that this survey find  you doing well in your career and personal life.  As part of our accreditation process with the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (EAC/ABET), we are seeking input from a number of our constituents. Our alumni are one of our most important constituent base.  Our educational programs have a number of Program Educational Objectives, which are defined as what our graduates should be able to do a number of years after graduation.  In order to evaluate our objectives, we are gathering information regarding the career paths taken by our alumni in order to better advise our students on the educational choices that they have.  Your responses to these questions will help us in assessing our program.

Please be advised that the information provided will be kept strictly confidential.  No names will be associated with the data provided.  We hope that you will take a few minutes to fill out the survey and return it in the envelope supplied.  We thank you for your help collecting information for better student advising and improving our curriculum.

Sincerely,

**Educational Information** (check all that apply):

Month/Year of Graduation: _____

Which program (option) did you graduate from?

□ Paper Science and Engineering (Engineering Option)

□ Paper Science and Engineering (Science Option)

□ Paper Engineering

□ Paper Science

Which minor(s) did you complete?

□ Management

□ Computer and Information Technology

□ Other _____

What additional education/degrees have you obtained:

| University | Degree | Year |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |

**Employment Information:**

Starting Job Title: _____ Starting Salary: _____

Current Job Title: _____ Current Salary: _____

Briefly describe your current job (duties, responsibilities, etc.):

| | | |
|---|---|---|
| 1. Did you do a coop (summer + semester) with a company while you were a student at ESF? | Yes | No |
| 2. If you answered yes to #1, were you offered a permanent position with the company after graduation? | Yes | No |
| 3. Was your first position after graduation a company that you had worked for either during a coop or during a summer mill experience? | Yes | No |
| 4. Are you still working for the same company that you started with immediately after graduation? | Yes | No |
| 5. If you answered no to #4, how many times have you switched companies (not counting mergers)? | | _____ |

**Professional Licensure** (check all that apply):

□ I have taken the Fundamentals of Engineering Exam (FE Exam).

□ I have passed the FE Exam.

□ I have taken the Professional Engineering Exam (PE Exam)

□ I have passed the PE Exam.

**Program Educational Objectives of Paper Engineering**

The aim of the Paper Engineering Program is to produce graduates who, **during their first few years after graduation**, have attained the five educational objectives listed below. Please indicate, for each of the program objectives, your assessment of how the overall program satisfied these objectives over the entire curriculum and prepared you for your career. Use the space below for any comments regarding the Program Educational Objectives, especially those you feel were not met or were exceptionally well met.

| **Program Objective** | **Program Assessment** |
|---|---|
| 6. I have a sound background in fundamental science and engineering principles as applied to paper science and engineering. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree |
| 7. I understand related societal issues such as environmental protection, occupational health and safety, resource management, and appropriate business skills. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree |
| 8. I am a well-rounded professional in terms of teamwork, communication, and problem solving. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree |
| 9. I am well prepared for engineering practice in paper science and engineering. | □ Strongly disagree<br>□ Disagree |

| | |
|---|---|
| | □ Neutral<br>□ Agree<br>□ Strongly agree |
| 10. I have developed life-long learning skills or abilities. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree |
| Comments: | |

**Program Outcomes of Paper Engineering**

Please indicate, for each of the eight program outcomes, your assessment of how you met that outcome **by the time of graduation**. Also indicate which course or courses touched significantly on that outcome. If necessary, refer to the list of courses on the following page. Use the space below for any comments regarding the Program Outcomes especially those you feel were not met or were exceptionally well met.

| Program Outcome | Self Assessment | Courses |
|---|---|---|
| 9. I have a sound knowledge of science and engineering as applied to paper science and engineering. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 10. I have the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 11. I have the ability to solve a real | □ Strongly disagree | |

| | | |
|---|---|---|
| engineering problem in a team environment using appropriate design techniques. | □ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 12. I have an ability to engage in life-long learning. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 13. I have well-developed written and oral communication skills. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 14. I have the ability to work in an industrial position within the pulp, paper, or allied industries. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 15. I have an understanding of the professional and ethical responsibility of an engineer. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |
| 16. I have a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts. | □ Strongly disagree<br>□ Disagree<br>□ Neutral<br>□ Agree<br>□ Strongly agree | |

| Comments: |
|---|

**General Questions**

Please indicate your response to the following questions:

**1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree**

| | | | | | |
|---|---|---|---|---|---|
| 1. My present position involves working in multidisciplinary teams. | 1 | 2 | 3 | 4 | 5 |
| 2. My present position involves leading a multidisciplinary team. | 1 | 2 | 3 | 4 | 5 |
| 3. My education gave me sufficient background to continue learning through on the job training, self-study, or additional education. | 1 | 2 | 3 | 4 | 5 |
| 4. I regularly write reports regarding the projects in my current position. | 1 | 2 | 3 | 4 | 5 |
| 5. I regularly give presentations or oral reports regarding the projects involved in my job. | 1 | 2 | 3 | 4 | 5 |
| 6. My job function involves environmental concerns faced by my company. | 1 | 2 | 3 | 4 | 5 |
| 7. My job function involves societal concerns faced by my company. | 1 | 2 | 3 | 4 | 5 |
| 8. My background in science and engineering was sufficient for me to do my job. | 1 | 2 | 3 | 4 | 5 |
| 9. I understand the ethical responsibility of an engineer or scientist with respect to the goals of my company. | 1 | 2 | 3 | 4 | 5 |
| 10. In my current or past position, I have designed and/or implemented a product, trial, or process that was successful. | 1 | 2 | 3 | 4 | 5 |
| 11. My summer internship and/or co-op experience enhanced my understanding of the responsibilities of an engineer or scientist. | 1 | 2 | 3 | 4 | 5 |
| 12. My job function is primarily technical in nature. | 1 | 2 | 3 | 4 | 5 |
| 13. My job function is primarily managerial in nature. | 1 | 2 | 3 | 4 | 5 |
| 14. My job function allows me take a global view in my decision- | 1 | 2 | 3 | 4 | 5 |

making.

| | | | | | |
|---|---|---|---|---|---|
| 15. The PSE program at SUNY-ESF gave me training comparable to a traditional science or engineering program. | 1 | 2 | 3 | 4 | 5 |
| 16. I am satisfied with the educational choices that I have made. | 1 | 2 | 3 | 4 | 5 |
| 17. I am satisfied with the career choices that I have made. | 1 | 2 | 3 | 4 | 5 |

**Open-Answer Questions**

What was the most important thing that you had to learn after graduation in order to perform in your first position after graduation?

What courses or topics or subject areas would you like to have seen taught as part of the Paper Science or Paper Engineering program that would have helped you in your job?

What are your career goals over the next 5 years?

**Please return the survey by 30 April 2006 to:**

**Ms. Linda Fagan, Manager**

Syracuse Pulp and Paper Foundation

SUNY-ESF

One Forestry Drive

Syracuse, NY 13210

## IV. Mid-Semester Evaluation

**PSE Midterm Course Evaluation**

Course_____ Fall_____ / Spring_____

I appreciate your honest and thoughtful answers to these items. Please circle the number which best represents your perceptions. Then, please answer the three questions on the back.

1) The required readings are helpful in learning the material.

Strongly disagree 1 2 3 4 5 Strongly agree

2) Lectures/class discussions are helpful in learning the material.

Strongly disagree 1 2 3 4 5 Strongly agree

3) Course policies and objectives were clearly stated.

Strongly disagree 1 2 3 4 5 Strongly agree

4) The instructor comes to class on time.

Strongly disagree 1 2 3 4 5 Strongly agree

5) The instructor's use of blackboard and other materials (overheads, handouts) is effective.

Strongly disagree 1 2 3 4 5 Strongly agree

6) The instructor explains the underlying rationale and concepts for particular topics.

Strongly disagree 1 2 3 4 5 Strongly agree

7) The level of content presented is about right.

Strongly disagree 1 2 3 4 5 Strongly agree

8) The integration between theory and practice is about right.

Strongly disagree 1 2 3 4 5 Strongly agree

1. Please comment on your current perception of the utility, comprehensiveness, representativeness, value, etc. of the **course objectives** and **course content**.

2. Based on your experience so far, what are your suggestions for improving the formal class sessions (e.g., lecture, discussion, problem solving, clarity of assignments, learner responsibility, levity, general atmosphere, etc.)?

3. What **one** specific suggestion do you have that might improve the formal class sessions?

# V. End-of-Course Evaluation 2000

#20104-001SU

SUNY-ESF

IDEaS

MAKE YOUR MARKS HEAVY AND DARK.
USE NO. 2 WOODEN PENCIL ONLY.

EXAMPLE

① ● ③ ④ ⑤

ERASE COMPLETELY WHEN NECESSARY.

**SUNY-ESF**

**End-of-Course Student Survey**

| Course-Section |
|---|
| | | | | | | - | | |

Please fill in your Course-Section above.

EXAMPLE

| F | O | R | 7 | 9 | 7 | - | 0 | 5 |
|---|---|---|---|---|---|---|---|---|

**Please take time to complete this survey in class. Your thoughtful and objective responses to each question are a highly valued part of the teaching and learning improvement process.**

**End-of-Course surveys are completed anonymously and are collected by someone other than the instructor who delivers them immediately to the IDEaS office (8–Moon). Survey reports are made available to the instructor and faculty chairs after course grades are submitted.**

**Using the scale at right, where ① = Strongly Disagree and ⑤ = Strongly Agree, indicate your level of agreement with the following statements:**

**Remember, use the following scale:**

| Strongly Disagree | | | | Strongly Agree |
|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ |

1. **The course and subject matter were well organized.** (1) ① ② ③ ④ ⑤
2. **The instructor communicated effectively.** (2) ① ② ③ ④ ⑤
3. **The instructor was enthusiastic about teaching.** (3) ① ② ③ ④ ⑤
4. **The instructor seemed knowledgeable about the subject matter.** (4) ① ② ③ ④ ⑤
5. **The instructor conveyed a positive attitude toward students.** (5) ① ② ③ ④ ⑤
6. **Tests, assignments, and projects were fair.** (6) ① ② ③ ④ ⑤
7. **Grading was fair.** (7) ① ② ③ ④ ⑤
8. **The instructional approach(es) used was (were) appropriate to the course.** (8) ① ② ③ ④ ⑤
9. **The instructor motivated me to do my best work.** (9) ① ② ③ ④ ⑤
10. **I gave my best effort in this course.** (10) ① ② ③ ④ ⑤

***Complete the following three questions (nos. 11–13) for lab or studio courses only.***

11. **I was provided with adequate orientation and guidance for proceeding with laboratory/studio activities.** (11) ① ② ③ ④ ⑤
12. **The instructor(s) was helpful in assisting with problems and difficulties in the lab/studio.** (12) ① ② ③ ④ ⑤
13. **Space & facilities were adequate for required activities.** (13) ① ② ③ ④ ⑤
14. **Instructor provided item** (14) ① ② ③ ④ ⑤
15. **Instructor provided item** (15) ① ② ③ ④ ⑤
16. **Instructor provided item** (16) ① ② ③ ④ ⑤
17. **Instructor provided item** (17) ① ② ③ ④ ⑤
18. **Instructor provided item** (18) ① ② ③ ④ ⑤
19. **Instructor provided item** (19) ① ② ③ ④ ⑤
20. **Instructor provided item** (20) ① ② ③ ④ ⑤



(Please continue on other side)

SIDE 2

**SUNY-ESF**
**End-of-Course Student Survey**

**PART 2: Written Responses**

**Please provide written comments directly on this page in response to the following questions.**

1. **What was the most effective part of this course?**

2. **What are your suggestions, if any, for changes that would improve this course?**

3. **Given all that you learned as a result of this course, what do you consider to be most important?**

4. **Do you have any additional comments or clarifications to make regarding your response(s) to any particular survey item?**

5. **Do you have any additional comments or suggestions that go beyond issues addressed on this survey?**

(DO NOT WRITE BELOW THIS LINE)

## VI. SPPF Board of Directors Survey

**I. Paper Engineering Program Outcomes.** In conjunction with the accreditation process by EAC/ABET and the continuous improvement processes implemented in the programs, the Faculty of Paper Science and Engineering would like your feedback on how the program met the published outcomes. With respect to this, we would appreciate your rating of the Program Outcomes with respect to two criteria: Importance to the program and General Performance of Students.

**By the time of graduation, each student in Paper Engineering will have:**

| **Program Outcome** | **Important to Program**<br>**1 = Not important**<br>**5 = Very important** | **Performance of Students**<br>**1 = No ability**<br>**3 = Average ability**<br>**5 = Exceptional ability** |
|---|---|---|
| 17. a sound knowledge of science and engineering as applied to paper science and engineering; | 1 2 3 4 5 | 1 2 3 4 5 |
| 18. the ability to conceptualize problems in terms of unifying principles, design and conduct experiments, and analyze and interpret data; | 1 2 3 4 5 | 1 2 3 4 5 |
| 19. the ability to solve a real engineering problem in a team environment using appropriate design techniques; | 1 2 3 4 5 | 1 2 3 4 5 |
| 20. an ability to engage in life-long learning; | 1 2 3 4 5 | 1 2 3 4 5 |
| 21. well-developed written and oral communication skills; | 1 2 3 4 5 | 1 2 3 4 5 |
| 22. the ability to work in an industrial position within the pulp, paper, or allied industries; | 1 2 3 4 5 | 1 2 3 4 5 |

| | | |
|---|---|---|
| 23. an understanding of the professional and ethical responsibility of an engineer; | 1 2 3 4 5 | 1 2 3 4 5 |
| 24. a knowledge of the broad, contemporary issues facing the engineer in global and societal contexts. | 1 2 3 4 5 | 1 2 3 4 5 |

**II. Paper Engineering Program Objectives.** In conjunction with the accreditation process by EAC/ABET and the continuous improvement processes implemented in the programs, the Faculty of Paper Science and Engineering would like your feedback on how the program met the published objectives.

**The objectives of the Paper Engineering Program are to produce graduates who, during their first few years after graduation:**

| **Program Objective** | **Importance to Program**<br>**1 = Not important**<br>**5 = Very important** | **Program**<br>**Evaluation** |
|---|---|---|
| 11. have a sound background in fundamental science and engineering principles as applied to paper science and engineering; | 1 2 3 4 5 | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 12. understand related societal issues such as environmental protection, occupational health and safety, resource management, and appropriate business skills; | 1 2 3 4 5 | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 13. are well-rounded professionals in terms of teamwork, communication, and problem solving; | 1 2 3 4 5 | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |

| | | |
|---|---|---|
| 14. are well-prepared for engineering practice in paper science and engineering; | 1 2 3 4 5 | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |
| 15. have developed life-long learning skills or abilities. | 1 2 3 4 5 | ___ The program does not meet this objective.<br>___ The program is approaching this objective.<br>___ The program minimally meets this objective.<br>___ The program fully meets this objective. |

**III. Discussion Questions.**

1. How could the Paper Engineering Program better meet your needs as an employer? That is, how could the educational program change to better meet the objectives and outcomes?

2. What skills and abilities are you looking for in graduates that are not reflected in the current outcomes and objectives?

3. What suggestions and ideas do you have for courses or topics to be offered at SUNY-ESF?

## H. Pulp and Paper Education and Research Alliance (PPERA)

The following information is taken from the PPERA website maintained by the University of Minnesota at http://www.cnr.umn.edu/PPERA/. The members of PPERA meet annually in conjunction with the All Foundations meeting of the pulp and paper related foundations. Additional meetings, often by conference call, are organized as needed throughout the year.

### Purpose

The Pulp and Paper Education and Research Alliance (PPERA) is an alliance of universities with programs which are individually distinctive but which are similar in being committed to the advancement of the North American pulp, paper and allied industries. Each of the PPERA university partners has various supportive relationships with industry and government designed to strengthen the contributions of higher education to the pulp, paper and allied industries. In recognition of these strategic partnerships, the university programs comprising PPERA will work together to develop synergistic programs in education, research, and service, which are mutually beneficial and collectively leverage contributions to the pulp, paper and allied industries. Membership in PPERA places no limitations on participating institutions.

### Vision

The vision of PPERA is to maximize the individual and collective contributions of represented member institutions to the North American pulp, paper and allied industries.

### Mission

PPERA is committed to advancing the strength of participating universities and the North American pulp, paper and allied industries through the individual and collective endeavors of the related university programs. We are pledged to cooperate in attaining our common objectives in education, research, and service, for the purpose of enhancing benefits to the industry. We will pursue and develop opportunities for joint ventures in all areas, which will be mutually beneficial to the university programs as well as to their respective external constituents. We will work to increase resources available for meeting the education and research needs of the North American pulp, paper and allied industries. We will share information that will assist in understanding existing resources and in identifying industry needs. We will pursue new funding opportunities from public and private sources to be utilized in areas vital to the pulp, paper and allied industries. We will collaborate with academic, industrial and governmental organizations in pursuit of our goals.

### Strategy

PPERA benefits its member institutions and the North American pulp, paper and allied industries by:

1. Facilitating high quality research and development programs that are vital to the pulp, paper and allied industries.

- PPERA institutions will work with the North American pulp, paper and allied industries and the professional organizations serving that industry to expand related research support and infrastructure.
- PPERA institutions will be encouraged to collaborate with each other and with industry to maximize benefits derived from research and development program expenditures.
- Faculty in PPERA institutions will be encouraged to develop joint research proposals, programs, and more extensive student and faculty interactions.
- Electronic data interchange/networking will be used whenever cost effective to advance the cause of the alliance.

2. Recruiting and preparing students in engineering and science programs related to the pulp, paper and allied industries.
   - PPERA institutions will enhance student recruitment by encouraging the development of appropriate materials and programs describing technical capabilities of the industry and its career opportunities.
   - Educational needs of the industry will be determined and advice sought through foundations and industrial advisory boards.
   - Information regarding educational programs of PPERA institutions will be disseminated broadly within the academic and industrial communities.
   - Faculty in PPERA institutions will be encouraged to collaborate on educational projects that benefit the institutions and the North American pulp, paper and allied industries.
3. Developing new educational and training materials.
   - PPERA institutions will encourage the development of educational and training materials that can be utilized by academic, industrial and government organizations.
   - Faculty from PPERA institutions will be encouraged to develop innovative educational/training materials that can be delivered via electronic media.
   - Faculty in PPERA institutions will be encouraged to cooperate in providing continuing educational offerings.
4. Working with the North American pulp, paper and allied industries and the professional organizations supporting that industry to provide authoritative technical information and analysis to the public.
   - PPERA institutions will, when appropriate, interface with other industry organizations to develop information on pulp and paper issues.
   - PPERA institutions through their networking capabilities will identify and recommend personnel who can provide objective information on pulp and paper issues.