ABET
Self-Study Report

for the

Paper Science and Engineering

Program

at

The University of Wisconsin – Stevens Point

Stevens Point, WI

July 1, 2008

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There are a number of references to the “PSE ABET information web site” throughout the text. This web site (http://www.uwsp.edu/papersci/abet/) contains supporting documentation for this report.
Self-Study Report  
Paper Science and Engineering  
Bachelor of Science  
The University of Wisconsin – Stevens Point  

BACKGROUND INFORMATION  
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Program History

The Paper Science and Engineering (PSE) program at UWSP is the only program of its kind in the state of Wisconsin. The first four students graduated from the program in May 1972. There are now over 700 alumni of the program. While keeping current with industry technology, the curriculum of the program remains essentially unchanged; based on chemical engineering fundamentals with the addition of paper industry specific technology courses, the curriculum has served its constituencies well over time. A more complete departmental history may be found in the PSE ABET information web site.

Since this is an initial request for accreditation, there are no changes to report.

Options

There are no options, tracks or concentrations included in the program.

Organizational Structure

The Paper Science and Engineering (PSE) Department, although physically located in the Science Building on the UWSP campus, is administratively located in the College of Natural Resources. The current administrative structure appears in Figure B-1. The PSE Department chair reports to the Dean of the College, who in turn reports to the Provost.

The governing body that oversees the University of Wisconsin-Stevens Point (UWSP) is known as the University of Wisconsin System (UWS). Created in 1974 as a result of the merger of the University of Wisconsin and the Wisconsin State Universities, the UWS is comprised of two doctoral institutions, eleven comprehensive institutions...
Figure B-1. UWSP Organizational Chart: Academic Affairs Division
(collectively known as the University Cluster), and thirteen two-year colleges. The Stevens Point campus, originally a member of the Wisconsin State Universities, became part of the University of Wisconsin in 1971. UWSP is one of the eleven comprehensive institutions, charged with providing undergraduate and select graduate degrees. UWSP, in addition to sharing in the missions of the UWS and the University Cluster, has its own list of select goals and responsibilities.

The University of Wisconsin System, in accordance with state statutes, is governed by an eighteen-member Board of Regents. Sixteen of these are appointed by the state Governor to seven-year terms, and two student representatives are appointed to two-year terms. The President of the UW System, the thirteen Chancellors of the universities, the Deans of the two-year colleges, and the Chancellor of Extension and the two-year colleges are appointed by the Board of Regents. The Regents establish the basic parameters within which the different constituencies of the UW System function, including budgets, admission standards, and tuition rates.

At each of the universities the chief executive officer and the person responsible for programs and operations is the Chancellor. UWSP’s current Chancellor (its thirteenth) is Linda Bunnell. She was officially inaugurated on June 1st, 2004, succeeding Interim Chancellor Virginia M. Helm (2003-2004) and prior Chancellor Thomas George (1996-2003).

**Program Delivery Modes**

Program courses are scheduled during normal business hours. The faculty use a web-based course management system to deliver course materials, but there are no fully online courses in the curriculum.

**Deficiencies, Weaknesses or Concerns Documented in the Final Report from the Previous Evaluation(s) and the Actions taken to Address them**

This report is for an initial accreditation.
CRITERION 1. STUDENTS

Student Admissions

The process for admission to the PSE program at UWSP includes recruitment of high school students, application and acceptance to the university and new student orientation.

The UWSP Admissions Office handles a large share of the recruiting duties. Admissions counselors attend numerous college fairs to promote the university; when they find students who are interested in engineering, the counselors provide contact information and brochures describing the program. The Admission Office also handles Point Preview Days, which are essentially open house events for potential students and their families. The Paper Science and Engineering Department participates in these Point Preview Days by meeting with groups of students and parents expressing an interest in the major.

In addition to recruiting by the Admissions Office, the College of Natural Resources (CNR) has two staff members responsible for recruiting students into the college. These individuals have more in-depth knowledge of the program. PSE faculty have, on occasion, accompanied the CNR recruitment personnel to college fairs to provide additional support and information. The CNR also hosts many programs for youth on campus, including “Careers in Natural Resources Day”. The PSE faculty have time during these programs to present information to the students about careers in the paper industry and the PSE program and give tours of our facilities.

In November 2007, the PSE Department hosted an Open House. The event was widely advertised by mail, email and campus message postings. Of the seventeen students who attended, eight have declared PSE as their major. This was one of the most successful recruiting events we have had so far.

Students who are specifically interested in the PSE program will typically arrange a visit to campus for a more extensive tour and discussion with a PSE faculty member. This discussion usually involves a detailed description of the curriculum, the career opportunities and starting salaries for graduates of the program.

Students apply for admission to UWSP through an online system for all UW System institutions (http://apply.wisconsin.edu). A paper application is also available from the Admissions Office. The admissions standards for acceptance to UWSP change periodically, and are summarized in table 1-1 for the past five years. The admission qualifications for entering PSE majors for the previous five years are shown in table 1-2a. For comparison, the admission qualifications for all UWSP freshmen are shown in Table 1-2b.

Once admitted to the university, students may declare the PSE major immediately. There are no requirements for admission to the major at the freshman level. New freshmen at UWSP take part in a two-day orientation program with their parents. Through the program, they learn how to adapt to university life and get to know UWSP's customs, traditions, curricula, policies, and services. As part of this program, PSE students meet with a PSE faculty advisor and prepare their class schedule for their first semester. They also meet with upperclass students and other new students in small
discussion groups. At the same time, parents hear presentations by UWSP faculty and staff on such topics as student health programs, health insurance, financial aid opportunities, housing and dining programs, and parent-student understanding. During the program, students and parents may stay in a residence hall and eat at UWSP dining facilities.

**Table 1-1. Standards for Freshman Admissions**

<table>
<thead>
<tr>
<th>Fall 2007</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank in the top 25% of high school graduating class</td>
<td>OR</td>
</tr>
<tr>
<td>OR</td>
<td>Cumulative high school grade point average of 3.25 or above (on a 4-point scale) AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>OR</td>
<td>Rank in the top 50% of high school graduating class AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>Applicants who don’t meet the above criteria but have a high school GPA of 3.00 or above -OR- a high school rank in the top 50% -OR- an ACT composite score of 21 or above (SAT I equivalent) will be reviewed individually. The decision to admit, deny or place on our postpone/wait list for later consideration will depend on a combination of factors including class rank, ACT/SAT I score, high school GPA, rigor of the high school courses, trend in grades, and performance in college preparatory courses.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall 2006</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank in the top 25% of high school graduating class</td>
<td>OR</td>
</tr>
<tr>
<td>OR</td>
<td>Cumulative high school grade point average of 3.25 or above (on a 4-point scale) AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>OR</td>
<td>Rank in the top 50% of high school graduating class AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>Applicants who don’t meet the above criteria but still have a high school GPA of 3.00 or above -OR- a high school rank in the top 50% -OR- an ACT composite score of 21 or above (SAT I equivalent) will be reviewed individually. The decision to admit, deny or place on our postpone/wait list for later consideration will depend on a combination of factors including class rank, ACT/SAT I score, high school GPA, rigor of the high school courses, trend in grades, and performance in college preparatory courses.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall 2005</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank in the top 25% of high school graduating class</td>
<td>OR</td>
</tr>
<tr>
<td>OR</td>
<td>Cumulative high school grade point average of 3.25 or above (on a 4-point scale) AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>OR</td>
<td>Rank in the top 50% of high school graduating class AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>Applicants who don’t meet admission criteria but have a GPA of 3.00, rank in the top 41-50% of class or have an ACT of 21 (SAT 990) were reviewed individually on a rolling basis. The decision to admit, deny or place on our postpone/wait list for later consideration will depend on a combination of factors including class rank, ACT/SAT I score, high school GPA, rigor of the high school courses, trend in grades, and performance in college preparatory courses.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall 2004</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank in the top 40% of high school graduating class</td>
<td>OR</td>
</tr>
<tr>
<td>OR</td>
<td>Cum high school GPA of 3.25 (on a 4.0 scale) AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>OR</td>
<td>Rank in the top 50% of high school graduating class AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>Applicants who don't meet admission criteria but have a GPA of 3.00, rank in the top 41-50% of class or have an ACT of 21 (SAT 990) were reviewed individually on a rolling basis. The decision to admit, deny or place on our postpone/wait list for later consideration will depend on a combination of factors including class rank, ACT/SAT I score, high school GPA, rigor of the high school courses, trend in grades, and performance in college preparatory courses.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fall 2003</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank in the top 40% of high school graduating class</td>
<td>OR</td>
</tr>
<tr>
<td>OR</td>
<td>Cum high school GPA of 3.25 (on a 4.0 scale) AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>OR</td>
<td>Rank in the top 50% of high school graduating class AND ACT composite score of 21 or higher (SAT I equivalent)</td>
</tr>
<tr>
<td>Applicants who don't meet admission criteria but have a GPA of 3.00, rank in the top 41-50% of class or have an ACT of 21 (SAT 990) were reviewed individually on a rolling basis. The decision to admit, deny or place on our postpone/wait list for later consideration will depend on a combination of factors including class rank, ACT/SAT I score, high school GPA, rigor of the high school courses, trend in grades, and performance in college preparatory courses.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 1-2a. Admission Qualifications for Freshmen PSE Majors

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Composite ACT</th>
<th>Composite SAT</th>
<th>Percentile Rank in High School</th>
<th>Number of New Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN. AVG.</td>
<td>MIN. AVG.</td>
<td>MIN. AVG.</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>19 22.0</td>
<td>NA NA</td>
<td>55 74.7</td>
<td>7</td>
</tr>
<tr>
<td>2006</td>
<td>22 25.9</td>
<td>NA NA</td>
<td>54 72.9</td>
<td>5</td>
</tr>
<tr>
<td>2005</td>
<td>22 25.3</td>
<td>NA NA</td>
<td>59 84.8</td>
<td>6</td>
</tr>
<tr>
<td>2004</td>
<td>19 22.2</td>
<td>NA NA</td>
<td>50 69.4</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>22 23.5</td>
<td>NA NA</td>
<td>79 83.5</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 1-2b. Admission Qualifications for All UWSP Freshmen Admissions

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Composite ACT</th>
<th>Composite SAT</th>
<th>Percentile Rank in High School</th>
<th>Number of New Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN. AVG.</td>
<td>MIN. AVG.</td>
<td>MIN. AVG.</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>NA 22.8</td>
<td>NA NA</td>
<td>NA 72.5</td>
<td>1627</td>
</tr>
<tr>
<td>2006</td>
<td>NA 22.7</td>
<td>NA NA</td>
<td>NA 71.6</td>
<td>1649</td>
</tr>
<tr>
<td>2005</td>
<td>NA 22.7</td>
<td>NA NA</td>
<td>NA 70.9</td>
<td>1530</td>
</tr>
<tr>
<td>2004</td>
<td>NA 22.7</td>
<td>NA NA</td>
<td>NA 73.5</td>
<td>1534</td>
</tr>
<tr>
<td>2003</td>
<td>NA 22.8</td>
<td>NA NA</td>
<td>NA 73.2</td>
<td>1508</td>
</tr>
</tbody>
</table>

### Evaluating Student Performance

The UWSP Office of Registration and Records provides an electronic Degree Progress Report (DPR) for advisor use. Example DPRs are shown in the PSE ABET information web site with further explanation. The DPR shows the courses completed by the student, the courses in progress, and the course requirements for the major. When a student has declared a minor, the requirements are shown for that as well. Especially helpful for PSE faculty advisors is the listing of the General Degree Requirements in the DPR.

The DPR is accessible only by department chairs, the student’s assigned advisors and the students themselves. Faculty must be logged in to the university’s “myPoint” system to obtain the DPR. Since these documents are online, student progress may be evaluated from any computer with internet access.

Student progress toward graduation is defined in the Academic Information section of the UWSP Catalog (http://www.uwsp.edu/news/uwspcatalog/academic.htm). Requirements for student performance are summarized here.

Students are ultimately responsible for meeting the requirements of their degree. In general, they are required to complete the requirements in force at the time that they enroll. There are special situations that are exceptions to this requirement, such as changes in requirements of an external agency (http://www.uwsp.edu/news/uwspcatalog/academic.htm#Academic Requirements).

A student is deemed to be in “good academic standing” if both their cumulative and semester grade point averages are above 2.0 (on a 4.0 scale). Problems with grades lead to changes in the student’s academic standing: the levels are Probation-1, Probation-2 and Suspension. Details of these academic standings appear on the UWSP catalog web site (http://www.uwsp.edu/news/uwspcatalog/acad3.htm#Probation).
Satisfactory academic progress is determined each June, and the status is printed on the DPR (http://www.uwsp.edu/news/uwspcatalog/acad4.htm#SAP).

Advising Students

All student advising is handled by PSE faculty. Advisors are assigned based on the student’s year in the program; since the sequence of courses and industry experiences is very similar for all students, grouping students in this way facilitates more effective advising. As an example, the faculty member who handles the sophomores can quickly scan their degree progress reports for the courses that should have been completed. The student can then be advised accurately and efficiently on the academic requirements for the following semester. The faculty member will also know that these students should have accepted a cooperative internship in industry, and will guide them to the necessary procedures to spend a semester off campus without losing their status as continuing students.

All students must consult with their advisor to obtain electronic authorization to register for classes in the subsequent semester. This requirement allows PSE faculty to be in contact with each of their advisees at least once per semester for review of academic progress, to answer questions, etc.

Online advising tools make finding the academic progress of students easy. The Registration and Records Office maintains a comprehensive database of student information which may be viewed in a number of ways online. In addition, PSE faculty may track student progress using the department’s advising form (see the PSE ABET information web site).

Transfer Students and Transfer Courses

Transfer students apply to UWSP using the same application as new freshman students. Transfer students submit the UW System application form and have official transcripts from both their high school and each college they have attended forwarded directly to the UWSP Admissions Office.

Students are normally eligible for admission unless they have compiled an academic record at their last institution such that they would have been suspended if they had been attending UWSP. Students with such a record may apply for admission to UW-Stevens Point no sooner than one semester after their first suspension or two years (four semesters) after their second suspension.

Transferring credits from other UW System institutions is usually straightforward. The Transfer Information System (http://www.uwsa.edu/tis/) is an online source of information about credit transfer, course equivalencies, academic requirements and general UW System campus information, and allows students to determine how their credits will transfer. Transfer counselors in the Admissions Office review transcripts to ensure accuracy in transfer credits. Students who transfer from non-UW institutions, or whose courses are not included on the Transfer Information System will have their courses and credits reviewed individually by the transfer admissions counselors in conjunction with academic departments.

Historically, PSE has had few transfer students (Table 1-3). The department has established a transfer course equivalency guide for Bay de Noc Community College in
Escanaba, MI, shown in the PSE ABET information web site, which may increase the number of transfer students in the future.

Table 1-3. PSE Transfer Students for Past Five Academic Years

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Number of Transfer Students Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>0</td>
</tr>
<tr>
<td>2006-07</td>
<td>1</td>
</tr>
<tr>
<td>2005-06</td>
<td>2</td>
</tr>
<tr>
<td>2004-05</td>
<td>3</td>
</tr>
<tr>
<td>2003-04</td>
<td>2</td>
</tr>
</tbody>
</table>

Graduation Requirements
Undergraduates apply for graduation at least one full semester prior to the term in which they complete their degree. PSE majors are advised to complete this application in the spring semester of their junior year. The application forms are obtained from the Registration and Records Office, completed by the student, and returned to the Registration and Records Office. It is the student’s responsibility to declare all majors and minors in the appropriate departments before submitting the graduation application. The requirements for a bachelor’s degree are:

- Complete all the general requirements for the degree.
- Earn a cumulative grade point average of 2.00 in all courses attempted at UW-Stevens Point.
- Earn a minimum 2.00 GPA in all courses required for a major, except in those programs requiring a higher GPA, and complete all the requirements for the major. In PSE, students must also complete a chemistry minor.
- Earn a cumulative GPA of 2.00 overall (includes both UWSP and transfer credits).

The Registration and Records Office performs a credit check on all graduation applications and returns a report to the department chair(s) in which the student has declared their major(s). The department chair(s) then sign the report authorizing the student for graduation.

Enrollment and Graduation Trends
Figure 1-1 and Table 1-4 summarize the enrollment and graduation trends for the PSE program from 2002-2008. The Student FTE in Table 1-4 is calculated as 

\[ \text{student FTE} = \frac{\text{total credits for all PSE majors}}{15 \text{ credits/FTE}} \].

Since most PSE majors take more than 15 credits per semester, the calculated FTE may be more than the actual number of students (headcount).

During the period from 1997-2001 (not shown on this graph), the program had a rapid decline in the number of declared majors (from 209 down to 86). There are two major causes for this decline: prospective student concerns about the paper industry and lack of student recruiting. The paper industry in Wisconsin had major workforce reductions during this period. Most of the reductions were in the unionized labor force, but since this “downsizing” was widely publicized the perception of a diminishing paper industry presence in the state was prevalent among potential students. This problem was
compounded by the program’s previous reliance on industry employees’ recommendations to recruit students into the program. Most of these employees were discouraging students from entering the industry. The recent improvement in the health of the paper industry, combined with renewed recruiting efforts, has helped stem the decline. We expect that the trend will reverse over the next two years.

Table 1-5 shows the matriculation and placement data for the most recent twenty-five PSE graduates. All twenty-five graduates were placed in the entry-level positions shown before graduation.

![Figure 1-1. Enrollment and graduation trends, 2002-2008](image)

### Table 1-4. Enrollment Trends for Past Five Academic Years

<table>
<thead>
<tr>
<th></th>
<th>2003 Year (Current-4)</th>
<th>2004 Year (Current-3)</th>
<th>2005 Year (Current-2)</th>
<th>2006 Year (Current-1)</th>
<th>2007 Year (Current)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time Students</td>
<td>45</td>
<td>34</td>
<td>38</td>
<td>29</td>
<td>38</td>
</tr>
<tr>
<td>Part-time Students</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Student FTE(^1)</td>
<td>47</td>
<td>36</td>
<td>43</td>
<td>31</td>
<td>41</td>
</tr>
<tr>
<td>Graduate students</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^1\) FTE = Full-Time Equivalent = 15 credits
<table>
<thead>
<tr>
<th>Name</th>
<th>Year Matriculated</th>
<th>Year Graduated</th>
<th>Initial Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyan Issacson</td>
<td>2002</td>
<td>2007</td>
<td>Process Engineer Ahlstrom Filtration</td>
</tr>
<tr>
<td>Yan Lou</td>
<td>2002</td>
<td>2007</td>
<td>Sales And Service Engineer TechPap Inc.</td>
</tr>
<tr>
<td>Corey Dercks</td>
<td>2001</td>
<td>2006</td>
<td>Manufacturing Associate Domtar</td>
</tr>
<tr>
<td>Andrew Kozloski</td>
<td>2001</td>
<td>2006</td>
<td>Graduate Student UW Madison</td>
</tr>
<tr>
<td>Nicholas Krueger</td>
<td>2001</td>
<td>2006</td>
<td>Process Engineer Sonoco</td>
</tr>
<tr>
<td>Adam Mueller</td>
<td>2001</td>
<td>2006</td>
<td>Process Engineer Altivity</td>
</tr>
<tr>
<td>Michael Parrett</td>
<td>2001</td>
<td>2006</td>
<td>Process Engineer Appleton Coated</td>
</tr>
<tr>
<td>Bryan Pierre</td>
<td>2001</td>
<td>2006</td>
<td>Process Engineer MeadWestvaco</td>
</tr>
<tr>
<td>Jeremy Ploederl</td>
<td>2001</td>
<td>2006</td>
<td>Application Engineer Honeywell</td>
</tr>
<tr>
<td>Michael Wagner</td>
<td>2001</td>
<td>2006</td>
<td>Associate Technologist Grain Processing Corp</td>
</tr>
<tr>
<td>Matthew Czerniak</td>
<td>2000</td>
<td>2005</td>
<td>Process Engineer Sonoco</td>
</tr>
<tr>
<td>Andrew Goodyear</td>
<td>2000</td>
<td>2005</td>
<td>Process Engineer Thilmany</td>
</tr>
<tr>
<td>Nathan Koeppel</td>
<td>2000</td>
<td>2005</td>
<td>Process Engineer Boise-Cascade</td>
</tr>
<tr>
<td>Jeffrey Osterberg</td>
<td>2000</td>
<td>2005</td>
<td>Process Engineer International Paper</td>
</tr>
<tr>
<td>Adam Schmidt</td>
<td>2000</td>
<td>2005</td>
<td>Associate Technologist Grain Processing Corp</td>
</tr>
<tr>
<td>Matthew Schneider</td>
<td>2000</td>
<td>2005</td>
<td>Sales Engineer Weavexx</td>
</tr>
<tr>
<td>Alison St. Peter-Graf</td>
<td>2000</td>
<td>2005</td>
<td>Associate Technologist Weyhaeuser</td>
</tr>
<tr>
<td>Jefferey Dykhuis</td>
<td>1999</td>
<td>2004</td>
<td>Mill Shift Technician Wausau Paper</td>
</tr>
<tr>
<td>Michael Fleischmann</td>
<td>1999</td>
<td>2004</td>
<td>Laboratory Technician USDA Forrest Services</td>
</tr>
<tr>
<td>Eric Herritz</td>
<td>1999</td>
<td>2004</td>
<td>Process Engineer Kimberly Clark</td>
</tr>
<tr>
<td>Corey Kopke</td>
<td>1999</td>
<td>2004</td>
<td>Manufacture Associate Domtar</td>
</tr>
<tr>
<td>Joshua Lorge</td>
<td>1999</td>
<td>2004</td>
<td>Process Engineer Appleton</td>
</tr>
<tr>
<td>Tyson Marquardt</td>
<td>1999</td>
<td>2004</td>
<td>Applications Engineer Kadant</td>
</tr>
</tbody>
</table>
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

ABET Definition: Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

ABET definition: Assessment under this criterion is one or more processes that identify, collect, and prepare data to evaluate the achievement of program educational objectives.

ABET definition: Evaluation under this criterion is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program educational objectives are being achieved, and results in decisions and actions to improve the program.

Mission Statement

The governing body that oversees the University of Wisconsin-Stevens Point (UWSP) is known as the University of Wisconsin System (UWS). Created in 1974 as a result of the merger of the University of Wisconsin and the Wisconsin State Universities, the UWS is comprised of two doctoral institutions, eleven comprehensive institutions (collectively known as the University Cluster), and thirteen two-year colleges. The Stevens Point campus, originally a member of the Wisconsin State Universities, became part of the University of Wisconsin in 1971. UWSP is one of the eleven comprehensive institutions, charged with providing undergraduate and select graduate degrees. UWSP, in addition to sharing in the missions of the UWS and the University Cluster, has its own list of select goals and responsibilities.

A three-part mission statement for the university appeared for the first time in the 1974-75 UWSP Catalog. This lengthy statement includes the “System Mission” of the UWS, the “Core Mission” of the University Cluster, and the “Select Mission” of the UWSP campus. The “Select Mission” for the campus was retitled as the “Select Goals and Responsibilities” for UWSP and lengthened in 1989-91. The mission statements have remained essentially unchanged since that time. The mission statements presented here are reproduced exactly as they are currently published.

The mission of the UWS broadly defines the purpose of the entire University system:

The mission of this system is to develop human resources, to discover and disseminate knowledge, to extend knowledge and its application beyond the boundaries of its campuses, and to serve and stimulate society by developing in students heightened intellectual, cultural, and humane sensitivities; scientific, professional, and technological expertise; and a sense of purpose. Inherent in this broad mission are methods of instruction, research, extended education, and public service designed to educate people and improve the human condition. Basic to every purpose of the system is the search for truth.

The mission statement of the University Cluster makes more specific statements about the role of the comprehensive campuses, including the responsibility for offering undergraduate and select graduate degrees, fostering teaching excellence, and encouraging faculty to engage in outreach activities (among many other things):
As an institution in the "University Cluster" of the University of Wisconsin System, UW-Stevens Point shares the following core mission with other universities of the cluster. Each university in the cluster shall:

a. Offer associate and baccalaureate degree level and selected graduate programs within the context of its approved mission statement.
b. Offer an environment that emphasizes teaching excellence and meets the educational and personal needs of students through effective teaching, academic advising, counseling, and through university-sponsored cultural, recreational, and extracurricular programs.
c. Offer a core of liberal studies that supports university degrees in the arts, letters, and sciences, as well as specialized professional/technical degrees at the associate and baccalaureate level.
d. Offer a program of pre-professional curricular offerings consistent with the university's mission.
e. Expect scholarly activity, including research, scholarship, and creative endeavor, that supports its programs at the associate and baccalaureate degree level, its selected graduate programs, and its approved mission statement.
f. Promote the integration of the extension function, assist the University of Wisconsin-Extension in meeting its responsibility for statewide coordination, and encourage faculty and staff participation in outreach activity.
g. Participate in inter-institutional relationships in order to maximize educational opportunity for the people of the state effectively and efficiently through the sharing of resources.
h. Serve the needs of women, minority, disadvantaged, disabled, and nontraditional students and seek racial and ethnic diversification of the student body and the professional faculty and staff.
i. Support activities designed to promote the economic development of the state.

The select goals for UWSP define specific programs that, along with the offering of a broad-based liberal education, are the responsibility of the campus. The list of professional programs includes paper science (now Paper Science and Engineering) as part of the select mission of the UWSP campus:

The select goals and responsibilities of UW-Stevens Point are to:

- Provide a broad foundation of liberal studies and selected degree programs in the fine arts, humanities, natural sciences, and social sciences, imparting the heritage of human civilization, critical intelligence, and the skills necessary for a lifetime of learning and upon which education in the professional fields may be built.
- Provide undergraduate professional programs in communicative disorders, teacher education, home economics*, the visual and performing arts, paper science, and natural resources with emphasis on the management of resources.
- Provide graduate programs in teacher education, communicative disorders, natural resources, home economics*, communication and other select areas clearly associated with this university's undergraduate emphases and strengths.
- Provide programs in wellness and health promotion.
- Provide quality undergraduate and graduate instruction through innovative
methods using print and non-print library resources, computing, communication technology, and direct student assistance.

- Expect scholarly activity, including research, scholarship and creative endeavor, that supports its programs at the associate and baccalaureate degree level, its selected graduate programs, and its special mission.

- Cooperate with UW-Extension in the development and coordination of statewide outreach programming, integration of the extension function into the institution, and appropriate and adequate recognition of those involved in outreach activities.

*The former home economics programs are now offered as child and family studies, dietetics, early childhood education, family and consumer education, human development, nutrition, and interior architecture.

Taken together, these three components comprise the definition of the mission for UWSP, and have formed the basis for operation since their approval by the Board of Regents in 1988. These mission statements are published in both the printed and online versions of the University Catalog.

The mission of the College of Natural Resources, according to the CNR Policy Manual, is:

The College of Natural Resources provides education, research, and outreach in integrated natural resources management, environmental education, and paper science.

The College of Natural Resources:

- Provides undergraduate and graduate instruction that combines theoretical concepts with practical experience, such as laboratory and field oriented courses, summer camps, internships and special projects.

- Promotes scholarly activities that enhance the creation or application of knowledge or contribute to the resolution of environmental and natural resource management issues, especially through student research.

- Shares faculty and student expertise with citizens, communities, agencies and industries through outreach, scholarship, and consulting.

The Paper Science and Engineering Department mission is published on the department web page (www.uwsp.edu/papersci/), and reads as follows:

The UWSP Paper Science and Engineering program is committed to preparing students for successful technical careers in the pulp, paper and allied industries. This mission is accomplished by promoting excellence in instruction, undergraduate research opportunities, industrial internships, and involvement in professional organizations.

The UWSP Paper Science and Engineering program is also committed to providing high quality outreach education opportunities for professionals in the pulp, paper, and allied industries. This mission is accomplished by continued development of
courses beneficial to industry professionals that will improve their understanding of the processes for which they are responsible.

Program Educational Objectives

The Program Education Objectives (PEOs) are published on the department web site. They are:

Graduates of the Paper Science and Engineering Program at UWSP will be productive employees in the paper and allied industries in the three to five years immediately following graduation because they:

1. Have a sound background in fundamental science and engineering principles as applied to paper science and engineering;

2. Understand related societal issues such as environmental protection, occupational health and safety, resource management, and appropriate business skills;

3. Are well-rounded professionals in terms of teamwork, communication, and problem solving;

4. Have developed life-long learning skills and abilities.

Consistency of the Program Educational Objectives with the Mission of the Institution

The PSE PEOs flow naturally from the missions of UWSP and the CNR. In addition to being a specified program in the second point of the UWSP select goals and responsibilities, the first point includes the broad foundation of liberal arts, which is reflected in PEO #2. PEO #1 connects directly to the first point of the CNR mission statement. All four of the PSE PEOs support the mission of the UW System.

Program Constituencies

Members of the PSE Department interact with a wide variety of constituencies. The primary audiences of concern to the department are current students in the program, alumni, employers of PSE students and graduates, the Paper Science Foundation, UWSP administration and the PSE faculty. Each of these groups is described briefly here.

- **Current undergraduate students** This group consists of the current student body in residence in the PSE program at UWSP. Information is generally sought from the current undergraduate students at the course level and at the outcome level, both formally and informally.

- **Alumni** The PSE program has a large alumni base from which to get information. These alumni fulfill roles in the industry from entry-level engineers to Vice-Presidents, Presidents, CEO’s, Engineering Directors, and Department Chairs. Alumni of the program have many opportunities to interact directly with the Department Chair or individual faculty members by attending Department events throughout the year.

- **Employers of PSE students and graduates** All students in the program are required to work at least one summer in the pulp, paper, or allied industry. In addition, all students who have graduated from the program in the past 14 years have worked on a cooperative internship (a summer plus a semester). The supervisors for these
Internships give us valuable feedback on how the students are doing up to that point and what needs to be improved. Students usually obtain summer and co-op positions through on-campus interviews. The PSE Department also has an active recruiting program for permanent positions for our graduates. Each year, recruiters come to campus to interview students who are graduating in the next year. Most students will have accepted positions by the time they graduate. The permanent employers see our students as “finished products,” so their needs must be satisfied.

- **Paper Science Foundation** The Paper Science Foundation has both companies and individuals as members. The Foundation President recruits company representatives and individuals to serve on the Board of Directors and the Executive Committee. Many of these member companies are also the employers of the graduates of the program. Employers in the pulp and paper industry are the primary “consumers” of our graduates, thus their concerns and comments are very important. The members of the foundation are keenly aware of the changes that are occurring within the pulp and paper industry. With the input from the foundation members, the PSE Faculty can make adjustments to best serve the needs of the industry.

- **UWSP Administration** PSE is part of the overall administrative structure of the college, with the chair reporting to the dean of the college. The PSE department chair and the discipline coordinators from other college programs meet weekly with the dean to review program and college matters. Additional ad hoc meetings with campus administration occur throughout the year.

- **PSE Faculty** The members of the PSE faculty are the key constituents in evaluating the feedback received from other sources, proposing improvements in the curriculum, outcomes, and objectives, and implementing these changes. All changes in the curriculum are initiated by faculty action. In addition, the faculty members continually interact with all of the other constituents, allowing the opportunities for the informal feedback into the process. PSE faculty members are directly responsible for delivery of course materials consistent with the course outcomes and program outcomes. As described in Table 2-1, faculty members perform a number of assessment activities integrated into the class activities.

### Table 2-1. Constituencies, Evaluation and Feedback

<table>
<thead>
<tr>
<th>Constituency</th>
<th>Evaluation and Assessment Instruments</th>
<th>Feedback Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate students</td>
<td>End of course survey</td>
<td>End of course survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Informal feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Student discussion group</td>
</tr>
<tr>
<td>Alumni</td>
<td>Alumni survey</td>
<td>Alumni survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Informal feedback</td>
</tr>
<tr>
<td>Employers</td>
<td>Internship survey</td>
<td>Recruiter feedback</td>
</tr>
<tr>
<td>Paper Science Foundation</td>
<td>Employment analysis</td>
<td>Internship survey</td>
</tr>
<tr>
<td>UWSP Administration</td>
<td>Placement analysis</td>
<td>Foundation committees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annual Faculty review</td>
</tr>
<tr>
<td>PSE Faculty</td>
<td>Student work</td>
<td>Faculty meetings</td>
</tr>
<tr>
<td></td>
<td>Exams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course portfolios</td>
<td></td>
</tr>
</tbody>
</table>
In a more general sense, the department interacts with many other constituencies, including the Technical Association of the Pulp and Paper Industry (TAPPI), the Pulp and Paper Education and Research Alliance (PPERA), prospective high school students and their parents, primary and middle school students, and the general public. Each of these groups is described briefly below. Feedback from these groups is usually informal and not well documented.

- **Technical Association of the Pulp and Paper Industry** The Technical Association of the Pulp and Paper Industry (TAPPI) is the leading association for the worldwide pulp, paper, packaging, and converting industries. PSE students and faculty attend technical conferences sponsored by TAPPI every year. These conferences offer students and faculty opportunities to interact with industry representatives in both formal and informal sessions, and help students understand the nature of professionals in the industry. Faculty and students also have the opportunity to present results of their research.

- **Pulp and Paper Education and Research Alliance** 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 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.

- **Prospective high school students and their parents** The faculty and staff work closely with the Admissions Office to recruit prospective high school students. During campus visits, sometimes it is the parents that are the primary contact with us. The parents communicate the perceived needs of the student.

- **Primary and middle school students** The faculty, staff and students give tours and demonstrations to primary and middle school students to introduce them to Paper Science and Engineering. The PSE students take on much of this responsibility, presenting programs for third and fourth grade classrooms across the state.

- **General public** As a public institution, UWSP is expected to respond to questions and/or concerns from the general public. Faculty members handle these responsibilities. This usually takes the form of responding to inquiries regarding various aspects of the paper industry from citizens and news reporters.

**Process for Establishing Program Educational Objectives**

There have been informal expectations of performance by PSE graduates since the program’s inception in 1972. The formal statement of ABET Program Educational Objectives has only recently been created. The process began when all PSE faculty members attended Faculty College in May 2006, a week-long retreat sponsored by the UW System Office of Professional Instructional Development. PSE faculty attended workshops on teaching and learning strategies and spent free time discussing ABET requirements for accreditation. The first draft of the Program Educational Objectives came from these discussions. The faculty worked with these statements until we agreed...
that they accurately represented what was expected of graduates from the program. The PEOs were then shared with industry representatives at the annual Academic Advisory Meeting in May 2007. Attendees at this meeting affirmed that these PEOs were acceptable.

**Achievement of Program Educational Objectives**

The PSE program currently uses indirect assessment of the PEOs via an alumni survey. An industry survey and a survey of alumni (graduating in 1988-2001) were completed in 2002 as part of regular program review. These surveys were created by a program review committee within the CNR, and were not intended to evaluate ABET PEOs (since the PEOs did not exist at the time). However, much of the information is comparable with the current alumni survey, and is presented below. The full surveys and results will be available in the team resource room.

The industry survey resulted in 49 responses, 24 of whom supervised PSE graduates. Their ratings of abilities in seven areas of importance are summarized in Table 2-2 and shown in Figure 2-1. Clearly, these supervisors thought highly of our graduates. The Department will send out another survey to industry representatives during the Fall 2008 semester.

**Table 2-2. Summary of 2002 Industry Survey**

<table>
<thead>
<tr>
<th>How do you rate UWSP Paper Science graduates on their:</th>
<th>% responding “Excellent” or “Very Good”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of pulp and paper raw materials and processes</td>
<td>94</td>
</tr>
<tr>
<td>Communications skills</td>
<td>73</td>
</tr>
<tr>
<td>Level of computer literacy</td>
<td>86</td>
</tr>
<tr>
<td>Ability to work effectively as part of a team</td>
<td>86</td>
</tr>
<tr>
<td>Professional comportment</td>
<td>84</td>
</tr>
<tr>
<td>Ability to continue learning</td>
<td>90</td>
</tr>
<tr>
<td>Ability to take on high levels of responsibility</td>
<td>86</td>
</tr>
</tbody>
</table>
The alumni survey asked several questions that are pertinent to the current PEOs. This paper-based survey was sent to 389 alumni, and 189 responded. Of the 189 respondents, 179 worked in a paper-related field, and 131 supervised others as part of their job. Only 10 expressed dissatisfaction with their job. The results of some of the program-specific questions appear in Table 2-3. There was some concern about the responses on faculty quality and interaction. PSE faculty was rated as poor or very poor by 23 respondents. The quality of advising and the interaction with faculty outside of class was rated poor or very poor by 15 respondents. These results were discussed extensively by the faculty, and some faculty behaviors identified and addressed. The 2008 alumni survey shows improvement in both the interactions with faculty outside the classroom and the overall quality of the faculty. In addition, improvements in the academic advising and PSE courses are noted.
Table 2-3. Alumni survey responses
% responding “Excellent” or “Very good”

<table>
<thead>
<tr>
<th>Please rate the following:</th>
<th>2002</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic advising in program</td>
<td>65</td>
<td>69</td>
</tr>
<tr>
<td>Mill visits and tours</td>
<td>90</td>
<td>87</td>
</tr>
<tr>
<td>Technical meetings and conferences</td>
<td>82</td>
<td>76</td>
</tr>
<tr>
<td>Quality of Paper Science courses</td>
<td>72</td>
<td>85</td>
</tr>
<tr>
<td>Quality of collateral courses</td>
<td>88</td>
<td>92</td>
</tr>
<tr>
<td>Quality of general degree courses</td>
<td>55</td>
<td>63</td>
</tr>
<tr>
<td>Quality of “co-op” experience</td>
<td>95</td>
<td>91</td>
</tr>
<tr>
<td>Interaction with faculty outside of the classroom</td>
<td>69</td>
<td>74</td>
</tr>
<tr>
<td>Quality of Paper Science faculty</td>
<td>64</td>
<td>87</td>
</tr>
<tr>
<td>Overall quality of preparation for career</td>
<td>79</td>
<td>86</td>
</tr>
<tr>
<td>Overall quality of Paper Science program</td>
<td>90</td>
<td>92</td>
</tr>
</tbody>
</table>
CRITERION 3. PROGRAM OUTCOMES

ABET definition: Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.

ABET definition: Assessment under this criterion is one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes.

ABET definition: Evaluation under this criterion is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes are being achieved, and results in decisions and actions to improve the program.

Process for Establishing and Revising Program Outcomes

The PSE faculty articulated the first set of formal expectations for student achievement in 1996. Using the UWSP Assessment Committee’s terminology, these expectations were called “Behavioral Objectives”, and included the following:

1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

These six statements were the basis for our initial assessment efforts that began in 1997. PSE faculty discussions that led to the PEOs (see previous section) included consideration of these six Behavioral Objectives and whether they were suitable for the ABET assessment requirements. PSE faculty decided that the ABET Criterion 3 outcomes a-k were more appropriate for use in our program as they were stated in ABET documents. The ABET outcomes included all of the objectives we were already assessing and provided an improved framework for assessment. The program is committed to the education of engineers for the pulp and paper industry, so the faculty added a twelfth outcome of industry-specific knowledge. These Program Outcomes have been in place since being officially adopted by the PSE faculty in 2007. The six Behavioral Objectives that were the original basis for assessment of student achievement may be mapped onto the current Program Outcomes as shown in Table 3-1 below.

Program Outcomes

The Program Outcomes are published on the department web site, and incorporated into the syllabi for courses in the program where appropriate. The outcomes map directly onto the ABET Criterion 3 outcomes, with the additional requirement of industry-specific knowledge for graduates of this program:

Graduates of the PSE program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:

(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(f) the understanding of professional and ethical responsibility
(g) the ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and the ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Table 3-1. Relationship of Behavioral Objectives to Program Outcomes

<table>
<thead>
<tr>
<th>Behavioral Objective</th>
<th>Program Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental knowledge of pulp and paper raw materials and processes</td>
<td>(a) the ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td></td>
<td>(b) the ability to design and conduct experiments, as well as to analyze and interpret data</td>
</tr>
<tr>
<td></td>
<td>(e) the ability to identify, formulate, and solve engineering problems</td>
</tr>
<tr>
<td></td>
<td>(l) knowledge of the science and technology used in the paper industry</td>
</tr>
<tr>
<td>Excellent communication skills</td>
<td>(g) the ability to communicate effectively</td>
</tr>
<tr>
<td>A high level of computer literacy</td>
<td>(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
</tr>
<tr>
<td>The ability to work effectively as part of a team</td>
<td>(d) the ability to function on multi-disciplinary teams</td>
</tr>
<tr>
<td>A professional comportment</td>
<td>(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</td>
</tr>
<tr>
<td></td>
<td>(d) the ability to function on multi-disciplinary teams</td>
</tr>
<tr>
<td></td>
<td>(f) the understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td></td>
<td>(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
</tr>
<tr>
<td></td>
<td>(j) a knowledge of contemporary issues</td>
</tr>
<tr>
<td>The ability to continue learning</td>
<td>(i) a recognition of the need for, and the ability to engage in life-long learning</td>
</tr>
</tbody>
</table>
Relationship of Program Outcomes to Program Educational Objectives

Table 3-2 illustrates the supporting relationships among the PSE Program Outcomes and the PEOs. Each of the PEOs has at least one supporting Program Outcome. Many of the outcomes are intended to support more than one PEO, allowing the assessment of the Program Outcomes to connect directly to the achievement of the PEOs. For example, ensuring that our graduates have the ability to design and conduct experiments and analyze and interpret data (outcome b) is certainly a contributor to their background in science and engineering principles (PEO#1) and their professional problem solving ability (PEO#3).

Table 3-2. Mapping of PSE Program Outcomes to the PSE PEOs

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>a. Apply math &amp; science</th>
<th>b. Design &amp; conduct experiments</th>
<th>c. Design a system</th>
<th>d. Work on a team</th>
<th>e. Solve engr problems</th>
<th>f. Prof &amp; ethical responsibility</th>
<th>g. Communicate effectively</th>
<th>h. Broad education</th>
<th>i. Life-long learning</th>
<th>j. Contempory issues</th>
<th>k. Use modern engr tools</th>
<th>l. Knowledge of pulp &amp; paper</th>
<th>m. Use modern engr tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have a sound background in fundamental science and engineering principles as applied to paper science and engineering</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Understand related societal issues such as environmental protection, occupational health and safety, resource management, and appropriate business skills.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Are well-rounded professionals in terms of teamwork, communication, and problem solving.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Have developed life-long learning skills.</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*** 29
Relationship of Courses in the Curriculum to the Program Outcomes

Table 3-3 maps the Program Outcomes to the courses in the PSE curriculum. The courses are listed in the table in the approximate order that PSE students take them.
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Courses</th>
<th>Term</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
<th>l</th>
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</thead>
<tbody>
<tr>
<td>CHEM 115</td>
<td>MATH 120</td>
<td></td>
<td></td>
<td>F</td>
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<tr>
<td>ENGL 101</td>
<td>PAPR 103</td>
<td>1-F</td>
<td></td>
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<td></td>
<td></td>
<td>F</td>
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<tr>
<td>PAPR 105</td>
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<td>1-F</td>
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<td></td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>CHEM 116</td>
<td>MATH 121</td>
<td>1-S</td>
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<td>F</td>
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<tr>
<td>COMM 101</td>
<td>ENGL 102</td>
<td>1-S</td>
<td></td>
<td>F</td>
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<td></td>
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<tr>
<td>PAPR 210</td>
<td>MATH 222</td>
<td>2-F</td>
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<td>F</td>
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<tr>
<td>CHEM 325</td>
<td>PHYS 150</td>
<td>2-F</td>
<td></td>
<td>F</td>
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<tr>
<td>CHEM 326</td>
<td>PAPR 215</td>
<td>2-F</td>
<td>A</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>X</td>
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<tr>
<td>CHEM 248</td>
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<tr>
<td>PHYS 210</td>
<td>ECON 210</td>
<td>2-S</td>
<td>F</td>
<td>X</td>
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<tr>
<td>PAPR 300</td>
<td>PAPR 310</td>
<td>SUM</td>
<td>F</td>
<td>F</td>
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<td>F</td>
<td></td>
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<tr>
<td>PAPR 320</td>
<td>PAPR 350</td>
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<td>F</td>
<td>A</td>
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<tr>
<td>PAPR 385</td>
<td>CHEM 335</td>
<td>3-F</td>
<td>F</td>
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<tr>
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<td>PAPR 314</td>
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<td>PAPR 326</td>
<td>PAPR 355</td>
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<td>A</td>
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<td>PAPR 430</td>
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<td>A</td>
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<tr>
<td>PAPR 440</td>
<td>PAPR 460</td>
<td>4-F</td>
<td>A</td>
<td>A</td>
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<td>A</td>
<td>F</td>
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<tr>
<td>PAPR 475</td>
<td>PAPR 484</td>
<td>4-F</td>
<td>A</td>
<td>A</td>
<td>A</td>
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<td>PAPR 410</td>
<td>PAPR 445</td>
<td>4-S</td>
<td>F</td>
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<td>PAPR 486</td>
<td>PAPR 486</td>
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<td>A</td>
<td>A</td>
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<td>A</td>
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<td>WASTE 489</td>
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<td>4-S</td>
<td>F</td>
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<tr>
<td>Gen Ed Req</td>
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<td>F</td>
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<td></td>
<td>PAPR 486</td>
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<td>F</td>
<td>F</td>
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</tbody>
</table>

**NOTES:**
Term code: #-F = Year #-Fall semester, #-S = year #-Spring semester, SUM = summer, Var = various semesters
Codes in table represent the levels of outcome exposure
X = introductory exposure to this outcome
F = develop more familiarity and practice on this outcome
A = in-depth instruction and assessment of this outcome
Documentation

During the site visit, the team resource room will have course portfolios for each Paper Science and Engineering course in the curriculum. These portfolios will contain the syllabus for the course, examples of student work, and if indicated, the results of the assessments of the learning outcomes addressed in that course. For example, the PAPR 484/486 course portfolio will include the final report for the senior design project, the results of the evaluation of the project and student presentations by Academic Advisory Meeting attendees, and a statement by faculty members on the level of achievement of the program outcomes addressed in the course.

The team will also have access to the program’s assessment plans and reports that were prepared as part of our campus assessment process. These documents span the years from 1997 through 2006. The team will have access to the reviews of these reports and plans from the UWSP Assessment Committee.

Achievement of Program Outcomes

The Paper Science and Engineering program at UWSP is a small, close-knit group of faculty and staff allowing a great deal of informal discussion of student achievement. Historically, this sharing of information was the primary method for monitoring the students’ levels of subject mastery and how to improve their performance. In 1996-97, the PSE faculty began development of assessment plans and tools. Learning about ABET accreditation requirements has led to even more formal evaluation and assessment being gradually and deliberately introduced into the program. The following will first describe the department’s historical approach to assuring the quality of its graduates. The additional elements and processes that have been introduced more recently will then be discussed.

ASSESSMENT ACTIVITY: PRE-ABET

Student achievement is a frequent topic of both formal and informal conversation for PSE faculty. It is common for lunchtime discussions to revolve around a faculty member’s latest assignment or exam, the problems students were having with it, and brainstorming ideas to help the students perform at a higher level.

In 1997, the PSE faculty articulated the first set of formal expectations for student achievement. Using the UWSP Assessment Committee’s terminology, these expectations were called “Behavioral Objectives”, and were stated as follows:

Graduates of the Paper Science program at the University of Wisconsin - Stevens Point have the greatest potential for success in their professional lives if they possess the following attributes:
1. Fundamental knowledge of pulp and paper raw materials and processes
2. Excellent communication skills
3. A high level of computer literacy
4. The ability to work effectively as part of a team
5. A professional comportment
6. The ability to continue learning

The assessment of the first three “Behavioral Objectives” was the initial focus of our effort. The faculty prepared a comprehensive multiple choice examination on pulp and
paper knowledge (christened the “Paper Knowledge Exam”) and administered it to the senior class. The Academic Advisory meeting attendees assisted with the second Behavioral Objective by evaluating senior design presentations (as had been the practice since the PSE program’s inception); this data was used to assess the seniors’ oral communication skills. In addition, the UWSP English Department agreed to administer and evaluate a writing test for our seniors, similar to the placement exam for English 101/102. We were then able to determine the improvement in students’ writing skills directly. To address the third Behavioral Objective, a faculty member developed a computer skills test to evaluate the computer literacy of PSE students. All of these assessments were carried out for many years, and the results are presented in the Assessment Reports prepared for the Assessment Committee. At the time, the department was at the forefront of assessment activity on campus, and received much praise for our work.

The Paper Knowledge Exam consisted of fifty questions: twenty-five based on engineering courses and twenty-five based on paper technology courses. This exam was created by the faculty members in the department in 1996-97, with each faculty member contributing questions that were supposed to reflect the important information that students were expected to remember. The results of five years of exams are shown in Figure 3-1. The graph shows the scores on the engineering questions and the technology questions, as well as the overall average scores.

![Figure 3-1. Results of Paper Knowledge Exam](image-url)
Concerned about the utility of the exam as an assessment tool, we asked nine volunteers from our network of paper industry professionals to take the exam. Five of the volunteers were graduates of our program. The average score for this group of knowledgeable engineers was only 46%.

The faculty reviewed the results of student testing over this six-year period. Unlike standardized tests, there were no national norms for comparison. The average scores did not improve over the years. Based on informal conversations with employers, faculty members were confident that graduates of the program continued to perform well in industry. The faculty became convinced that this multiple choice exam wasn’t measuring Behavioral Objective #1 as intended, and some other assessment approach was needed. These results were discussed with attendees at the Academic Advisory meeting in May 2002. Industry personnel agreed with the faculty, and the exam has not been administered since 2002.

We now assess the Program Outcomes related to engineering and technology using assignments, projects and exams that are a regular part of student course work (embedded assessments). These assessments are more “authentic”, giving a better indication of what the student knows and can do with their knowledge. The embedded assessments are described for each Program Outcome in the section entitled “Assessment Activities: Current” below.

The development of communication skills has been a major focus of the PSE program for at least twenty years. The faculty has deliberately built in a sequence of activities in required courses that requires students to perform progressively more difficult writing and speaking assignments. These assignments, described more fully under outcome (g) below, culminate with the seniors’ design project presentations to the Academic Advisory Meeting. The industry professionals attending this meeting rate the students’ performance using the same form that is used for all other PSE course presentations, shown in the PSE ABET information web site.

PSE faculty who teach courses that require writing use the same evaluation rubric for writing in every course. This rubric is shown in Table 3-4. Students receive copies of this evaluation rubric with the assignments so that they know what is expected. Faculty provide detailed feedback on the students’ work at each stage, and students may also evaluate each other’s work.

<table>
<thead>
<tr>
<th>Numerical Score</th>
<th>English Skills</th>
<th>Organization</th>
<th>Report Format</th>
<th>Scholarship</th>
<th>Technical Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>96-100</td>
<td>Superior use of grammar, no significant errors</td>
<td>All topics presented in logical sequence</td>
<td>No observed departure from required format</td>
<td>Well researched report</td>
<td>Excellent understanding of processes</td>
</tr>
<tr>
<td>91-90</td>
<td>Some lapses in grammar</td>
<td>Some noticeable topics out of sequence</td>
<td>A few formatting errors</td>
<td>Good use of library resources</td>
<td>Good, solid understanding of processes</td>
</tr>
<tr>
<td>81-90</td>
<td>Many lapses in grammar</td>
<td>Many topics out of sequence</td>
<td>Many lapses in format</td>
<td>Minimal library use evident</td>
<td>Adequate understanding of processes</td>
</tr>
<tr>
<td>71-80</td>
<td>Poor use of language</td>
<td>Random sequence of topics</td>
<td>Does not comply with required format</td>
<td>No library work evident</td>
<td>Poor understanding of processes</td>
</tr>
<tr>
<td>&lt;70</td>
<td></td>
<td></td>
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</tbody>
</table>
For several years, the English Department assisted with the evaluation of improvement in PSE students’ writing. They administered a writing evaluation that was very similar to the English placement exam given to entering freshmen. These writing samples were scored by the same English faculty who score the placement exams. We were then able to compare the scores of the students who started their studies here at UWSP with their scores in their senior year, giving a direct measure of their improvement. The results are shown in Figure 3-2 for all PSE students graduating during the academic years of 1997-98 through 2004-05. Scheduling difficulties prevented the assessment of the seniors graduating in 2006 and 2007. The scores assigned may range from 1 to 5 as illustrated in Table 3-5. The writing samples are evaluated based on the grading criteria rubric for Freshman English at UWSP (Table 3-6). The shift in the distribution of writing scores in Figure 3-2 clearly shows the improvement in writing ability in our graduates.

![Figure 3-2. Writing assessment results, 1998-2005](image)

### Table 3-5. Holistic method for evaluating English placement exams

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>The student is clearly above average in writing proficiency and should be placed in English 150</td>
</tr>
<tr>
<td>4</td>
<td>The student has some elements of his/her writing that exceeds the usual 101 competency, but other elements are only at the 101 elements. The student might be successful in English 150.</td>
</tr>
<tr>
<td>3</td>
<td>The student's writing proficiency matches that of the usual incoming English 101 student.</td>
</tr>
<tr>
<td>2</td>
<td>The student's writing is somewhat below the usual level for incoming English 101 students.</td>
</tr>
<tr>
<td>1</td>
<td>The student's writing is far below the usual level for incoming English 101 students. This student might benefit from remedial work on writing skills.</td>
</tr>
</tbody>
</table>
Table 3-6. Grading Criteria for English 101

<table>
<thead>
<tr>
<th>Grade</th>
<th>Sentence Level Skills</th>
<th>Essay Construction</th>
<th>Audience &amp; Style</th>
<th>Prewriting &amp; Drafting</th>
<th>Critical Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>rhetorically effective sentences; consistently accurate use of standard conventions of spelling &amp; punctuation; almost no grammatical errors</td>
<td>rhetorically powerful strategy; firmly established thesis/purpose; effective use of meta-textual devices to indicate structure; individual paragraphs fully develop a single, pertinent idea; easy to read &amp; convincing</td>
<td>written in the idiom and with the tone the audience expects; variety and precision in vocabulary; a unique and natural voice emerges</td>
<td>discovers original topics; has strategies for generating ideas; critically assesses and improves own draft; welcomes and responds to criticisms from others</td>
<td>full comprehension of literal and inferential meaning; recognizes themes, &amp; motivations of author/character; aware of cultural &amp; historical context ; synthesizes main points; understands tone</td>
</tr>
<tr>
<td>B</td>
<td>varied sentence structure and length with only occasional awkwardness; general adherence to standard conventions; only a few grammatical errors</td>
<td>appropriate rhetorical approach; identifiable thesis/purpose; evident structure with some signaling devices; all paragraphs relate to the thesis/purpose; coherent</td>
<td>largely successful utilization of the idiom and tone of the audience; appropriate vocabulary; an effective, but somewhat imitative voice</td>
<td>(same as above, but has greater need of teacher direction)</td>
<td>comprehension of literal meaning; accurate if limited interpretation of themes and motivations; some knowledge of context; identifies main points; recognizes tone</td>
</tr>
<tr>
<td>C</td>
<td>Communicatively adequate but repetitive sentence structure; awareness of, but inconsistent use of standard conventions; grammatical errors on every page</td>
<td>weak and/or inconsistent rhetorical approach; thesis/purpose present, but obscure; the rhetorical function of individual passages not always evident; occasional lack of distinction between major points and supporting points; hard to read</td>
<td>some attempt to utilize the relevant idiom and tone; sometimes inaccurate or confusing use of vocabulary; weak approximation of an appropriate written voice</td>
<td>slow to discover and develop original topics; needs assistance generating ideas; needs much guidance to improve drafts; trouble weighing and utilizing student criticism; perhaps indifferent effort</td>
<td>basic understanding of ideas/events; may not understand themes and motivations; minimum of background contextual knowledge; difficulty distinguishing major &amp; minor points/issues; unaware of sarcastic or ironic tones</td>
</tr>
<tr>
<td>D</td>
<td>Command of only basic, SVO sentence pattern and consequent obscurity; many violations of standard conventions; grammatical errors throughout, some affecting comprehension</td>
<td>no rhetorical plan; thesis/purpose must be inferred with difficulty; paragraphs are short and general statements are often followed with little or no support; subsequent readings do not clarify the meaning</td>
<td>idiom and tone are barely differentiated from casual speech; sporadic and/or ineffective use of crucial vocabulary; not immediately recognizable as belonging to a particular written genre</td>
<td>reluctance/inability to participate in the process; has few or no drafts to share with students and teacher; subsequent drafts evolve very little</td>
<td>holes in basic comprehension; only vague notions of themes and motivations; owns very few tools for interpreting texts</td>
</tr>
</tbody>
</table>
ASSESSMENT ACTIVITY: CURRENT

The current instruments for assessing the Program Outcomes use tasks that are embedded in student course work. Assessment of each Program Outcome is described below, including information from each course that includes direct assessment of the outcome as indicated in Table 3-2. All course syllabi may be found in Appendix A.

(a) the ability to apply knowledge of mathematics, science, and engineering

Evidence for the achievement of this outcome is included in the course portfolios for ten PSE courses: PAPR 215, 314, 320, 326, 385, 430, 440, 460 and 484/486.

PAPR 215: This course, Introduction to Process Engineering Calculations, introduces sophomore level students to the techniques of material and energy balances, a fundamental requirement for all internship and entry-level engineering positions for our students. PAPR 215 is sometimes called the “stoichiometry course” in a chemical engineering curriculum. Students learn to apply the basics of mathematics, chemistry and physics to problems concerning “real” processes. Students learn to draw process flow charts and perform balances on the material flowing through a system, often including chemical reactions. If time permits, students are introduced to energy balance procedures. If there is not sufficient time for energy balances during the semester, that topic is covered completely in PAPR 385. The evidence of student achievement is the final mass balance project. This project involves a case study on a large industrial system. The case study may be taken from a textbook or created by the instructor from industry data. All of these projects are based on pulp and paper industry technology. The course portfolio will contain the results of these projects from the last two offerings of this course. The project from 2006 is a case study taken from Felder and Rousseau’s first edition of Elementary Principles of Chemical Processes, and includes a mass and energy balance on a Kraft pulp mill. The project from 2007 is a mass balance on our department paper machine using data that the students themselves collected during a machine run conducted by the senior class of PSE majors. In each case, every student in the course was able to create an accurate process flow chart and perform most of the calculations correctly. The average on the Kraft mill was 85% of the calculations performed correctly; the paper machine balance average was 80%.

PAPR 314: This course, Engineering Statistics and Experimental Design, teaches junior level students how to apply statistics to pulp and paper manufacturing. Like all manufacturing processes, the pulp and paper industry relies heavily on statistics to track system performance. Students are required to analyze data provided through course instruction and data generated by laboratory projects. Examples of student work will be located in the course portfolio. Grading of these projects has focused on the correct statistical calculations based on the type of data. The average grade for these projects is over 90% correct.

PAPR 320: This course, Fluid Mechanics and Hydraulics, teaches junior level students concepts in fluid mechanics and their direct application to the pulp and paper industry. Students learn how to determine if flow is laminar or turbulent and why industrial equipment is designed for a specific flow regime. The pulp and paper industry relies heavily on equipment grounded in fluid mechanics to run its various processes. Students are taught how to calculate friction losses when selecting pipe sizes and
pumping equipment. As a final project, students must build a spreadsheet which calculates friction losses for piping systems using water or paper stock. The course portfolio will contain friction loss spreadsheets built by the last two classes. All students must succeed on this project through submission of spreadsheets for analysis of the instructor. If the student spreadsheets do not work, they are given back to the students to produce a revised spreadsheet until correct.

**PAPR 326:** The main focus of Heat Transfer Operations is teaching concepts of heat transfer to junior level students. The pulp and paper industry relies on heat transfer to dry paper during production, dry waste materials prior to burning, drying coatings applied to the sheet, and reducing heat losses through the use of heat exchangers. Students are taught how to calculate heat transfer coefficients for heat exchangers and drying systems used in the pulp and paper industry. Every semester, the students run the paper machine to generate data for the calculation of heat transfer coefficients on individual dryer cans in the system. In addition, the students build and use a simple heat exchanger to demonstrate the loss in heat transfer efficiency during fouled conditions. Examples of these projects will be located in the course portfolio. The average grade for these two projects is 92% correct which is based on having the correct calculations and coming up with the appropriate conclusion based on the calculations.

**PAPR 385:** Students in this Systems Engineering and Simulation course study larger material and energy balance problems that are of specific interest to the paper industry, including the use of spreadsheets and other modeling software to study the steady-state response of systems to changes in operating conditions. Results of computer simulations must be described in written reports that discuss the implications of the system responses. For example, in a problem that models a waste heat boiler, changes in the excess air supplied may result in operating conditions and flow rates that are impractical in one or more ways. Students must recognize these problems and state what their results mean in practical terms. The course portfolio for PAPR 385 will contain the reports, spreadsheets and model examples from several simulation problems. Students’ initial performance on these problems is highly variable, but if their first submission is inadequate the report is returned for revision and/or rework until the solution is correct. Students therefore have achieved 100% of the expected results on these assignments.

**PAPR 430:** Mass Transfer Operations is a course in which students apply many science and engineering principles to the analysis and design of mass transfer equipment. Students study several unit operations of importance to the pulp and paper industry. These processes require that they learn and use the principles of diffusion to solve the problems, which may also require mass and energy balances, phase equilibria and some fluid mechanics. Students prepare projects for this course, including an analysis of an operating gas absorption system, a study of the dryer section on the department paper machine and calculations for an industrial filtration process. The course portfolio for PAPR 430 will contain all of the course assignments and examples of student work on these assignments. Students tend to have the most difficulty with the gas absorption assignment, receiving an average of 70% on their work. This assignment is conceptually challenging for them, and is usually the first major assignment in the course. This is their first exposure to the concept of “transfer units” and operating/equilibrium lines. In subsequent assignments, such as the filtration work, the application of these concepts...
seems to be more clear to them, with an average of 85% on their work.

**PAPR 440**: In Industrial Thermodynamics and Kinetics, students learn that difficult engineering problems can be approached in a logical manner through the use of a defined problem solving method given to them at the beginning of the semester. Furthermore, all examples given in lecture follow this method explicitly. Students learn to define known parameters as symbolic variables and to record the magnitude and units of each variable including the unknowns. In this course, students are required to express their final result as an equation rather than just a numerical answer. The course portfolio for PAPR 440 includes numerous samples of solved problems using this structured method. Problems are evaluated using the following criteria: format, use of MathCad, Excel and/or TEST (The Expert System for Thermodynamics), use of a symbolic approach, correct thermodynamic theory, proper units, and finally the correct answer. The percent score for each criteria is presented in the syllabus. A homework or test problem is always scored with a preference for the correct equation and not just the correct answer. By the end of the semester this approach produces typical scores above 85%.

**PAPR 460**: Process Dynamics and Control requires students to apply what they have learned in math courses and in PAPR 215/385 to the analysis of time-dependent systems. Students must construct unsteady-state material and/or energy balance equations and solve them. The course portfolio contains examples of student solutions to these problems. Students generally have little difficulty with the solution of single differential equations, and their solutions are 90% correct.

**PAPR 484/486**: These courses house the capstone design project, described fully under Criterion 5.

**PAPR 314**: Both PAPR 314 and 355 are taught to junior level students. Over the past few years, students have been required to design experiments and analyze data as part of a two course project. Students must use concepts learned in PAPR 355 to develop a hypothesis to test and concepts from PAPR 314 to design and conduct experiments to test their hypothesis. Examples of student work from previous courses will be located in the course portfolio. Students were 100% successful on these projects through submitting drafts for analysis by the instructors until complete.

**PAPR 355**: Paper and Fiber Physics is a junior level course designed to teach students the scientific principles underlying the performance of paper and paper products. Although, there is a strong emphasis on teaching TAPPI testing procedures, the laboratory exercises are designed to explore key scientific principles and are essentially exploratory research projects. The projects are semester long and usually involve considerable planning and coordination by the students to produce analyzable results. Important experimental concepts such as accuracy and precision are emphasized to make students aware that correct procedures must be followed and sufficient sampling must be performed to obtain good results. This method of working with students has sometimes led to publishable results. Within recent years, the goal has been to have

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students present a joint poster at the CNR Student Research Symposium. The portfolio for this course contains example student laboratory reports describing the assigned projects and the student’s final results. One illustrating example is the construction of a model of a fiber network using paper strips and comparing those results with theoretical predictions. Another example is a more difficult experiment involving the collection of several paper sheet variables to determine veracity of the theoretical “Page” equation. This equation required the manipulation of a complex hyperbolic equation to determine regression parameters to enable data fitting. Student project reports generally earn “B” or better grades.

**PAPR 484/486:** These courses house the capstone design project, described fully under Criterion 5.

(c) The ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

This outcome is assessed in four PSE courses: PAPR 326, 430 and 484/486

**PAPR 326:** Students in Heat Transfer Operations are required to design a simple heat exchanger and then analyze its performance under normal operating conditions and fouled conditions. This exercise demonstrates how easily a device of this sort can be severely compromised and become uneconomical to run when fouled. Examples of student work from this project will be located in the course portfolio. The average grade for these two projects is 92% correct which is based on having the correct calculations and coming up with the appropriate conclusion based on the calculations.

**PAPR 430:** Students in Mass Transfer Operations study several processes of importance to the paper industry. The textbook used for the course is Unit Operations of Chemical Engineering by McCabe, Smith and Harriott. The course includes a unit on Humidification Operations based on the corresponding chapter from the text, but including in-depth study of cooling towers used in the paper industry. As part of this unit, students improve their understanding of the psychrometric chart and wet-bulb temperature measurement. They use a sling psychrometer to measure the wet- and dry-bulb temperature in a variety of locations, plotting the response of the thermometers as a function of time. Based on the theory of wet-bulb temperature and their observations during the use of the psychrometer, they are asked to design a wet-bulb temperature measurement device that addresses the limitations of the sling psychrometer (e.g. space required for use, time to equilibrium, etc.). The course portfolio for PAPR 430 will contain examples of student designs and reports. Students are encouraged to be creative, but some will resort to looking for laboratory devices that are readily available from many suppliers and attempting to copy the design of those devices. Over the years, only about 10% of students have taken this path. About 60% of the students will see what the design requires and make a good attempt at addressing the requirements, but will fall short in the considerations of the practicality of their device. The remaining 30% will design a good instrument that addresses all deficiencies and wet-bulb temperature measurement needs. This level of achievement is unsatisfactory, and must be addressed. Plans are described under Criterion 4.

**PAPR 484/486:** These courses house the capstone design project, described fully under...
Criterion 5.

(d) The ability to function on multi-disciplinary teams

This outcome is assessed in four PSE courses: PAPR 355, 475 and 484/486.

**PAPR 355:** Paper and Fiber Physics has been described previously under PSE program outcome “b. design and conduct experiments”. Because the assigned laboratory exercise was complex and generally entailed coordinated planning and execution, teams of approximately five students were formed to accomplish the assigned laboratory task. For this reason, this course was identified by its instructor as a good candidate to assess this program outcome. When the faculty attended the 2007 ABET Faculty Workshop on Assessing Program Outcomes, Gloria Rogers presented a rubric to assess this program outcome. As a result, the instructor of PAPR 355 chose to use this rubric in this course during the second semester of 2007-08. The following table was presented to the eight juniors taking this course. They were requested to rate their classmates in each criteria using the descriptors given in the table after the laboratory exercise has been completed that semester. The results of this peer review for the course are given below in Table 3-8.

<table>
<thead>
<tr>
<th>Performance criteria</th>
<th>Performance Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researched and gather information</td>
<td>Unsatisfactory 1, Developing 2, Satisfactory 3, Exemplary 4</td>
</tr>
<tr>
<td>Fulfills team roles duties</td>
<td>Always performs all duties of assigned team role</td>
</tr>
<tr>
<td>Share equally</td>
<td>Always relies on others to do the work</td>
</tr>
<tr>
<td>Listen to other teammates</td>
<td>Is always talking—never allows anyone else to speak</td>
</tr>
</tbody>
</table>

Since this was the first year using this rubric, there is no other data to compare these results with. These results will be used in future years to benchmark other team’s performances. This technique is encouraging. Although the results are narrowly distributed the average rankings did correspond to the instructor’s evaluation of most involved student (#5) and least involved student (#3). Overall, the instructor observed good team work among all the team members.
Table 3-8. Team performance: Peer ratings for PAPR 355

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Attribute 1</th>
<th>Attribute 2</th>
<th>Attribute 3</th>
<th>Attribute 4</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>2.9</td>
<td>3.1</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
</tr>
<tr>
<td>#2</td>
<td>3.5</td>
<td>3.5</td>
<td>3.2</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>#3</td>
<td>2.8</td>
<td>3.0</td>
<td>2.9</td>
<td>3.0</td>
<td>2.9</td>
</tr>
<tr>
<td>#4</td>
<td>2.8</td>
<td>3.0</td>
<td>3.0</td>
<td>3.1</td>
<td>3.0</td>
</tr>
<tr>
<td>#5</td>
<td>3.5</td>
<td>3.5</td>
<td>3.4</td>
<td>3.4</td>
<td>3.5</td>
</tr>
<tr>
<td>#6</td>
<td>2.9</td>
<td>3.0</td>
<td>3.0</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>#7</td>
<td>3.4</td>
<td>3.5</td>
<td>3.4</td>
<td>3.0</td>
<td>3.3</td>
</tr>
<tr>
<td>#8</td>
<td>2.9</td>
<td>3.1</td>
<td>2.9</td>
<td>3.1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

PAPR 475: Paper Machine Operations is a senior level course, where students learn about the design and operation of various types of modern paper machines. Because this department has a unique paper machine that is designed to be operated safely by students, this course’s laboratory section takes the opportunity to use the machine at its intended potential. Students in this course are divided into teams with the intention of producing a pre-defined grade of paper. Five practice lab sessions are scheduled followed by a final production run. Each team has five members and uses the practice lab sessions to learn the defined operational roles on the machine. One student team member serves as the leader or coordinator. All students rotate through the operational roles. Each practice run increases the number of process parameters that must be controlled until five parameters are controlled during the fifth run. The production run is the sixth and last machine run where the production of at least one roll of paper to specifications is required. Before the production run the team must select one team member who will be their leader and also select all other roles. A final report on the production run is required. This report asks the following questions: 1) How personal leadership skills were developed during the machine exercises. 2) Discuss the development of communication skills. 3) Discuss your acquisition of knowledge and skills about paper making. And 4) Discuss particular problem solving events that occurred. These reports are included in the portfolio for this course. A final oral report is given at the end of the semester where all team members discuss their successes and failures. However, this assessment technique did not demonstrate that the team was striving to work together rather it invoked statements of personal leadership. Therefore, the assessment technique described for PAPR 355 above will be used for this upcoming year.

PAPR 484/486: These courses house the capstone design project, described fully under Criterion 5.

(e) The ability to identify, formulate and solve engineering problems

This outcome is assessed in seven PSE courses: PAPR 320, 326, 430, 440, 460 and 484/486.

PAPR 320: Student ability to solve engineering problems is evaluated through solving problems on exams and homework. Examples of graded student work are included in the course portfolio. Average student grades for assignments and exams in this course are 91% based on correct problem solutions.
PAPR 326: Student ability to solve engineering problems is evaluated through solving problems on exams and homework. Examples of graded student work are included in the course portfolio. Average student grades for assignments and exams in this course are 91% based on correct problem solutions.

PAPR 430: Students solve a variety of mass transfer problems in the final course in the transport phenomena sequence. Examples of student work will be presented in the course portfolio. Students achieve 70-85% proficiency on these problems, lower earlier in the semester, higher on the later assignments.

PAPR 440: Engineering Thermodynamics concentrates on traditional problems obtained from numerous thermodynamic textbooks. The problems range from simple change-of-state problems to more complex process problems. Student’s ability to formulate and solve these problems is assessed using a structured problem-solving method. This format requires stating the givens, the unknowns, the thermodynamic theory or principle used to solve the problem, and the final solution to the problem stated with correct units in engineering notation. The course portfolio for PAPR 440 includes numerous examples of this formatted problem solutions. At the end of the semester, all students are able to achieve 85% or better for assigned problems.

PAPR 460: Students in Process Dynamics and Control extend their knowledge of industrial processes to include non-steady state material and energy balances and automatic control systems. During this course, students work many problems from the textbook, Principles and Practice of Automatic Process Control by Smith and Corripio. The course portfolio for PAPR 460 will contain several examples of solved problem assignments and exams. Students have little difficulty with the early mathematical content of the course (LaPlace Transforms for simple differential equations, 100% of students solve problems correctly). The subsequent application of LaPlace transforms to transient material and energy balance problems causes more difficulties (60% performed problem development correctly). Creation of block diagrams to represent processes is done well by students (100% correct). The solutions to problems in which a controller is introduced are handled with spreadsheets, and these problems are handled well by students (80% correct).

PAPR 484/486: These courses house the capstone design project, described fully under Criterion 5.

(f) The understanding of professional and ethical responsibility

This outcome is assessed in PAPR 475 and 484/486.

PAPR 475: Paper Machine Operations is a course that enables students to acquire sound professional and ethical responsibilities of working safely on potentially dangerous equipment. This course since 1997 has required that all students read and understand the safety and operations manual before being allowed to work on the paper machine. To ensure that students meet this high requirement, all students must first pass the safety exam with at least a 85% on a multiple-choice/fill-in-the-blanks exam. Each team assigned to work on the paper machine must have all its members pass the exam before being allowed to begin their assignments.

For the last four years, each team has been asked to produce a video “safety” film.
teaching their fellow classmates the required safety procedures on and around the
machine. Examples of these videos will be incorporated in the PAPR 475 portfolio.

**PAPR 484/486:** In the senior design sequence, students participate in class discussions
of the responsibilities of engineers and engineering codes of ethics. The students then
complete an online quiz on the code of ethics. They must repeat the quiz until they
score 100%. Last year’s senior class (five students) required a total of 47 attempts for
all of them to achieve 100%. This exercise will be repeated with future classes. The
course portfolio for PAPR 484/486 will contain the ethics quiz and results, showing
which of the questions caused students the most difficulty.

(g) The ability to communicate effectively

This outcome is assessed in six PSE courses: PAPR 210, 350, 355, 475, 484 and 486.
The development of writing skills is emphasized in the PAPR 210→350→355→
484/486 course sequence, although many other courses include some form of writing in
their assignments. Oral presentations are required and assessed in PAPR 350, 355, 475
and 484/486.

**PAPR 210:** This course is the first of two writing emphasis courses within the Paper
Science & Engineering major. The main focus of this course is to develop student
writing skills. The type of written communication this course emphasizes is brief
technical reports. Engineers when working in industry must be able to provide
technical reports summarizing current development projects within the organization.
These reports must contain the vital information without including unnecessary
information. This course is taught to freshmen students in the major. During their
sophomore year, students will begin their cooperative learning experience in industry.
The writing style taught in this course will be needed by students during their co-op.
Students are graded in this course using the standard department rubric. In addition,
students are provided a writing manual to guide report style in the course. The writing
manual will be included in the course portfolio. Students are required to reflect on their
weekly reports after they have received their grade online. This exercise has been a
great way to get feedback from students who may be reluctant to ask specific questions
during class time. Examples of student papers and online reflections are included in the
course portfolio. Technical writing is a skill that students do not generally learn in high
school which typically translates into poor grades at the start of the semester which
gradually transition better grades as the students improve. The average grade for the
first paper in the course is 67% which is at a D average. The average grade of the final
paper is 93% which is at an A- average.

**PAPR 350:** This is the second writing emphasis course. The focus of this course is for
students to write research papers similar to the type that would be submitted for
publication in a scientific journal. Paper style and evaluation requirements are included
as part of the department writing guide which is included in the course portfolio. In
addition to written papers, the students present their information orally in the course to
students and faculty in the department. Oral presentations are graded following a
standard department speaker evaluation form which is included in the course portfolio.
Examples of student papers will also be included in the portfolio. The average grade for
the research papers has been 90% correct based on the department writing rubric. The
average grade for the oral presentations has been 92% based on the department presentation evaluation form.

**PAPR 355:** In PAPR 355, a 3000 to 5000 word research paper is assigned to improve writing skills with a complex multi-page report that is more challenging than the writing tasks assigned during sophomore year. In addition, the objective is to have students search the published literature and use these sources as citations in their report. Usually eight to ten refereed citations are required. At the end of the semester, these reports are summarized in an oral presentation in class using PowerPoint software. The written reports are evaluated using the PSE grading criteria matrix developed in conjunction with the English department and paper industry members twenty years ago. The oral presentations are evaluated using the PSE standard speaker evaluation form. Examples of these reports are presented in the PAPR 355 course portfolio. In addition, several examples of the research reports, collected since the early 1990s, are included in a CD in the course portfolio. These reports are being compiled in order to provide a mechanism in which the work of students can benefit other students in their class and others. The expectation is that all students in this course is that all students will receive a B- or better grade in both the research report and oral presentation, and roughly 10% of the students will merit an A. Over the last five years involving 48 students, the grades ranged from B to A.

**PAPR 475:** In PAPR 475, students learn effective communication by assuming the role of leader during the practice runs and the final production run. The student team leader is called the “Machine Tender” to correlate with functional roles on actual paper machine crews. During each operation the machine tender is responsible for planning the run prior to the operation, communicating with the other team members to coordinate their actions and solving any immediate problems that occur. They are usually given an hour or more to achieve the objectives of the operation. There are usually five students on each team. During the run the instructor is observing the operation and scoring performance criteria for preparation, communication, problem solving and participation. At the end of the operation a sample sheet of paper must be handed in to prove that their objectives have been met. During these exercises, students are very much aware of their performance. When the fifth exercise, the production run, takes place the team members have learned to work well with each other and run the paper machine correctly to make a useable sheet of paper. In the portfolio for this course you will find evaluations of team performance and how communication related to their success. The minimal expectation for this course is that a “B” level of performance is achieved. However, this course generates a level of enthusiasm that usually has to be graded as a B+ or greater. Few teams fail to make good paper.

**PAPR 484/486:** These courses house the capstone design project, described fully under Criterion 5.

(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

This outcome is studied in several courses throughout the curriculum, primarily through the general education component. Although there are ample opportunities for assessment in these courses, UWSP as a campus does not assess general education
outcomes at all. The campus recognizes this as a significant problem, and must address this issue as a condition of its latest accreditation recommendation from the Higher Learning Commission.

(i) A recognition of the need for, and the ability to engage in life-long learning

This outcome is assessed by extension of the Industry Survey results for PEO #4. In this survey from 2002, 44 out of 49 supervisors of PSE graduates rated these employees either “Excellent” or “Very Good” on their “Ability to continue learning”.

The results of the 2008 survey of PSE alumni show that alumni take an average of 6.8 continuing education opportunities, only 3.5 of which are required by their employer. This illustrates that PSE alumni recognize the need to continue upgrading their skills and knowledge. Results of these surveys will be available to the team during the visit.

(j) A knowledge of contemporary issues

This outcome is assessed in PAPR 350, 365 and 484/486.

PAPR 350: Research topics for this course focus on contemporary issues in the pulping manufacturing sector. Current hot topics focus on biofuel production and energy efficiency. Each student is assigned a topic for a research paper. After finishing the research paper, all students are required to present their paper to the class. The oral presentations allow the students in the class exposure to all of the assigned contemporary issues. Paper style and evaluation requirements are included as part of the department writing guide which is included in the course portfolio. Oral presentations are graded following a standard department speaker evaluation form which is included in the course portfolio. Examples of student papers will also be included in the portfolio. The average grade for the research papers has been 90% correct based on the department writing rubric. The average grade for the oral presentations has been 92% based on the department presentation evaluation form.

PAPR 365: PAPR 365 addresses the knowledge of contemporary issues in the paper industry through the chosen topics of the assigned research paper. The most recent assignment involved “Nanotechnology” in papermaking, a topic that is considered the next important technology for the future of the industry. These reports were required to be 5000 words long with eight literature citations. An oral presentation was also required. The standard PSE tools were used to measure this program outcome. These reports are found in the portfolio for this course. This year’s average score for the term paper was 84%, which was worth 35% of the course evaluation. The average score for the oral presentation was 60%, which was worth 10% of the course evaluation.

PAPR 484/486: These courses house the capstone design project, described fully under Criterion 5.

(k) The ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

This outcome is assessed in eight PSE courses: PAPR 314, 320, 326, 385, 440, 460 and 484/486. Students have access to the Microsoft Office suite of software through the campus computer labs (or they may purchase the software at a greatly reduced cost through a UW System contract with Microsoft). The WinGEMS software package is
also accessible through the campus network. WinGEMS was written specifically for the pulp and paper industry, and contains many industry-specific process blocks for use in simulation.

PAPR 314: This course teaches junior level students how to apply statistics to pulp and paper manufacturing. Like all manufacturing processes, the pulp and paper industry relies heavily on statistics to track system performance. Students are required to analyze data provided through course instruction and data generated by laboratory projects. To analyze the data, students are required to use Minitab and the statistical calculations in Microsoft Excel. This is the same software they will use during their careers in industry. Grading of these projects has focused on the correct statistical calculations based on the type of data. The average grade for these projects is over 90% correct.

PAPR 320: Students develop skills to properly design flow systems necessary to run any pulp and paper facility. Students must build a spreadsheet to calculate friction losses in piping systems for water and pulp suspensions. These spreadsheets are tools that they can use in industry. Course exams require students to do these calculations without the aid of spreadsheets. Examples of student exams and spreadsheets will be included in the course portfolio. All students must succeed on this project through submission of spreadsheets for analysis of the instructor. If the student spreadsheets do not work, they are given back to the students to produce a revised spreadsheet until correct. Average exam grades based on completing the calculations correctly are 91%.

PAPR 326: Drying paper and pulp represents a very large cost in their manufacturing process. Every semester, the students run the paper machine to generate data for the calculation of heat transfer coefficients on individual dryer cans in the system. This assignment provides students a methodology to evaluate dryer cans when they work in industry. Examples of these projects will be located in the course portfolio. The average grade for these projects is 92% correct which is based on having the correct calculations and coming up with the appropriate conclusion based on the calculations.

PAPR 385: The simulation problems described under outcome (a) require the use of spreadsheets and higher level simulation software developed for the pulp and paper industry. Students use the Excel spreadsheet to solve many problems in this course. The course portfolio for PAPR 385 will show examples of student-created spreadsheets for material and energy balances for lime kilns, boilers and other commonly-used unit operations. The portfolio will also include examples of more complicated systems modeled with WinGEMS, including models of the department paper machine. This modeling task is the final assignment in the course. The students gather data for this simulation in groups, but each must prepare their own computer model of the system. Student performance on this assignment is excellent (100% produce a model that accurately reflects the operation of the paper machine), primarily due to the course policy of allowing students to correct and resubmit their work.

PAPR 440: PAPR 440 uses the web-based “The Expert System for Thermodynamics” (TEST) by Prof. S. Bhattacharjee (www.thermofluids.net). This software calculates all thermodynamic property values for virtually all materials in every phase. It calculates values for perfect, ideal and real materials. It calculates properties for several states and
graphs them in traditional diagrams such as PV, PH and TS. All calculations and graphs can be exported to Excel. It is also available to students after they graduate so that it is “carry forward” learning. Examples of the use of TEST with PAPR 440 homework problems and exams are included in the portfolio for this course. This web site is used frequently during lectures. Students enjoy using this site and it is a great improvement over steam tables and other more traditional property charts and tables.

**PAPR 460:** Students in Process Dynamics and Control use the Excel spreadsheet to model the time-dependent response of a system to process disturbances and setpoint changes. The course portfolio will contain examples of student-created spreadsheets that model the control of tank level and outlet solids concentration from a tank with dilution. Students perform well (100% achievement) on these assignments due to the ability to correct and resubmit their work. Future offerings of this course will incorporate the use of MATLAB/Simulink to model dynamic systems.

**PAPR 484/486:** These courses house the capstone design project, described fully under Criterion 5.

**Knowledge of the science and technology used in the paper industry**

This outcome is assessed in eight PSE courses: PAPR 350, 385, 355, 365, 430, 475 and 484/486.

**PAPR 350:** Students are assigned papers in vital areas in pulp manufacturing in this course. Through written papers and oral presentations, each student in this course learns key concepts in pulp production. In addition, as part of this course students take 4 in-depth tours of pulp mills in the Central Wisconsin area where they witness firsthand the technology necessary to produce chemical and mechanical pulp. Students build an Excel spreadsheet to calculate H-factor and G-factor. Chemical pulp mills use one of these numbers to control their pulping process. Exams in this course cover much of the science and technology to manufacture pulp. Examples of student work and exams will be included in the course portfolio. Average student grades on the exams and spreadsheets are 91% based on performing the calculations correctly.

**PAPR 385:** The simulation problems described under outcome (a) require that students interpret their results using their knowledge of pulp and paper science and technology. The course portfolio contains examples of student reports for these problems. Although students willingly resubmit their spreadsheets and WinGEMS files to improve their achievement, they do not do as well with the interpretation of their results. None of last year’s student reports showed high levels of thought about their simulation results. Many (75%) suggested process modifications that were highly impractical. These results are clearly unacceptable.

**PAPR 355:** Paper and Fiber Physics is the course where PSE students learn about paper as a product and the measurements of its properties. Information is presented to students via lecture, reading, and laboratory exercises. Acquisition of this knowledge is assessed using written exams. Exams are generally essay exams that explore student’s deeper understanding of the material by posing complex problems that need analysis and understanding in order to answer them completely. Classroom material is supplemented by a research paper and laboratory exercises. In the course the expectation is that 85% will
score above a “B-” grade, and that 25 % will score above a “B+” grade. Since 2002, 48 students have taken this course and the average grade was 3.56 or between B+ and A-.

**PAPR 365: Colloid and Surface Phenomena** is the course where PSE students learn about the process chemistry and the numerous papermaking additives. Information is presented to students via lecture, and reading. Acquisition of this knowledge is assessed using written exams. Exams are generally essay exams that explore student’s deeper understanding of the material by posing complex problems that need analysis and understanding in order to answer them completely. Classroom material is supplemented by a research paper. In the course the expectation is that 85% will score above a “B-” grade, and that 25 % will score above a “B+” grade. Since 2002, 48 students have taken this course and the average grade was 3.43 or between B+ and A-.

**PAPR 430: Mass Transfer Operations** concentrates on processes of importance to the paper industry, such as gas absorption, humidification, drying and filtration. Students work on projects based on operating equipment in a mill for this course. The average scores on these projects range from 70% on early assignments to 85% on later assignments.

**PAPR 475: Paper Machine Operations** is the course where PSE students learn about the equipment and process of papermaking. Information is presented to students via lecture, reading and through hands-on operation of a paper machine. Acquisition of this knowledge is assessed using written exams. Exams are generally essay exams that explore student’s deeper understanding of the material by posing complex problems that need analysis and understanding in order to answer them completely. In the course the expectation is that 85% will score above a “B-” grade, and that 25 % will score above a “B+” grade. Since 2002, 80 students have taken this course and the average grade was 3.86 or between A- and A.

**PAPR 484/486:** These courses house the capstone design project, described fully under Criterion 5.
CRITERION 4. CONTINUOUS IMPROVEMENT

Information Used for Program Improvement

Figure 4-1 shows the process for gathering and evaluating program performance data. The co-op and PAPR 300 evaluations by industry supervisors and PSE alumni surveys provide valuable data for use in a “long-loop” program planning cycle. An element that is missing from the present system is an ongoing process for obtaining information from the “permanent” employers of our graduates, similar to the industry survey that was done in 2002. The Paper Science Foundation is not represented in Figure 4-1, even though members of the Foundation are valuable sources of information. The department needs to design a formal, documented method for interacting with the Foundation for program improvement. The information obtained from these sources on industry trends, career satisfaction, etc. will allow long term adjustments to the program.

Student performance on the embedded assessment instruments described in criterion 3 will provide information for use in the “short-loop” program evaluation cycle, and allow short-term adjustments for the strengths and weaknesses of individuals and cohorts progressing through the program.

Figure 4-1. Assessment processes
Actions to Improve the Program

This report is for initial accreditation, so this will be the first general review. However, the PSE faculty has always been responsive to the need for curriculum adjustment. It is therefore of interest to describe the most recent changes in curriculum: the addition of PAPR 484 as a new course and the addition of Biochemistry as an alternative to Physical Chemistry. The assessment process continues to develop and is described here as well.

The addition of PAPR 484 worked very well. Extending the senior design project across both semesters created more space in the senior course schedule for engineering economics, engineering ethics, guest speakers (professional engineers, technical consultants, etc.), safety discussions, and laboratory experiments with the new equipment. This curriculum change was well received by industry attendees at the last two Academic Advisory meetings (May 2007 and 2008).

Adding Biochemistry as an alternative did not work well. The Chemistry Department indicated that PSE students are not well prepared for the course and performed poorly. This change will be reversed in the fall 2008 semester; the current biochemistry course will no longer be an option for PSE students.

The decision to pursue ABET accreditation resulted in some significant changes to the assessment processes in the department. The first action was to send Biasca and Ring to the ABET Commission Summit meeting in November 2006. The meeting proved valuable in that the faculty made contact with ABET personnel, learned more about the structure of ABET and gained an understanding of the accreditation requirements.

Next, all PSE faculty attended the 2007 ABET Faculty Workshop on Assessing Program Outcomes and the 2007 ABET Commission Summit. These meetings significantly improved the understanding of ABET accreditation procedures by all PSE faculty. Ideas generated during these meetings are gradually being introduced into the curriculum at logical assessment points, and the reporting formats for assessment data will be significantly improved during the next accreditation cycle. Furthermore, PSE faculty members are now creating rubrics for use on all major class projects, with the goal of having rubrics for use on embedded assessments during the 2008-09 academic year. These rubrics will contain statements of performance criteria and descriptions of the performance levels for all program outcomes. The faculty will develop common rubrics for use in evaluating problem-solving, teamwork and oral communication skills, similar to the rubric currently used for writing skills. These changes represent significant improvements to the informal assessments performed in the past.

Future assessment of program outcomes will take place using electronic portfolios. This project has been in progress for two years. The availability of appropriate software (with campus support) has been the limiting factor. These portfolios will contain required elements (those listed as assessment items in Criterion 3) as well as student selected items. We hope to begin testing a student-constructed e-portfolio in the fall 2008 semester.
CRITERION 5. CURRICULUM

Program Curriculum

All courses in the PSE curriculum are taught by tenure-track faculty, including those outside the department. The PSE faculty has full responsibility for ensuring that the PSE courses prepare students for the current engineering needs of the paper industry. All PSE faculty members have industry experience, and interact with technical and engineering professionals in the paper industry regularly. The faculty is thus well informed on the current industry-specific issues and needs. Tables 3-2 and 3-3 showed the relationships among the Program Educations Objectives, the Program Outcomes and the courses in the curriculum.

Table 5-1 lists the PSE curricular requirements, including the courses containing a significant element of engineering design instruction. As seen in the table, the curriculum distribution includes 51 credits (36%) of math and basic sciences and 62 credits (44%) devoted to engineering topics. This distribution satisfies both Criterion 5 requirements of 32 credits (or 25%) of math and basic sciences and 48 credits (37.5%) in engineering topics. It should be noted that, although Table 5-1 presents the curriculum as a four-year program, students who accept a co-op internship will be in residence at UWSP for a total of five years.

Based on tables 3-2, 3-3 and 5-1, there is adequate time devoted to all curricular components. The General Degree Requirements (GDR) deserve additional description and explanation.

UWSP uses a “distributed” model for its general education program. Students choose courses from a variety of disciplines to satisfy requirements. The GDR classifications are similar to those of other general education programs: Verbal and Quantitative Skills, Natural Science, Cultural Awareness, History, Humanities, Social Science, Environmental Literacy and Wellness. The PSE major results in a Bachelor of Science degree, which has no Foreign Language requirement. The objectives for the GDR classifications may be found in UWSP’s University Handbook, Section 3. Students who satisfy these extensive requirements should have a broad-based education upon which their professional studies may rest. Unfortunately, there is no mechanism for assessment of the GDR program. This deficiency was noted in the last institutional accreditation cycle and is the subject of a focused visit by the Higher Learning Commission in January 2012. Donald Guay, a PSE faculty member, chairs the General Education Review Committee for the campus. This committee has been charged with the development of a revised general education program that is amenable to assessment. Karyn Biasca, also a PSE faculty member, will serve on the UWSP Assessment Committee beginning in the fall 2008 semester. Faculty members in PSE recognize the importance of the general education component to our engineering program, and we do not hesitate to become involved in the shaping of this vital element of our students’ education.
<table>
<thead>
<tr>
<th>Year, Semester</th>
<th>Course (Department, Number, Title)</th>
<th>Category (Credit Hours)</th>
<th>Math &amp; Basic Sciences</th>
<th>Engineering Topics</th>
<th>General Education</th>
<th>Other</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>Second year Second semester</td>
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**Table 5-1 Curriculum**

**Paper Science and Engineering**

<table>
<thead>
<tr>
<th>Year, Semester</th>
<th>Course (Department, Number, Title)</th>
<th>Category (Credit Hours)</th>
<th>Math &amp; Basic Sciences</th>
<th>Engineering Topics</th>
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<th>Other</th>
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<td>Second year First semester</td>
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<td>PAPR, 215, Introduction to Process Engineering Calculations</td>
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<td>Second year Second semester</td>
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<td>ECON, 210, Principles of Macroeconomics</td>
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**TOTALS-ABET BASIC-LEVEL REQUIREMENTS**

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**OVERALL TOTAL FOR DEGREE**

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**_PERCENT OF TOTAL**

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<th>Percentage</th>
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<tr>
<td>36%</td>
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<td>44%</td>
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<td>20%</td>
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Totals must satisfy one set

<table>
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<th>Minimum semester credit hours</th>
<th>Minimum percentage</th>
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<tbody>
<tr>
<td>32 hrs</td>
<td>25%</td>
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<tr>
<td>48 hrs</td>
<td>37.5%</td>
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(WE) = Satisfies Writing Emphasis General Degree Requirement

(EL) = Satisfies Environmental Literacy General Degree Requirement
SENIOR ENGINEERING DESIGN PROJECT

The culminating design experience for PSE students is contained in the PAPR 484/486 course sequence during the senior year. The seniors are divided into groups of four to five and assigned a design project. The projects are based on laboratory needs within the department facilities, most often on the pilot paper machine. Since these projects involve changes to existing equipment or the installation of new equipment on the paper machine, there are always multiple possibilities for solutions but with very real constraints on the design choices. Since the paper machine is used for many other purposes, the final designs must not interfere with the existing uses. The equipment installation or modification must also be scheduled around the use of the paper machine for courses or contract work, bringing an element of the “real world” of project management to the design projects. Safety considerations are of utmost importance. Lack of attention to safety in a proposed design is unacceptable performance and will result in the project report being returned to the group for revision. The impact of the project on the environment must also be addressed in the report.

The two-semester sequence is administered as follows. During PAPR 484 (fall semester), the students are presented with their design problem. The final report for this course is a detailed project proposal containing background research, the design alternatives (PIDs and description), material and energy balances, computer models, cost estimates, detailed equipment lists and the group’s recommendation. Gathering the data, performing the calculations and preparing this report may be a significant challenge for the students, and is sometimes incomplete at the end of the fall semester. Students may negotiate with the instructors for additional time to complete the report early in the spring semester.

PAPR 486 follows in the spring semester. The students are expected to have their equipment changes and installation (as proposed in their report from PAPR 484) complete by spring break. This allows time for experiments on the machine to determine whether the project requirements have been met, and for design modifications if needed. The final requirements for the project include a written report and a formal presentation at the PSE Department’s Academic Advisory Meeting during finals week of spring semester. These final reports include a complete description of the project, an economic analysis and recommendations for future work. The attendees at this meeting are all paper industry professionals, many of whom are alumni form the PSE program. Attendees will ask the students many questions about the technical aspects of the project and what they learned about communication, teamwork and other managerial skills. Attendees then provide feedback to the faculty on student performance and preparation for engineering positions in the industry.

Over the last four years, there have been a good variety of design problems assigned to the seniors. The design project for 2007-08 required students to redesign the water system on the pilot paper machine to eliminate loss of papermaking fiber and reduce sewer losses by at least 50%. The project for 2006-07 required the students to find the causes for excessive variability in the paper produced on the department’s pilot paper machine and recommend and implement equipment to fix the problem. The projects from 2005 and 2006 required students to design modifications to the paper machine to allow the use of recovered paper from the campus to produce specified grades of paper.
The PAPR 484/486 course portfolio contains the final reports for these projects and the PowerPoint presentations given by students at the Academic Advisory Meeting. Industry attendees evaluate the students’ presentation skills and the project itself. These evaluations also appear in the course portfolio, and summaries from the 2008 meeting appear in Tables 5-2 and 5-3. The students also presented their projects at the College of Natural Resources Undergraduate Student Research Symposium, and their evaluations from this activity will be in the course portfolio as well. Both PSE groups presenting at the 2006 Symposium won Highest Honors for their poster presentation.

Table 5-2. Summary of evaluation of presentation skills, 2008

<table>
<thead>
<tr>
<th>Attribute</th>
<th>% scoring “Outstanding” or “Very Good”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>96</td>
</tr>
<tr>
<td>Voice</td>
<td>88</td>
</tr>
<tr>
<td>Organization</td>
<td>91</td>
</tr>
<tr>
<td>Knowledge</td>
<td>82</td>
</tr>
<tr>
<td>Attitude</td>
<td>87</td>
</tr>
<tr>
<td>Discussion</td>
<td>80</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 5-3. Summary of evaluation of design project, 2008

<table>
<thead>
<tr>
<th>Attribute</th>
<th>% scoring “Exceptional” or “Acceptable”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Problem and Boundaries</td>
<td>85</td>
</tr>
<tr>
<td>Alternative Designs</td>
<td>92</td>
</tr>
<tr>
<td>Use of Computer-aided Tools</td>
<td>85</td>
</tr>
<tr>
<td>Application of Engineering Principles</td>
<td>92</td>
</tr>
<tr>
<td>Final Design</td>
<td>100</td>
</tr>
<tr>
<td>Process Economics</td>
<td>100</td>
</tr>
<tr>
<td>Interpretation of Results</td>
<td>92</td>
</tr>
</tbody>
</table>

COOPERATIVE EDUCATION REQUIREMENT

PAPR 300 is a three-credit mill internship that is required for the major. This requirement may be satisfied with a cooperative internship or a summer internship. The
cooperative internships, or “co-ops”, are similar to those of many other programs in that they span an academic semester and a summer. Students interview for the co-op opportunities through a department-sponsored job fair in early October of every year. Employers make the offers directly to the students, usually before the end of November. The students may begin their internships in January and work through August of that year, or they may begin in late May and work through January of the following year. A result of the student being off-campus for a semester is that they will then need five years to complete the PSE major. There is some benefit for the student, however: the additional semester gives the opportunity to take courses for an additional minor. Many students will take courses required for a minor in Business Administration, Economics, Math or a foreign language.

Summer internships are also publicized at the job fair; students are typically hired for the summer by the following March or earlier. Both co-op and summer opportunities are paid internships. Wages for these students ranged from $15-20 per hour in the 2006-07 academic year. Although the co-op internship is not required, virtually all PSE students choose to take a co-op internship. These students will also work in a summer mill internship, resulting in graduates of the program having at least a year of paper-industry work experience. Students usually satisfy the PAPR 300 requirement while on their co-op.

Students receive credit for PAPR 300 by writing a comprehensive report on the mill where they have their internship. Since this report usually contains confidential information about the mill, the student’s supervisor is responsible for evaluating the report and forwarding a grade to the PSE Department chair. PSE provides guidelines for report requirements and a grading rubric for the supervisor’s use. The PAPR 300 evaluation form provided to the supervisor is shown in the PSE ABET information web site. The results of the evaluations of 72 student reports are shown in Table 5-4.

<table>
<thead>
<tr>
<th></th>
<th>English Skills</th>
<th>Organization</th>
<th>Report Format</th>
<th>Scholarship</th>
<th>Technical Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td>88.9</td>
<td>92.4</td>
<td>92.0</td>
<td>89.0</td>
<td>89.4</td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td>5.5</td>
<td>3.0</td>
<td>4.2</td>
<td>6.7</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>70-95</td>
<td>80-95</td>
<td>75-97</td>
<td>65-97</td>
<td>70-97</td>
</tr>
</tbody>
</table>

Supervisors also complete a co-op performance evaluation form for the department. This form asks for information about the student’s work habits and abilities. The results of evaluations of students in the graduating classes from 2002-07 are shown in Figure 5-1, with 1=lowest and 5=highest. The expectation is that 75% or more of the employers will rate the students at 4 or 5 for all attributes. This is shown to be the case in Table 5-5. Co-op employers are consistently pleased with the work of our students, and return to hire co-ops year after year.
Figure 5-1. Co-op employer evaluation results (2002-2007)

Table 5-5. Summary of Co-op employer evaluations (2002-2007)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>% responding 4 or 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships with others</td>
<td>90%</td>
</tr>
<tr>
<td>Attitude</td>
<td>79%</td>
</tr>
<tr>
<td>Ability to learn</td>
<td>94%</td>
</tr>
<tr>
<td>Personal judgement</td>
<td>79%</td>
</tr>
<tr>
<td>Dependability</td>
<td>86%</td>
</tr>
<tr>
<td>Quality of work</td>
<td>89%</td>
</tr>
<tr>
<td>Overall performance</td>
<td>86%</td>
</tr>
<tr>
<td>Relationships with others</td>
<td>90%</td>
</tr>
</tbody>
</table>
Materials that will be available for review during the visit include:

- UWSP Catalog
- University Handbook
- College of Natural Resources Policy Manual
- Course portfolios containing materials as described under Criterion 3
- General Degree Requirements
- Past Program Review and Assessment Reports
- Feedback from UWSP Assessment Committee
- Paper Science Foundation documents
- Minutes from Academic Advisory Meetings

**Prerequisite Flow Chart**

Figure 5-2 shows a prerequisite flow chart for the PSE major. Arrows indicate prerequisites for each course.

**Course Syllabi**

Course syllabi for each course used to satisfy the mathematics, science, and discipline-specific requirements required by Criterion 5 are included in Appendix A.

**Course Sections**

Table 5-6 shows the course section size summary for the latest academic year (2007-08). Only Paper Science and Engineering courses are included.
Figure 5-2. Prerequisite flowchart
<table>
<thead>
<tr>
<th>Course No.</th>
<th>Title</th>
<th>Responsible Faculty Member</th>
<th>Sections Offered (Fall/Spring)</th>
<th>Section Enrollment</th>
<th>Lecture</th>
<th>Laboratory</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPR 103</td>
<td>Paper, Society and The Environment</td>
<td>Guay/Biasca</td>
<td>1/1</td>
<td>49/50</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 105</td>
<td>Freshman Forum</td>
<td>Guay</td>
<td>1/0</td>
<td>6/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 210</td>
<td>Pulp &amp; Paper Lab Methods</td>
<td>Guay</td>
<td>0/1</td>
<td>0/16</td>
<td>20%</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>PAPR 215</td>
<td>Intro to Process Engineering Calcs</td>
<td>Biasca</td>
<td>1/0</td>
<td>10/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 300</td>
<td>Mill Internship</td>
<td>Ring</td>
<td>1/1</td>
<td>6/2</td>
<td>100%</td>
<td></td>
<td>FIELD 100%</td>
</tr>
<tr>
<td>PAPR 314</td>
<td>Engineering Stat Design and Analysis</td>
<td>Guay</td>
<td>0/1</td>
<td>0/9</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 320</td>
<td>Fluid Mechanics and Hydraulics</td>
<td>Guay</td>
<td>1/0</td>
<td>8/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 326</td>
<td>Heat Transfer Operations</td>
<td>Guay</td>
<td>0/1</td>
<td>0/8</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 350</td>
<td>Wood and Pulping Technology</td>
<td>Guay</td>
<td>1/0</td>
<td>8/0</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>PAPR 355</td>
<td>Paper and Fiber Physics</td>
<td>Ring</td>
<td>0/1</td>
<td>0/8</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>PAPR 365</td>
<td>Colloid and Surface Phenomena</td>
<td>Ring</td>
<td>0/1</td>
<td>0/8</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 385</td>
<td>Systems Engineering and Simulation</td>
<td>Biasca</td>
<td>1/0</td>
<td>8/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 399</td>
<td>To Be Arranged</td>
<td>Ring</td>
<td>1/1</td>
<td>0/1</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 410</td>
<td>Leadership Practicum</td>
<td>Guay</td>
<td>0/1</td>
<td>0/4</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 430</td>
<td>Mass Transfer Operations</td>
<td>Biasca</td>
<td>1/0</td>
<td>5/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 440</td>
<td>Industrial Thermo and Kinetics</td>
<td>Ring</td>
<td>1/0</td>
<td>5/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 445</td>
<td>Coating and Converting Operations</td>
<td>Biasca</td>
<td>0/1</td>
<td>0/2</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 460</td>
<td>Process Dynamics and Control</td>
<td>Biasca</td>
<td>1/0</td>
<td>5/0</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAPR 475</td>
<td>Paper Machine Operations</td>
<td>Ring</td>
<td>1/0</td>
<td>5/0</td>
<td>50%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>PAPR 484</td>
<td>Engineering Design Project I</td>
<td>Guay</td>
<td>1/0</td>
<td>5/0</td>
<td>75%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>PAPR 486</td>
<td>Engineering Design Project II</td>
<td>Biasca</td>
<td>0/1</td>
<td>0/5</td>
<td>75%</td>
<td>25%</td>
<td></td>
</tr>
</tbody>
</table>
CRITERION 6. FACULTY

Leadership Responsibilities

Gerard Ring is the department chair. His leadership and management responsibilities are listed in the position description, included in the PSE ABET information web site.

Authority and Responsibility of Faculty

Course creation, modification and evaluation are entirely the responsibility of PSE faculty. The Dean of the College may make suggestions about curricular matters, but it is the faculty’s responsibility to take action.

Courses may be created or modified through an established process through the faculty governance system. The procedure is as follows.

1. A department faculty member identifies a need for course creation or modification.

2. After discussion with other department faculty, a “Request to Approve a New Course or Revise a Course” form is completed (see the PSE ABET information web site for an example form).

3. Department faculty members vote on the proposal.

4. The request is sent to the CNR Curriculum Committee, which presents the request at a meeting of the CNR faculty for a vote.

5. The request is forwarded to the University Curriculum Committee for approval. If the course is to satisfy a General Degree Requirement, the request must first be approved by the General Degree Requirement Subcommittee.

6. After the approvals listed in step 5, the request is brought to the Faculty Senate for approval.

Responsibility for consistency and quality of courses resides within the department.

Faculty

Table 6-1 shows the activity distribution for the faculty members in PSE. Table 6-2 shows the professional credentials of the faculty. Faculty resumes may be found in Appendix B. The size of the faculty (three tenure-track faculty members) is adequate for the current status of the program. Growth in the number of students majoring in PSE, research activity or outreach activity will place a strain on faculty availability for advising, consulting, etc.

Faculty Competencies

In the field of Paper Science and Engineering, professional registration is not required in most entry-level positions. There are, therefore, few to no Professional Engineers on the faculty for such programs. The variety of content required for the curriculum requires a faculty with diverse backgrounds to provide adequate coverage. The PSE Department at UWSP has such a faculty.

Ring has ample experience and knowledge in the areas of surface and colloid chemistry, paper physics and paper manufacture. His degrees include a B.S. in chemistry and
biology from the State University of New York at Albany, and M.S. and Ph.D. degrees from the Institute of Paper Chemistry. He has published in these areas, and has twenty-two years of experience in teaching his courses in the curriculum.

Biasca brings extensive knowledge and experience in pulping processes, paper manufacture, engineering topics and the use of computers for engineering tasks. She has a B.S. degree in Chemical Engineering from UCLA, and M.S. and Ph.D. degrees from the Institute of Paper Chemistry. She has published in her areas of focus and has nineteen years of experience on the faculty.

Guay is a graduate of the UWSP PSE program. He has a Ph.D. from the University of Maine at Orono. His industrial experience includes work with a contract engineering firm and management of a laboratory service provider for the pulp and paper industry. He brings this experience into his courses at every level.

**Faculty Size**

The current PSE faculty is comprised of three tenure-track professors: Gerard Ring, Karyn Biasca and Donald Guay. Ring and Biasca are tenured, full professors. Guay is an untenured assistant professor. Kelly Klaas, the department laboratory manager, has an academic staff appointment and assists with instruction in several courses. Resumes for these individuals are included in Appendix B. There are currently thirty-three declared PSE majors, giving an 11:1 student:faculty ratio.

Faculty members perform all academic and career advising for students. Students are assigned to advisors based on their year in the program. Guay currently advises the freshman and sophomore classes, Biasca advises the juniors and the students who are working in their co-op positions and Ring advises the seniors. This assignment of advisors allows more effective advising for the students. For example, Guay is responsible for ensuring that the sophomores (who are about to go to their off-campus co-op position) register for the appropriate course (COOP 001, 0 credits) so that they will maintain their status as continuing students without paying tuition. Biasca knows that the students who are returning to campus must register for PAPR 300 to satisfy the industrial internship requirement. These subtleties of advising will slip past the students if not advised properly.

All faculty members interact extensively with students, both inside and outside of the classroom. Class sizes are small, allowing students to receive individual attention from faculty. The small classes also allow faculty to use more intensive assignments, include more writing and oral presentations than would be practical with larger classes.

Opportunities for student-faculty activities outside of the classroom include an annual scholarship banquet, a spring banquet and many student organization activities (bowling, skiing, etc.). Depending on individual interests, faculty will join in with the students on many of these activities.

Students and faculty travel to professional and technical meetings as well, allowing faculty to model the role of professionals in the paper industry. For example, juniors and seniors attended the Technical Association of Pulp and Paper Industry (TAPPI) Engineering, Pulping and Environmental Conference in Jacksonville, FL in October 2007 accompanied by Guay. Students may also attend local technical events.
The faculty members enjoy the relationships that are possible with the small number of students currently in the program. The number of students is expected to increase due to improved recruiting efforts and a healthier paper industry. Significant increases in student numbers will put additional demands on the faculty, perhaps resulting in less intensive course work, less time for advising, etc.

Faculty Development

The PSE Department places high priority on faculty development. Faculty members are encouraged to choose their own path for improving their abilities while keeping the mission of the department in mind. The Paper Science Foundation provides monetary support for faculty travel to technical conferences to maintain currency in the field. The Dean of the College, the Provost and the Chancellor have also provided support for faculty to develop their understanding of ABET requirements and assessment methods.

All CNR faculty members are required to report their activities to the Dean of the College on an annual basis. The forms for the last three years for PSE faculty are included in the PSE ABET information web site. The highlights of these development activities for each faculty member are listed below, organized under the general headings of teaching, scholarship and service, with Ring having the additional “Administrative” category as department chair.

Ring

Teaching
- Integrated the paper machine into all my courses (PAPR 101, 355, 365 and 475).
- Had PAPR 355 students participate in CNR student research symposium by presenting a poster entitled “Theoretical Paper” describing a model sheet of with random fibers.

Scholarship
- Was awarded UW System Innovation Scholar Award for “Pulp Preprocessor” patent application.

Service
- Served on the Phi Kappa Phi Executive Committee as President.
- Served on the TAPPI Board of Directors.

Administrative
- Working with UWSP administrators, the paper industry (particularly the Wisconsin Paper Counsel), and Wisconsin state legislators funding for our laboratory manager position was secured.
- Awards were sought and obtained for Karyn Biasca (Teaching excellence), Carl Rasmussen (University Service Award), Michael Kocurek (Paper Industry International Hall of Fame, 2005 inductee).
- Worked with Chris Thomas and Randy Champeau to write a proposal for the “Wisconsin Institute of Sustainable Technology”. The proposal is now a four-college joint effort for UWSP.
**Biasca**

**Teaching**
- Attend annual UWSP Teaching Symposium
- Member of ASEE
- Pulp and paper outreach courses for paper industry employees

**Scholarship**
- Development of online learning tools
- Electronic portfolio project

**Service**
- ABET coordinator/liaison
- NCA/HLC Reaccreditation coordinator, Chair of Accreditation Steering Committee
- UWSP General Degree Requirement Subcommittee
- Program Assessment Coordinator

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**Guay**

**Teaching**
- Attend annual UWSP Teaching Symposium
- Pulp and paper outreach courses for paper industry employees
- Co-developed PAPR 103 to teach students (Both majors and non-majors) about environmental issues in the pulp and paper industry

**Scholarship**
- Cellulosic biofuel development
- Fiber utilization to incorporate more recycled fiber
- Fiber length analysis techniques

**Service**
- Co-chair of General Education Policy Review Committee
- UWSP University Personnel Development Committee
- Past-chair of Process & Product Quality Division of TAPPI
- UWSP Student TAPPI/PIMA group advisor
### Table 6-1. Faculty Workload Summary
Paper Science and Engineering, 2007-08

<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>FT or PT</th>
<th>Classes Taught (Course No./Credits), Semester (F=fall, S=spring)</th>
<th>Total Activity Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>Ring</td>
<td>FT</td>
<td>300/3, F+S, 440/4, F, 475/4, F, 355/4, S, 365/3, S</td>
<td>75%</td>
</tr>
<tr>
<td>Biasca</td>
<td>FT</td>
<td>103/3, F, 320/3, F, 350/4, F, 484/2, F, 210/3, S, 314/3, S, 326/3, S, 410/1, S</td>
<td>75%</td>
</tr>
<tr>
<td>Guay</td>
<td>FT</td>
<td></td>
<td>75%</td>
</tr>
</tbody>
</table>
Table 6-2. Faculty Analysis
Paper Science and Engineering

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Type of Academic Appointment</th>
<th>FT or PT</th>
<th>Highest Degree and Field</th>
<th>Institution from which Highest Degree Earned &amp; Year</th>
<th>Years of Experience</th>
<th>Level of Activity (high, med, low, none) in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Professional Society</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Consulting /Summer Work in Industry</td>
</tr>
<tr>
<td>Ring</td>
<td>Prof</td>
<td>TT</td>
<td>FT</td>
<td>PhD</td>
<td>Inst of Paper Chem, 1980</td>
<td>6</td>
<td>TAPPI – M</td>
</tr>
<tr>
<td>Biasca</td>
<td>Prof</td>
<td>TT</td>
<td>FT</td>
<td>PhD</td>
<td>Inst of Paper Chem, 1989</td>
<td>3</td>
<td>TAPPI – L</td>
</tr>
<tr>
<td>Guay</td>
<td>Asst Prof</td>
<td>TT</td>
<td>FT</td>
<td>PhD</td>
<td>Univ Maine, 1999</td>
<td>4</td>
<td>TAPPI – H</td>
</tr>
</tbody>
</table>

TT = Tenure Track  T = Tenured  NTT = Non Tenure Track
CRITERION 7. FACILITIES

Space
The facilities available to the faculty and staff of the Paper Science and Engineering program are adequate for the needs of the undergraduate curriculum. The PSE department is housed in an addition to the Science building that was built in 1986. This addition is comprised of a distance learning classroom, a conference room, several laboratories, and faculty/staff office space. The laboratories include a paper testing laboratory, a paper wet lab area, a process engineering/paper machine lab and a converting lab. These laboratories are preferentially available for classroom work. They are also available for research and outside contract work.

PSE Staff and Faculty Offices
The faculty offices are large, well maintained and easily located by both students and visitors. The Paper Science and Engineering Department Office (D-274 Science) is staffed by a Program Associate along with the Department Chair. There are also five faculty and staff offices. The close proximity of all the offices, the main classroom and paper testing lab allow for easy facilitation of communication between both the faculty and staff and the students.

Classrooms
The PSE Department has a modern, level-4 distance education classroom (D-279 Science) that was installed in 2003. D-279 has the capability to project all forms of electronic media. Most paper science and engineering courses are taught in this room. This classroom is also used by the students as a commons area for studying or working on class projects. Other classrooms are shared with the other academic departments in the Science building and are scheduled on a semester by semester basis as needed. These classrooms are listed in Table 7-1 below.

Table 7-1: Classrooms used for PSE required courses

<table>
<thead>
<tr>
<th>Room</th>
<th>Capacity</th>
<th>Department Responsible</th>
<th>Written Media</th>
<th>Electronic Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-106</td>
<td>25</td>
<td>Physics</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>A-107</td>
<td>56</td>
<td>Physics</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen, Sound</td>
</tr>
<tr>
<td>A-109</td>
<td>56</td>
<td>Physics</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen, Sound</td>
</tr>
<tr>
<td>A-110</td>
<td>25</td>
<td>Chemistry</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>A-111</td>
<td>25</td>
<td>Chemistry</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>A-112</td>
<td>25</td>
<td>Chemistry</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>A-202</td>
<td>44</td>
<td>Math</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen, Sound</td>
</tr>
<tr>
<td>A-207</td>
<td>36</td>
<td>Math</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen</td>
</tr>
<tr>
<td>A-210</td>
<td>49</td>
<td>Math</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen</td>
</tr>
<tr>
<td>A-225</td>
<td>39</td>
<td>Math</td>
<td>Chalkboard</td>
<td>Computer, DVD, AV Screen</td>
</tr>
<tr>
<td>B-348</td>
<td>28</td>
<td>Math</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>D-228</td>
<td>29</td>
<td>Math</td>
<td>Chalkboard</td>
<td>AV Screen</td>
</tr>
<tr>
<td>D-279</td>
<td>39</td>
<td>PSE</td>
<td>Doc Camera</td>
<td>Computer, DVD, AV TV’s, Sound</td>
</tr>
</tbody>
</table>
PSE Conference Room
The PSE conference room (D-281 Science) is used as a faculty meeting room, an interview room, a small library, and a classroom.

PSE Multi-Purpose Room
The PSE department has a multipurpose room (D-272 Science) that is used for departmental and student projects. The department uses this room to assemble recruitment mailings, and storing office supplies. Students use this room for student organization projects.

Laboratories
All PSE laboratories are described in Table 7-2, with room number, size and courses taught for each room along with the condition of the laboratory and its adequacy for instruction. In addition to the laboratories listed below, space in the Waste Water treatment laboratory adjacent to D-135 is being shared as a substitute paper wet lab. This space is necessary to accommodate PAPR 210 laboratory exercises which typically involve 15 – 21 students. The current Waste Water Laboratory space will replace the wet lab located in room D-135 when a new Waste Water Laboratory is built in another building.

PSE required courses such as chemistry and physics have their own laboratories and are maintained by those departments.

Table 7-2: Paper Science and Engineering Laboratory Facilities

<table>
<thead>
<tr>
<th>Room No.</th>
<th>Purpose of Laboratory, Including Courses Taught</th>
<th>Condition of Laboratory</th>
<th>Adequacy for Instruction</th>
<th>Area (Sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-271</td>
<td>Converting Equipment PAPR 314, 355, 475.</td>
<td>Very Good</td>
<td>N/A</td>
<td>240</td>
</tr>
<tr>
<td>D-135</td>
<td>Process-Engineering/Paper Machine Laboratory PAPR 105, 210, 320, 326, 350, 355, 385, 410, 440, 445, 460, 475, 484, 486</td>
<td>Excellent</td>
<td>Excellent</td>
<td>3500</td>
</tr>
<tr>
<td>D-135</td>
<td>Paper Wet Lab Area PAPR 210, 350, 355, 440, 460, 484, 486</td>
<td>Good</td>
<td>Good for 8 students or fewer</td>
<td>500</td>
</tr>
<tr>
<td>D-285</td>
<td>Paper Testing Laboratory PAPR 210, 314, 355, 410, 475, 484, 486</td>
<td>Very Good</td>
<td>Very Good</td>
<td>1144</td>
</tr>
</tbody>
</table>

Total Area: 5384

Library
The UWSP library, known as the Albertson Learning Resource Center (LRC), maintains a collection of text books, technical journals and archived information to support the Paper Science and Engineering Department. There is an annual budget for PSE faculty requests for text- and reference books. The recent average acquisition expenditure for PSE is $1305. The library subscribes to eleven journals specifically for PSE, costing $2654 annually. The library currently holds 338 volumes specifically related to PSE. The LRC provides library services and materials in a variety of formats, including books
(paper and electronic), serial publications, government documents, microforms, and electronic reference sources and aggregation services in a federated searching system. Library services for faculty, staff, administrators, and students are numerous and include: circulation; reference (email, telephone, and in-person); reserve (electronic and paper); interlibrary loan; document delivery; library instruction and other presentations and workshops; and assistive technology. The web site for the LRC and its services is: http://library.uwsp.edu/.

The LRC provides the PAPERCHEM paper industry literature database (annual subscription cost $6752) for the use of PSE students and faculty. Many other literature databases are available including ChemAbstracts.

PSE Room D-281 has a small library that contains technical and abstract journals.

Storage
A storage room in the Science Building is used to keep paper machine parts, a lab coater and a lab de-inking floatation cell. Along with this small facility a locked area in the Facility Services Building is used to store our large paper machine spares, extra testing and laboratory equipment, piping and raw materials.

Resources and Support

Computers
Paper Science and Engineering faculty and staff have access to all computing resources at UW-Stevens Point, including the availability for desk top and/or lap top computers, printers, and any necessary software. Computers have access to the Internet through high speed wired connections. All campus buildings have both wired and wireless network connectivity. Computer service requests are processed through the campus Information Technology Department.

Paper Science and Engineering students also have access to Information Technology support as well as the university computer labs and any available software. The University Information Technologies Department will install specific engineering-related software on the servers, at the request of an individual Faculty. Computer labs can be scheduled for classroom computer exercises as needed. There are computer labs in all instructional campus buildings and the Learning Resource Center and Dreyfus University Center. The most commonly used computer lab by Paper Science and Engineering majors is room B-228 in the Science Building. This computer laboratory is split into two teaching labs with a total of 86 workstations, two teaching consoles and projectors, and standard campus software on all machines. All residence halls are wired for internet and network access.

The software that is used within the curriculum includes Microsoft Office applications, Minitab, WinGEMS, and MATLAB/Simulink. The department also licenses the use of “The Expert System for Thermodynamics” (TEST) on the web (http://thermo.sdsu.edu/testcenter/) for thermodynamic property evaluation and thermal systems analysis. Microsoft Office, Minitab, and WinGEMS are licensed for network use through the campus Information Technology Department. All of the computer
hardware and software systems more than adequately support the Paper Science and Engineering program educational objectives and outcomes.

The Information Technology Department has four different divisions including Information Technology, Information Systems, Telephone Support and Web and Media Services. This department has 49 full time employees and a variable number of student workers. The breadth and depth of their knowledge covers Student Technical Services, Software Contracts, Network and Infrastructure Coordination and Support, General Tech Support and Help Desk, Email Infrastructure, Computer Lab, Printer, AV and Support, Information Systems, and Electronic Media coordination and Support.

Laboratories
The faculty and staff have very good laboratory resources in all areas of chemistry, physics and papermaking. Over the last fifteen years many donations of high-priced items have been brought to our facility, including our entire paper machine. The primary sources of funding were from donations from alumnus, paper companies, allied companies, grants and through endowments from our UWSP Paper Science Foundation. In 1992 S.D. Warren Company donated our paper machine at a value of $2,000,000. The machine also received a WISTAR $900,000 grant from the state and matching grants from the paper industry. George Mead from Consolidated Paper Company gifted our Foundation with an endowment of $300,000 ($500,000 present value) restricted to maintaining our paper machine and laboratory equipment.

We maintain our equipment and laboratory supplies by generating external revenue; companies may use our machine for production runs, and companies or individuals seeking testing or paper machine trials may use our facilities for their research. Equipment is repaired or replaced on an as needed basis, as determined by the Laboratory Manager. The senior design projects usually are aligned with our paper machine or equipment repair, design or redesign needs. Within the upcoming year we plan to purchase a horizontal tensile tester and some new analytical balances to replace older laboratory equipment. Many of the paper machine table and guide rolls will also be reconditioned.

The Laboratory Manager is in charge of installing, maintaining, managing and running all of the equipment in all of the laboratories and supervises student employees. The lab manager also assists in the instruction of laboratory classes by demonstrating safe operations of equipment and instruments used in the Paper Science and Engineering courses, and supporting the faculty with any needs they may have for a course during the year.

Mechanical maintenance and installations are done by the lab manager with the support of about three part time student employees during the academic year and three full time student employees during the summer. The University provides maintenance and installation service on any electrical equipment, and anything that would be needed for infrastructure within the building (e.g. steam leaks or city water line repair). University support for maintenance is described further under Criterion 8.
Major Instructional and Laboratory Equipment

Major pieces of instructional and laboratory equipment are listed in Appendix C with the courses that use that equipment and estimated values. The total estimated value of this equipment exceeds $4,300,000.
CRITERION 8. SUPPORT

Program Budget Process and Sources of Financial Support

The budget for the Department of Paper Science and Engineering is provided by the College of Natural Resources. Dean Christine Thomas and Ian Goldberg, the CNR Fiscal Officer are responsible for the allocation of funds provided to the CNR by the Vice Chancellor for Business Affairs, who is responsible for the entire UWSP budget. The budget provided to UWSP originates from a Biennial GPR/Fee Operating Budget & Capital Budget request made by the Board of Regents to the legislature of the State of Wisconsin. This request is incorporated into a Biennial Budget Bill. The biennium covers from July 1 of one odd-numbered year through June 30 of the next.

Budget summaries are published each year in the UWS Budget Redbook. Excerpts from this document for the College of Natural Resources and the Department of Paper Science and Engineering are posted in the PSE ABET information web site.

Sources of Financial Support

General Purpose Revenue
These funds are state tax and tuition monies derived from the biennial budget described above. Salaries, student wages, operating costs, and travel expenses are customary budget items. Salary costs are typically 96% of these funds.

Program Revenue
The Department of Paper Science and Engineering has for the last ten years earned income from its laboratory and paper machine services. Fiber length analysis and paper testing are examples of these services. Educational workshops and contract trials on the paper machine have also been good sources of income; on average about $35,000/year has been earned. Plans are underway to expand these contract offerings under the Wisconsin Institute of Sustainable Technology (WIST). WIST is a UWSP campus initiative that is currently in the planning stages.

UWSP Paper Science Foundation
The UWSP Paper Science Foundation has provided $10,000/year in support of the paper machine laboratory. These funds are derived from the Mead Wittier endowment that was given to the UWSP PS Foundation in 1997. According to the Foundation’s 2008 annual report the present value of this endowment is approximately $500,000.

The Foundation’s primary mission is to provide scholarships to paper science and engineering students. These scholarships are an important factor for the Paper Science and Engineering Department’s recruiting efforts. Supporting information about the UWSP Paper Science Foundation can be found at http://www.uwsp.edu/papersciencefoundation/.

Wausau Paper Scholarship
In 2007, Wausau Paper Foundation Inc. created a $1,000/semester scholarship for sophomores in the Paper Science and Engineering program. This scholarship is carried through to graduation for each recipient with the stipulation that a minimum grade point average is maintained. Each year an additional scholarship is awarded to a new
sophomore. Ultimately, four students will be receiving this award each year. A description of this scholarship can be found at http://www.uwsp.edu/papersci/Program/scholarships

Special State Budget Allocation for Laboratory Manager Position
Since July 2005, the State of Wisconsin has provided a special budget allocation of $78,000/year to provide a salary for the Laboratory Manager position. This amount also includes a $5,000/year allocation for supplies and equipment. According to the July 28, 2005 press release from Governor Jim Doyle announcing this allocation of state funding:

“A technician knowledgeable in the operation and maintenance of a paper machine is a necessity for the continued success of the Paper Science Program. In the past, the position was funded only through private donations from the Paper Science Foundation. However, a decline in support for the Paper Science Foundation has made those funds available for student scholarships only.

The Paper Science program at UW-Stevens Point is an engineering program aimed at training students for employment in the paper industry. The program is the only one of its kind in Wisconsin.”

Paper Industry Support
Wisconsin’s paper industry is very supportive of the Paper Science and Engineering Department. Paper pulp and process chemicals are examples of materials that have been regularly donated to the program to assist in courses that use the paper machine. Tanks, valves and other equipment have also been donated upon request. Local paper companies contributing to the department include: NewPage Corporation, Wausau Paper Corporation and Domtar. In the past the industry has provided the program with funding for a special computer lab and matching funds for the construction and refurbishing of the paper machine.

Adequacy of Budget
The Paper Science and Engineering program budget has adequately provided for the education of more than 700 graduating students since the program’s inception. Virtually all of these students have been employed by the paper industry and its affiliates as process or application engineers at engineering salaries.

However, the program’s general program revenue (GPR) budget does not provide for a laboratory technician’s salary. The GPR budget has also not provided a laboratory supply and equipment budget. Instead the funds for these budget items have come from the Paper Science Foundation, industry donations, earned program revenue and special allocations as described above.

Support of Faculty Professional Development
Support of faculty professional development is extensive at UWSP. All new faculty and staff receive an orientation program by the Office of Academic Affairs in August before classes start. In addition Academic Affairs provides workshops and seminars for new faculty and staff throughout the year on advising, institutional research, diversity, grants writing, and many others topics. Academic Affairs also hosts a teaching conference each January. Topics of these conferences include: technology, assessment, scholarship, diversity, as well as other topics on teaching and learning.
The University Personnel Development Committee (UPDC) helps faculty and staff develop grant-writing skills through periodic workshops. The UPDC also provides funding for faculty and staff professional development.

The UW System supports faculty professional development through its Office of Professional and Instructional Development (OPID). OPID sponsors the annual Faculty College, the Wisconsin Teaching Fellows, and the Wisconsin Teaching Scholars programs. Recently, all Paper Science and Engineering faculty have attended Faculty College to learn about the scholarship of teaching and learning (SOTL). Professor Ring was a Wisconsin Teaching fellow in 1992. Professor Biasca is currently a Wisconsin Teaching Scholar.

Support of Facilities and Equipment

This section will describe those support areas not implicitly addressed in the financial support section above.

UWSP as part of the University of Wisconsin System follows strict purchasing guidelines as mandated by the legal codes of the State of Wisconsin. All purchases must comply with the Department of Administration (DOA) and UWSP procurement policies and procedures. The department uses a controlled purchase (p) card for best judgment purchases under $5,000. For purchases between $5,000 and $25,000, the services of the CNR purchasing agent are used. For purchases above $25,000 and those purchases requiring a signed contract, the services of the Director of Purchasing are requested. More information about purchasing at UWSP can be found at http://www.uwsp.edu/purchasing/.

The primary source of PSE equipment maintenance and operation is provided by the PSE laboratory manager. This person’s responsibility is to work with PSE faculty to anticipate equipment usage in all courses, and schedule all routine maintenance. It is also the laboratory manager’s responsibility to be the primary operator of the PSE paper machine. In performing these responsibilities, the laboratory manager trains and supervises a student work force hired each semester to assist with routine tasks.

UWSP’s Facilities Services Department provides the Paper Science and Engineering Department with a complete array of trades to maintain all of its laboratories, classrooms and offices. These services include plumbing, electrical, mechanical, and heating, ventilating and A/C. Outside contractors are occasionally used when required.

The Science building in which the Paper Science and Engineering Department is located employs a special instrument technician, who is shared by the Chemistry, Physics and PSE departments. This technician assists PSE with special projects where the skills of the laboratory manager do not apply.

The Department of Information Technology (IT) provides all computer support to UWSP faculty, staff, and classrooms. A periodic computer upgrade program is followed where faculty receive replacement computers every two years and all replaced computers are trickled down to less demanding uses. IT maintains an extensive list of software available
on the UWSP network. In addition a specialized support person is assigned to each college to assist all academic departments with their individual needs.

**Adequacy of Support Personnel and Institutional Services**

The support personnel and services at UWSP are outstanding. UWSP has created a service infrastructure that demonstrates its commitment to excellent undergraduate education. A substantial increase in student numbers or other increase in faculty responsibility could create demands on faculty that are not sustainable.
CRITERION 9. PROGRAM CRITERIA
This is a request for general engineering accreditation. There are no applicable advanced criteria.
APPENDIX A – COURSE SYLLABI

Chemistry
Mathematics
Physics
Paper Science and Engineering

NOTE: The typeface size may vary on the syllabi to allow a one-page presentation of the required elements.
CHEM 115: General and Inorganic Chemistry
Required
Catalog Description
Laws and principles of chemistry including atomic and molecular structure, review of stoichiometry, descriptive inorganic chemistry of the representative and transition elements, chemical equilibria, electrochemistry, thermodynamics, and chemical kinetics.

Prerequisites
One yr high school chemistry grade C or better; Math 118 or con reg or cons chemistry chair; or placement in 119 or higher.

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
Learn the chemistry fundamentals that you need for success in later science classes
Understand the importance of chemical measurements (significant figures; units; calculations) in recording and reporting experimental data
Understand the important models and concepts used by chemists to describe atoms, molecules and chemical reactions
Learn the general concepts of physical, inorganic, organic, and analytical chemistry and biochemistry
Develop the ability to apply the fundamental concepts to problems in biochemistry, engineering, geochemistry, materials science, environmental science, medicine, forensic science and other related fields
Develop an appreciation for the many ways that chemistry affects your daily lives

Topics Covered
The Nature of Chemistry
Atoms and Elements
Chemical Compounds
Quantities of Reactants and Products
Chemical Reactions
Energy and Chemical Reactions
Electron Configurations; Periodic Table
Covalent Bonding
Molecular Structures
Gases and the Atmosphere

Course Schedule
3 hours lecture, 1 hour discussion, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data

Description Prepared by:
Karyn Biasca
6/25/08
CHEM 116: General and Inorganic Chemistry
Required
Catalog Description
Laws and principles of chemistry including chemical equilibria, electrochemistry, thermodynamics, and chemical kinetics covered this semester.

Prerequisites
CHEM 115

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
Learn the chemistry fundamentals that you need for success in later science classes
Understand the importance of chemical measurements (significant figures; units; calculations) in recording and reporting experimental data
Understand the important models and concepts used by chemists to describe atoms, molecules and chemical reactions
Learn the general concepts of physical, inorganic, organic, and analytical chemistry and biochemistry
Develop the ability to apply the fundamental concepts to problems in biochemistry, engineering, geochemistry, materials science, environmental science, medicine, forensic science and other related fields
Develop an appreciation for the many ways that chemistry affects your daily lives

Topics Covered
Liquids, Solids and Materials
Fuels, Organic Chemicals and Polymers
The Chemistry of Solutes and Solutions
Chemical Kinetics: Rates of Reactions
Chemical Equilibrium
Thermodynamics: Directionality of Chemical Reactions
Acids and Bases
Additional Aqueous Equilibria
Electrochemistry and Its Applications

Course Schedule
3 hours lecture, 1 hour discussion, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data

Description Prepared by:
Karyn Biasca
6/25/08
CHEM 248: Quantitative Analysis
Required
Catalog Description
Theory and methods of quantitative chemical analysis including effects of chemical
equilibria on quantitative separations, titration curves, polyprotic acids and buffers, and
oxidation-reduction processes.

Prerequisites
CHEM 116

Textbook
Quantitative Chemical Analysis, 7th Ed. , by Daniel C. Harris
Laboratory Manual: Quantitative Analysis Experiments

Course Learning Outcomes (from syllabus as distributed to students)
Introduce students to techniques of quantitative analysis.

Topics Covered
Statistics and data analysis, acid-base equilibrium, gravimetric analysis, complexation
reactions, spectroscopy, electrochemistry, and chromatography

Course Schedule
2 hours lecture, 6 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret
data

Description Prepared by:
Karyn Biasca
6/25/08
CHEM 325: Organic Chemistry
Required
Catalog Description
Structure, conformation, stereochemistry, properties and reactions of organic compounds. Structure-property relationships and reaction mechanisms and their application in the study of a broad range of representative functional groups and compounds including carbohydrates, polymers, amino acids and proteins. Retrosynthetic analysis and spectroscopic characterization of organic modules.

Prerequisites
116

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
Students will describe the structure and function of simple organic molecules and explain the importance of stereochemistry.
Students will propose products and reasonable mechanisms for chemical reactions based on a fundamental understanding of organic chemistry.
Students will propose synthesis of simple molecules.
Students will use spectral data to identify organic compounds.
Students will safely prepare and characterize organic compounds and appropriately document and present their laboratory work.

Topics Covered
This first semester of organic chemistry will serve as an introduction to organic structure and function beginning with Lewis structures, resonance forms, atomic orbitals and molecular orbitals. Students will learn how different properties, such as boiling point, melting point, and acidity can arise from different organic functional groups. We will study the conformations of linear alkanes, cycloalkanes, and the stereochemistry of organic molecules to better understand the three-dimensionality of organic molecules. Students will learn how to identify molecules using modern instrumentation such as gas chromatographs (GC) as well as infrared (IR) and nuclear magnetic resonance (NMR) spectrometers. Finally, students will be shown how organic structure relates to reactivity in substitution, elimination and addition reactions. The semester will end with a brief introduction to free radical chemistry.

Course Schedule
3 hours lecture, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data

Description Prepared by:
Karyn Biasca
6/25/08
CHEM 326: Organic Chemistry
Required
Catalog Description
Continuation of 325

Prerequisites
CHEM 325

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
Students will propose reasonable mechanisms for chemical reactions based on a fundamental understanding of organic chemistry.
Students will propose synthesis of simple molecules and include the use of protecting groups as necessary.
Students will describe the structure and function of simple bioorganic molecules.
Students will demonstrate the ability to read aspects of organic chemistry in scientific journals.
Students will learn to use MacSpartan for HOMO/LUMO calculations.
Students will safely prepare and characterize organic compounds and appropriately document and present their laboratory work.

Topics Covered
Students will build upon what they have learned in Chem 325 to understand the reactivity of alcohols and ethers. Then, for the first time, students will be introduced to the reactivity of carbonyl compounds and the idea of reactions initiated by anion reactivity rather than cation reactivity. This concept will reappear in discussions of the Wittig reaction, Aldol reactions, Michael additions, and a host of other reactions. Students will also learn about the reactivity and properties of aromatic rings and other conjugated systems. Finally, students will be introduced to the role of organic chemistry in natural systems such as carbohydrates, lipids and amino acids.

Course Schedule
3 hours lecture, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data

Description Prepared by:
Karyn Biasca
6/25/08
CHEM 335: Physical Chemistry
Required
Catalog Description
Laws and principles of physical chemistry including atomic and molecular structure, thermodynamics, kinetics.

Prerequisites
326, MATH 222, PHYS 250

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
None listed on syllabi

Topics Covered
Chem 335 will cover thermodynamics and kinetics. Laboratory work will illustrate physical chemistry principles including thermochemical and electrochemical measurements, kinetics, and bulk properties of matter.

Course Schedule
3 hours lecture, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the math and basic sciences component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data

Description Prepared by:
Karyn Biasca
6/25/08
MATH 120: Analytic Geometry and Calculus I
Required
Catalog Description
Analytic geometry of the plane; differentiation and integration of algebraic functions with some applications.

Prerequisites
118 and 119 or suitable placement score

Textbook
Calculus: Early Transcendentals, 5th ed. by James Stewart

Course Learning Outcomes (from syllabus as distributed to students)
To gain a basic understanding of the topics in Chapters 1 – 5 of the text.
To be able to think and communicate better mathematically through the study of calculus.

Topics Covered
Functions and Models (REVIEW MATERIAL)
Limits and Derivatives
Differentiation Rules
Applications of Differentiation
Integrals

Course Schedule
4 hours lecture per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering

Description Prepared by:
Karyn Biasca
6/24/08
MATH 121: Analytic Geometry and Calculus II
Required
Catalog Description
Analytic geometry of the plane continued; differentiation and integration of transcendental functions; integration techniques; differential equations; infinite series; additional applications.

Prerequisites
120

Textbook
Calculus: Early Transcendentals, 5th ed. by James Stewart

Course Learning Outcomes (from syllabus as distributed to students)
To gain a basic understanding of the topics in Chapters 6 – 9 and 11 of the text.
To be able to think and communicate better mathematically through the study of calculus.

Topics Covered
Applications of integration
Techniques of integration
Further applications of integration
Differentiation
Infinite sequences and series

Course Schedule
4 hours lecture per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering

Description Prepared by:
Karyn Biasca
6/24/08
MATH 222: Analytic Geometry and Calculus III
Required
Catalog Description
Introduction to solid analytic geometry; differentiation of functions of several variables; multiple integrals; parametric equations and vectors; applications.
Prerequisites
121
Textbook
Calculus: Early Transcendentals, 5th ed. by James Stewart
Course Learning Outcomes (from syllabus as distributed to students)
To gain a basic understanding of the topics in Chapters 10 and 12-15 of the text.
Topics Covered
Parametric equations and polar coordinates
Vectors and the geometry of space
Vector functions
Partial derivatives
Multiple integrals
Course Schedule
4 hours lecture per week
Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.
Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
Description Prepared by:
Karyn Biasca
6/24/08
MATH 320: Differential Equations
Required
Catalog Description
Introduction to ordinary differential equations of the first and second order; linear equations with constant coefficients; solution in series; numerical approximations; Laplace transforms; system of ordinary equations; selected applications.

Prerequisites
222

Textbook
Zill, A First Course in Differential Equations, 9e

Course Learning Outcomes (from syllabus as distributed to students)
None listed in syllabus.

Topics Covered
Review of first-order separable and linear ordinary differential equations from second-semester calculus.
Related applications: Mixing problems, population growth, logistic model
Exact differential equations, with integrating factors.
Miscellaneous first-order techniques: Substitution, homogenous equations, Bernoulli equations, first-order Euler.
Second-order homogeneous equations with constant coefficients.
Second-order nonhomogeneous equations with constant coefficients, theory and solution form.
Using the Method of Variation of Parameters for constructing particular solutions to nonhomogeneous equations.
Using the Method of Undetermined Coefficients for constructing particular solutions to nonhomogeneous equations.
Generalization to higher-order equations with constant coefficients and the method of elimination for systems.
Related applications: Two-stage cascade reactions, spring problems, electrical networks.
Laplace transforms of products of polynomials and exponential functions.
Laplace transforms of products including Heavyside and Dirac Delta Functions.
The convolution integral.
Series methods.

Course Schedule
3 hours lecture per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering

Description Prepared by:
Karyn Biasca
6/24/08
PHYS 150: University Physics I
Required
Catalog Description
Mechanics, heat, and sound.

Prerequisites
MATH 120

Textbook
Principles of Physics by Serway & Jewett

Course Learning Outcomes (from syllabus as distributed to students)
The goals of this course are to (a) understand the conceptual framework underpinning that branch of physics known as classical mechanics, (b) apply fundamental principles of physics to the solution of practical problems, and (c) develop laboratory techniques useful to science and engineering disciplines.

Topics Covered
Introduction and Vectors
1 Dimensional Motion
2 Dimensional Motion
Newton's Laws of Motion
Applications of Newton's Laws
The Concept of Energy
Potential Energy
Momentum and Collisions
Rotational Motion
Rotational Motion
Gravity, Orbits, and Hydrogen
Fluid Mechanics
Oscillatory Motion
Mechanical Waves
Standing Waves

Course Schedule
3 hours lecture, 1 hour discussion, 3 hours lab per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering

Description Prepared by:
Karyn Biasca
6/24/08
PHYS 250: University Physics II  
**Required**  
**Catalog Description**  
Electricity, magnetism, and optics.  

**Prerequisites**  
150, MATH 121  

**Textbook**  
Principles of Physics by Serway & Jewett  
Lab manual  

**Course Learning Outcomes (from syllabus as distributed to students)**  
1. Make a connection between the conceptual, mathematical, and experimental aspects of physics. This means you will be able to  
   • Solve problems using both numbers and/or variables  
   • Design Simple experiments and prove they work  
   • Analyze and Interpret Data taken from experiments or given to you.  
2. Explain the ideas of physics to each other using words and relationships  
3. Describe how physics applies to various useful devices in the world around us, including both common and scientific devices.  

**Topics Covered**  
Electric Force, Electric Field, Electric Potential and Electric Circuits  
Magnetic Forces and Fields, Faraday’s Law and Lenz’s Law  
Reflection, Refraction, Image Formation, and Interference  
Temperature, Heat, Internal Energy and Entropy  

**Course Schedule**  
3 hours lecture, 1 hour discussion, 3 hours lab per week  

**Contribution to ABET Criterion 5**  
This course contributes to the engineering topics component of Criterion 5.  

**Relationship to Program Outcomes**  
(a) the ability to apply knowledge of mathematics, science, and engineering  

**Description Prepared by:**  
Karyn Biasca  
6/24/08
PAPR 103: Paper, Society and the Environment
Elective

Catalog Description
Study lifecycle of paper; raw materials; manufacturing; economic impact on society, recycling and sustainability; alternative disposal methods; impact on environment; policy and politics of pulp and paper industry.

Prerequisites
None

Textbook
Online readings

Course Learning Outcomes (from syllabus as distributed to students)
1) Knowledge of the history of paper in society
2) Understanding of the basic principles of economics
3) Learn how principles of economics affect manufacturing industries such as the paper industry
4) Acquire a rudimentary understanding of pulp and paper processes
5) Learn the life cycle of paper
6) Understand environmental and economic challenges facing the paper industry
7) Learn how environmental policy is created through interactions between government, industry, and environmental groups

Topics Covered
Critical thinking and environmental policy
Environmental policy and the paper industry
Environmental activism and the paper industry
Introduction to economic principles
History of paper and use by society
Current use of paper and consumer products by society
Forest management – practical and economic considerations
Pulp and paper manufacture and economic implications
Paper recovery and the recycling process
Economics of recycling vs. virgin paper
Past paper industry environmental challenges and solutions
Current paper industry environmental challenges
Climate change
Life cycle analysis
Sustainability

Course Schedule
Lecture, 3 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 105: Freshman Forum
Not Required
Catalog Description
Orientation to technical and professional aspects of paper and allied industries; presentations by students, faculty, and guest lecturers.

Prerequisites
None

Textbook
None

Course Learning Outcomes (from syllabus as distributed to students)
Introduction to the pulp and paper industry

Topics Covered
Pulp and Paper Industry Careers
Orientation to College
Commercial Facility Tours
Simple Engineering Design Project

Course Schedule
One 50 minute lecture per week. Commercial facility tours are done in local mills to accommodate the 50 minute period.

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(f) the understanding of professional and ethical responsibility
(j) a knowledge of contemporary issues
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Description Prepared by:
Don Guay
6/4/08
PAPR 210: Pulp and Paper Laboratory Methods
Required
Catalog Description
Laboratory methods in pulp, paper, and nonfibrous testing; microscopic techniques; emphasis on statistical analysis of data.

Prerequisites
CHEM 116 or CHEM 106

Textbook
Course laboratory descriptions, test methods, and key documents are located in a D2L webpage which all students enrolled in PAPR 210 have access to.

Course Learning Outcomes (from syllabus as distributed to students)
This course is not the type of lab course that you will experience in chemistry, physics, or biology. Getting the "right" answer is neither the objective nor the requirement for a good grade. Your goal is to become familiar with the important laboratory techniques and testing procedures used in the pulp and paper industry. This course is the first of two writing emphasis courses you will take in Paper Science. So naturally, the intent is to have you develop excellent written communication skills.

You will use a "Mill" memo format for your writing. This format will give you experience with the way things are actually written on the job. This course will not require you to spend hours in the library to write a theory section. You will write a research paper when you are a junior in Paper Science. In this course, you will acquire a skill that you will use in your co-op, summer job, and actual working experience.

You will work hard in this course. You will experience frustration because you are learning a new skill. Paper Science takes its writing-emphasis program seriously. I expect you to work on your own. You can get a good grade in this course if you follow these simple rules. In this course, I will recognize and reward the amount of work that everyone will have done when assigning the grades.

Organization is a vital key when undertaking laboratory projects. This class requires the purchase of a laboratory notebook for entering all data generated during each lab. I expect you to read each laboratory exercise in advance of coming to class each week. To demonstrate this, you must prepare blank data tables in your laboratory notebook each week before any testing begins. Record all data in permanent ink when performing each lab. This may seem like a silly detail, but permanent ink is a requirement in virtually every research lab in the pulp and paper industry.

Topics Covered

Course Schedule
One 50 minute lecture per week and one 4 hour laboratory exercise per week. Lecture time is reserved for discussing technical writing skills, data analysis, and the upcoming laboratory exercise. During the laboratory session, students are split into groups to complete the tasks outline in lab procedures.

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data
(d) the ability to function on multi-disciplinary teams
(g) the ability to communicate effectively
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Don Guay
6/4/08
PAPR 215: Introduction to Process Engineering Calculations
Required
Catalog Description
Basic principles and techniques of engineering problem formulation and solution; material and energy balances, including chemical reactions and studies of advanced systems; thermodynamic properties and engineering data information management; introduction to computer modeling and simulation; applications to pulp and papermaking process engineering.

Prerequisites
Chem 116, PAPR 210

Textbook
Elementary Principles of Chemical Processes, Felder and Rousseau, Third Edition

Course Learning Outcomes (from syllabus as distributed to students)
Your objective, as a successful student in this course, is to become proficient at solving material and energy balance problems. When you are a proficient problem solver, you are able to:

- read and understand problem statements
- correctlv draw and label a process flow diagram
- perform scientific and engineering calculations correctly
- determine physical properties of process streams
- recognize the problem type
- devise appropriate solution strategies, recognize dead ends (and use an alternate strategy) and
  - find a correct answer to the problem ON YOUR OWN.

Topics Covered
Chapters 1-9 of Felder and Rousseau
Material balances procedures on steady-state systems, with and without chemical reactions.
Energy balance procedures on steady-state systems, with and without chemical reactions.

Course Schedule
Classroom: 4 hrs per week.

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
This course contributes to program outcomes:
(a): the ability to apply knowledge of mathematics, science, and engineering
(c): the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d): the ability to function on multi-disciplinary teams
(f): the understanding of professional and ethical responsibility
(j): a knowledge of contemporary issues
(k): the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l): knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 314: Engineering Statistical Design and Analysis

Required

Catalog Description
Statistical methods for design, analysis and improvement of engineering experimentation and process operation: experimental design, regression analysis, modeling, analysis of variance, and evolutionary operation.

Prerequisites
Junior standing in Paper Science and Engineering

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
This course will cover engineering statistics. By the end of the course you will be expected design and conduct experiments and analyze and interpret data. The application of statistics is vital in a large variety of engineering projects. You will become familiar with the statistics functions in Excel and statistical software including Minitab and SPC XL. We will also cover the basics of lean/six sigma which is used by a good number of manufacturers to improve economic performance.

Topics Covered
Basic Statistics
Experimental Design
Hypothesis Testing
Analysis of Variance
Regression
Control Charts
Lean/Six Sigma Manufacturing Methodology

Course Schedule
Three 50 minute lectures per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data
(e) the ability to identify, formulate, and solve engineering problems
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Description Prepared by:
Don Guay
6/4/08
PAPR 320: Fluid Mechanics and Hydraulics

Required

Catalog Description
Properties of fluids; momentum transport phenomena; laminar and turbulent flow; measurement and control of flow; fluid machinery; engineering calculations and design; economic factors.

Prerequisites
PAPR 215, MATH 222, PHYS 150

Textbooks

Course Learning Outcomes (from syllabus as distributed to students)
Your objective in this class is to learn the basic concepts and theory of fluids and fluid flow and their applications to typical pulp and paper industry processes.

Topics Covered
Fluid Statics
Fluid Flow
Basic Equations of Fluid Flow
Incompressible Flow
Compressible Flow
Transportation and Metering of Fluids
Agitation and Mixing of Liquids

Course Schedule
Three 50 minute lectures per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Don Guay
6/4/08
PAPR 326: Heat Transfer Operations

Required

Catalog Description
Fundamental heat transfer mechanisms: conduction, convection, and radiation; heat transfer coefficients; heat exchange equipment; evaporation and evaporator systems; drying; economic factors; applications specific to pulp and paper processes; study of field operations.

Prerequisites
PAPR 320

Textbooks

Course Learning Outcomes (from syllabus as distributed to students)
This course will cover heat transfer. As engineers, you will be concerned with the efficient use of heat at some point during your career. Heat transfer will build upon your knowledge of math and science as an application of energy usage. At the end of this course you will be expected to design systems and identify and solve engineering problems related to the transfer of energy in the form of heat. We will design and analyze the performance of a heat exchanger.

Topics Covered
Heat Transfer by Conduction
Principles of Heat Flow in Fluids
Heat Transfer to Fluids Without Phase Change
Heat Transfer to Fluids With Phase Change
Heat-Exchange Equipment
Evaporation

Course Schedule
Three 50 minute lectures per week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) the ability to identify, formulate, and solve engineering problems
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Don Guay
6/4/08
PAPR 350: Wood and Pulping Technology
Required
Catalog Description
Cellulose, hemicelluloses, lignin, wood extractives, wood and fiber microstructure; commercial pulping and bleaching processes. Effective use of technical literature and presentation of information. 3 hrs lec, 3 hrs lab/disc per wk; field trips to commercial operations.

Prerequisites
PAPR 215 and CHEM 326

Textbooks

Course Learning Outcomes (from syllabus as distributed to students)
Your objective in this class is to learn wood chemistry and structure, pulping and bleaching chemistry, and commercial pulping and bleaching processes. Students are required to complete 2 writing assignments. This is a writing emphasis class so a significant portion of your grade will depend on these writing assignments. Each written assignment will also require an oral presentation. Both reports must follow the Paper Science writing style manual.

Topics Covered
Wood Chemistry
Forest Management
Woodyard Operations
Pulp Manufacturing
Pulp Bleaching
Technical Writing

Course Schedule
Three 50 minute lectures per week and one 3 hour laboratory exercise per week. Pulp mill field trips are accomplished during the scheduled laboratory period.

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(e) the ability to identify, formulate, and solve engineering problems
(g) the ability to communicate effectively
(i) a recognition of the need for, and the ability to engage in life-long learning
(j) a knowledge of contemporary issues
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Don Guay
6/4/08
PAPR 355: Paper and Fiber Physics

Required

Catalog Description
Fiber structure and properties; interfiber bonding; mechanical optical, chemical properties of paper; interrelations between structure, sheet formation, consolidation factors, and ultimate properties. Effective use of literature and presentation of information.

Prerequisites
PAPR 350

Textbook
The textbook for this course is “Introduction to Pulp and Paper Properties”, which is available as an e-book in the course folder. You may make one paper copy of this book.

Course Learning Outcomes (from syllabus as distributed to students)
This “Paper and Fiber Physics” course has two goals: first, to have you understand the papermaking process from the fundamental unit of paper, the fiber, to the completed paper product; second, to have you understand the strength and physical performance of paper as a hydrogen bond dominated material.

Topics Covered
Strength of materials
Fiber properties (dimensions, strength and bonding)
Formation of paper
The structure of paper
Physical properties
Mechanical properties
Optical properties

Course Schedule
Lecture, 3 hrs/week, lab 4 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(b) the ability to design and conduct experiments, as well as to analyze and interpret data
(d) the ability to function on multi-disciplinary teams
(g) the ability to communicate effectively
(i) a recognition of the need for, and the ability to engage in life-long learning
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Gerard Ring
6/3/08
PAPR 365: Colloid and Surface Phenomena
Required
Catalog Description
Principles of colloid and surface chemistry; electrokinetic and base exchange phenomena; thermodynamics of interfacial systems; adsorption; applications to coatings, flocculation, fillers, and wet end additives.

Prerequisites
CHEM 335

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
The goal of this course is to understand the chemistry of the papermaking process and paper products by studying such topics as electrokinetic and base exchange phenomena; the thermodynamics of interfacial systems; adsorption; coating technology; flocculation, fillers, and wet end additives.

Topics Covered
Surface energy and surface tension
Adsorption and swelling -- general
Sorption and swelling of cellulosic materials in water and other media
Surface area of cellulose and cellulosic materials
The role of swelling and shrinkage in the bonding between cellulose fibers in papermaking
The base-exchange and electrokinetic properties of cellulose fibers
Flocculation in papermaking systems
Interactions between pulp fibers and other materials in the papermaking system -- wet end additives
Internal sizing of papers and paperboard
Sorption and retention of high molecular weight compounds on fibers and their effects on paper properties -- wet end additives
Pitch troubles in papermaking
Foam in papermaking systems
Additives which affect optical and printing properties of paper and paperboard

Course Schedule
Lecture 3 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(i) a recognition of the need for, and the ability to engage in life-long learning
(j) a knowledge of contemporary issues
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Gerard Ring
6/3/08
PAPR: 385. Systems Engineering and Simulation
Required
Catalog Description
Modeling and simulation of pulp and papermaking systems; computer systems analysis; commercially available simulation hardware and software; model building for engineering systems; industrial case histories and economic systems optimization.
Prerequisites
PAPR 215, 350

Textbooks
Elementary Principles of Chemical Processes, Felder and Rousseau
Introduction to Process Simulation, TAPPI

Course Learning Outcomes (from syllabus as distributed to students)
When you complete this course, you should be able to:
- analyze process systems and determine how best to simulate their operation
- prepare a simulation of the process that accurately predicts the operation of that system
- use the simulation to answer "what if" questions about the system
- present your findings in a written or oral report

Topics Covered
Energy balances on systems with chemical reactions (review)
Process simulations using Excel
Process simulations using WinGEMS

Course Schedule
Lecture, 3 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(j) a knowledge of contemporary issues
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 410: Leadership Practicum
Not Required
Catalog Description
Develop leadership and supervisory skills; instruction in laboratory safety.

Prerequisites
Senior standing in Paper Science and Engineering

Textbook
None

Course Learning Outcomes (from syllabus as distributed to students)
Develop leadership and supervisory skills; instruction in laboratory safety.

Topics Covered
Supervisory Skills
Technical Writing Critiques

Course Schedule
One 4 hour laboratory exercise per week during PAPR 210 lab period

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(g) the ability to communicate effectively
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Don Guay
6/4/08
PAPR 430: Mass Transfer Operations

Required

Catalog Description
Fundamental concepts; mass transfer coefficients; gas absorption; filtration; extraction; pulp washing systems; sedimentation; cooling, humidification, air conditioning; drying; applications specific to pulp and paper processes; study of field operations.

Prerequisites
PAPR 326

Textbook
"Unit Operations in Chemical Engineering", McCabe, Smith and Harriott, 7th ed. Various readings distributed by instructor

Course Learning Outcomes (from syllabus as distributed to students)
Your objectives as a successful student in this course are to:
- perform design calculations for cooling towers
- determine the differences in drying behavior of the major pulp types used in the paper industry
- analyze the performance of a paper machine dryer section, identify the limitations of the equipment and propose solutions to the problems
- build and use WinGEMS simulations of brown stock washing systems to analyze the washing process
- analyze the mass transfer performance of an existing gas absorption system and predict the impact of changes in equipment and/or operating procedures
- analyze the performance of sedimentation equipment
- write reports on your activities

Topics Covered
Principles of Diffusion and Mass Transfer (Chapter 17)
Gas Absorption (Chapter 18)
Humidification (Chapter 19)
Paper Drying (Chapter 24 plus additional materials provided by Dr. B)
Filtration/Brown Stock Washing (some of Chapter 29 plus additional provided by Dr. B)
Sedimentation (more of Chapter 29 plus additional materials provided by Dr. B)

Course Schedule
Lecture, 3 hrs/week, mill tours

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(e) the ability to identify, formulate, and solve engineering problems
(i) a recognition of the need for, and the ability to engage in life-long learning
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 440: Industrial Thermodynamics and Kinetics

Required

Catalog Description
Thermo-dynamic properties; energy and entropy balances; thermodynamics of energy conversion: combustion, steam, vapor power cycles; energy recovery systems; chemical kinetics and reaction engineering; economic and environmental factors; applications to pulp and paper processes; field trips.

Prerequisites
PAPR 326, CHEM 335

Textbook

Course Learning Outcomes (from syllabus as distributed to students)
Paper 440 is an engineering course aimed at giving senior students in Paper Science a knowledge and capability in Chemical Engineering process design. Chemical Engineering process design capability may be described as the ability to solve problems and to create designs related to the manufacture of products. Ingenuity and problem solving ability are therefore required as well as a scientific and mathematical background.
PAPR 440 has a thermodynamics base and uses the laws of thermodynamics for mass and energy balances, for devising processes which are more energy efficient, for predicting the behavior of pure substances and solutions, for phase and chemical reaction equilibria, and for process kinetics.
At first you will be acquainted with the basic principles and techniques involved in chemical engineering thermodynamics. By the end of the course, however, you will be able to perform complex analysis and calculations for complex industrial processes.

Topics Covered
The scope of thermodynamics.
Ideal behavior of gases and liquids.
Departures from the ideal state.
Heat capacity, latent heat, and heats of reaction.
The analysis of heat engines
Entropy and the second law.
Analysis of homogeneous phases.
Thermodynamic analysis of multiphase systems
Flow of compressible fluids.
Production of power from heat.
Refrigeration systems.
Fundamental property relations.
Fugacity and excess properties.
Vapor-liquid equilibrium data and applications.

Course Schedule
Lecture 4 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(e) the ability to identify, formulate, and solve engineering problems
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Description Prepared by:
Gerard Ring
6/3/08
PAPR 445: Coating and Converting Operations
Not Required
Catalog Description
Pigment coating materials/processes; converting operations including laminating, corrugating, extrusion and hot melt coating; functional coatings; presentations by staff/guest lecturers.

Prerequisites
Senior standing in Paper Science and Engineering

Textbook
The Coating Processes, Walter, J. C. (ed.)
Other readings supplied by instructor

Course Learning Outcomes
Students will become familiar with a variety of operations used to convert paper into end products. Students will be able to identify operations used to produce different grades of paper. Students will have the knowledge to assist with troubleshooting converting equipment.

Topics Covered
Specific topics will include coating, calendaring, sheeting, printing, and corrugating. Other topics of interest to the class may be included as time permits.

Course Schedule
Classroom: 3 hrs per week. Students will lead some of the classroom discussions on course material.

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5. This is the only course dealing specifically with the conversion of paper into useful end products.

Relationship to Program Outcomes
This course contributes to ABET outcome (I): knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 460: Process Dynamics and Control
Required

Catalog Description
Dynamic model formulation and solution, using Laplace transform, analog, and digital computing techniques; control theories, strategies, and equipment; controller tuning; applications to pulp/paper processes; field trips.

Prerequisites
PAPR 215, MATH 320

Textbook
"Principles of Automatic Process Control," Smith and Corripio
"Elementary Principles of Chemical Processes," Felder and Rousseau (for reference)
Readings and handouts distributed by instructor

Course Learning Outcomes (from syllabus as distributed to students)
Your objectives as a successful student in this course are to:
- analyze the time dependent behavior of simple systems
- create block diagrams for open and closed loop systems
- describe instruments used for measurement and control in the pulp and paper industry
- create spreadsheet simulations of simple systems, and use these to predict system behavior
- identify sources of non-ideal behavior of real systems
- report on your activities (oral and written)

Topics Covered
Introduction to Process Control
Mathematics of Process Control
First Order Systems
Control Systems
Controller Tuning and Process Identification
Applications in Mill Operations

Course Schedule
Lecture, 3 hrs/week, mill tours

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(e) the ability to identify, formulate, and solve engineering problems
(l) a recognition of the need for, and the ability to engage in life-long learning
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 475: Paper Machine Operations
Required
Catalog Description
Hydrodynamics of fibrous suspensions; dynamics of sheet formation and water removal; fundamentals of pressing; analysis of drying process in terms of heat and mass transfer; engineering calculations performed on full scale production paper machines; field trips to paper mills and affiliated industries.

Prerequisites
PAPR 355

Textbook
Course notebook by instructor

Course Learning Outcomes (from syllabus as distributed to students)
PAPR 475 will acquaint you with the detailed operations of a paper machine. You will study the operation of the department’s paper machine and learn the necessary procedures to start, operate and shut it down safely.
This course will consist of many point-earning activities. The number of points accumulated relative to the total points will determine your grade in this course. Special activities may be announced throughout the semester.

Topics Covered
Stock White Water Systems
Roll Headboxes and Their Approach Flow
Hydraulic Headboxes
Fourdrinier Papermaking
Twin-Wire And Multiple-Wire Formation And Drainage
Multiply Forming
Press Operations
Paper Drying
Surface Sizing
Yankee Dryers
Winding
Calendering
Miscellaneous Topics

Course Schedule
Lecture 3 hrs/week, lab 4 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(d) the ability to function on multi-disciplinary teams
(f) the understanding of professional and ethical responsibility
(g) the ability to communicate effectively
(i) a recognition of the need for, and the ability to engage in life-long learning
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Gerard Ring
6/3/08
PAPR 484: Engineering Design I
Required
Catalog Description
Engineering economics; interest and economic equivalence; methods of comparing project and investment alternatives. Ethical and professional issues in engineering. Basic principles of process design.

Prerequisites
Senior standing in Paper Science and Engineering

Textbook
Plant Design and Economics for Chemical Engineers, Peters, Timmerhaus, West (5th ed.)

Course Learning Outcomes (from syllabus as distributed to students)
1) Perform time value of money calculations.
2) Perform equipment cost estimates.
3) Identify and describe ethical issues in industrial environments.
4) Develop process options that address specified project goals while working within project constraints.
5) Write a project proposal that describes process options (including costs), explains advantages and disadvantages of each option and addresses safety issues.

Topics Covered
Engineering economics
Engineering ethics
Oral and written project presentation strategies

Course Schedule
Lecture/lab, 3 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(f) the understanding of professional and ethical responsibility
(g) the ability to communicate effectively
(i) a recognition of the need for, and the ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
PAPR 486: Engineering Design Project
Required
Catalog Description
Engineering economics; interest and economic equivalence; methods of comparing project and investment alternatives. Individual student project includes project definition, equipment selection and sizing, capital and operating cost estimation, economic evaluation and justification; oral and written presentations.

Prerequisites
Senior standing in Paper Science and Engineering

Textbook
Plant Design and Economics for Chemical Engineers, Peters, Timmerhaus, West (5th ed.)

Course Learning Outcomes (from syllabus as distributed to students)
Complete design work and install equipment as specified in PAPR 484 Final Report
Perform economic analysis of project
Verify that project requirements have been met

Topics Covered
Engineering economics
Oral and written project presentation strategies

Course Schedule
Lecture/lab, 3 hrs/week

Contribution to ABET Criterion 5
This course contributes to the engineering topics component of Criterion 5.

Relationship to Program Outcomes
(a) the ability to apply knowledge of mathematics, science, and engineering
(b) the ability to design and conduct experiments, as well as to analyze and interpret data
(c) the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) the ability to function on multi-disciplinary teams
(e) the ability to identify, formulate, and solve engineering problems
(f) the understanding of professional and ethical responsibility
(g) the ability to communicate effectively
(i) a recognition of the need for, and the ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) knowledge of the science and technology used in the paper industry

Description Prepared by:
Karyn Biasca
6/3/08
APPENDIX B – FACULTY RESUMES

Gerard J. F. Ring
Karyn L. Biasca
Donald F. Guay
Gerard J. F. Ring  
Professor  

EDUCATION  
June 1980  
Dissertation: The Molecular Weight Distribution of Bacterial Cellulose as a Function of Synthesis Time.  

June 1976  
Research: The Effect of the Initial Oxidation State of Manganese as a Cellulose Degrader/Protector in Oxygen Alkali Bleaching.  

May 1974  
B.S. (Chemistry and Biology) State University of New York at Albany.  

EXPERIENCE  
2003-present  
Chair Department of Paper Science and Engineering. College of Natural Resources. University of Wisconsin - Stevens Point. Stevens Point, Wisconsin.  

1986-present  

1980-1986  
Research Scientist - Kimberly-Clark Corporation, Corporate Science and Technology, Roswell, GA.  

1969-1976  
Summer Intern Research Chemist - International Paper Company, Central Research Center, Sterling Forest, NY.  

1975  
Summer Intern Project Engineer - Westvaco Pulp and Paper Corporation, Wyckliffe, KY.  

PATENTS  

RESEARCH AND PUBLICATIONS  

HONORS AND AWARDS  
• Fellow of TAPPI (2008).  
• President of the UWSP Phi Kappa Phi Honorary Society (2006).  
• Inducted into Phi Kappa Phi Honorary Society (2004).  

***  
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• Award for Excellence. University Continuing Education Association Region IV. Creative Program-Noncredit Award (1999).
• Recognition Award for "Going the Extra Mile: supporting UWSP extension Programming (1999).
• Wisconsin Teaching Fellow (1992).

POSIIONS IN PROFESSIONAL ORGANIZATIONS
Technical Association of the Pulp and Paper Industry (TAPPI).
• Board of Directors (2005 – 2008)
• Operating Committee Member – Local Section Liasion. (2003 – 2004)
• Member of the Local Section Transition Team (2002)
• Chair of the Leadership Committee, Local Sections Operating Council (LSOC) (2001 – 2002)
• Lake States LSOC Representative (2000 – 2002)

PRESENTATIONS
• Multiple component analysis of fiber length distributions. 1995 International Paper Physics Conference, Niagara-on-the-Lake ON, pp. P75-P85.
• Presented Master’s Thesis research (Manganese in oxygen pulping) at the Fortieth Executives' Conference, 1976, The Institute of Paper Chemistry, Appleton, Wisconsin.

UWSP SERVICE AND COMMITTEE MEMBERSHIP
• University Technology Committee (UTC) (1999)
• College of Natural Resources Computer Committee (1999)
• University Technology Advisor Committee (1997-1998)
• Faculty Senate Representative to the University Center Advisory and Policy Board (UCAPB) (1995 - 1999).
• Served on the Medical Technology department program review committee (1994/1995).
• Served as chair of search and screen committee for temporary replacement of Said Abubakr’s position (1992/1993).
• Served as Faculty Senator (1990 - 1995).
• Member of the General Degree Subcommittee for 1988-1989 & 1989-1990
• Chaired the search and screen committee for the University’s Director of the Physical Plant (1990).
• Served on the search and screen committee for a new graphic artist for the Telecommunications Department (1989).
• Served on the "Alan Haney Evaluation Committee" (1990).
• Served on the Search and Screen Committee for the Paper Science Department Chairman (1986/1987).
• Served on the Search and Screen Committee for two new paper science faculty members (summer of 1988).
• Served on the Macintosh Evaluation Subcommittee that led to the creation of a new student Macintosh computer lab on campus (1991/1992).
• Member of the CNR Instructional Media committee (1986-1990).

Appointment: 100% Paper Science and Engineering
Karyn L. Biasca  
Professor  

EDUCATION  
The University of California at Los Angeles (UCLA) Bachelor of Science (Chemical Engineering), December 1981  
The Institute of Paper Chemistry, Appleton, Wisconsin, Master of Science (Pulp and Paper Technology), June 1986  
The Institute of Paper Chemistry, Appleton, Wisconsin, Doctor of Philosophy, June 1989  
Dissertation Topic: A Study of the Kinetics of Delignification During the Early Stage of Alkaline Sulfite Anthraquinone Pulping  

EXPERIENCE  
2007 - present: Professor, Department of Paper Science, University of Wisconsin - Stevens Point, Stevens Point, Wisconsin  
1994 - 2007: Associate Professor, Department of Paper Science, University of Wisconsin - Stevens Point, Stevens Point, Wisconsin  
1989 - 1994: Assistant Professor, Department of Paper Science, University of Wisconsin - Stevens Point, Stevens Point, Wisconsin  
February 1982 - July 1984: Process Engineer, Kimberly - Clark Corporation, Fullerton, California  
August 1980 - December 1981: Senior Reactor Operator, UCLA Nuclear Energy Laboratory, Los Angeles, California  

RESEARCH AND PUBLICATIONS  

PRESENTATIONS  
"Bleaching Recycled Fiber", presentation for BTG Tissue Seminar, Green Bay, WI (November 2005)  
"Outcomes Based Course Design”, Curriculum Redesign Program, UWSP (June 2004)  
"Assessment in Online Courses", Curriculum Redesign Program, UWSP (June 2004)  
"Air, Water and Learning Objects", presented for IT Brownbag (February 2004), UWSP Line Officers (March 2004) and Board of Regents Campus Visit (April 2004)  
“Writing Emphasis in the Paper Science Major”, UWSP Teaching and Learning Summit (April 2001)  
"A Technical Course on the Web”, Faculty Technology Series, UWSP (December 1999)  
"Classroom Assessment Techniques", CNR Brown Bag Series, UWSP (April 1999)  
"Pulping and Bleaching" in Value Added Processing of Secondary Fibers, Lake States TAPPI, Appleton, WI (1993)  

* * *
HONORS AND AWARDS
- University of Wisconsin - Stevens Point Excellence in Teaching Award (2005)
- "Going the Extra Mile" Award, UWSP Extension (1999)
- "High Tech Teacher" profile in UWSP Sundial (1996)
- Computer Integrated Manufacturing (CIM) in Higher Education Leadership Award, IBM Corp. (1995)

SERVICE TO THE UNIVERSITY
- Steering Committee Co-coordinator and Mission and Integrity Task Force Chair, UWSP HLC Accreditation (2006-2008)
- Ad Hoc Committee, Teaching and Learning Center (2005)
- Ad Hoc Committee, Student Reaction to Course Instruction (2001-2003)
- Faculty Affairs Committee Chair (2001-2003)
- Faculty Athletic Representative - Women's Sports (1999-2004)
- Academic Affairs Committee (1999-2001)

SERVICE TO THE COLLEGE OF NATURAL RESOURCES
- Curriculum Committee (2000-2004)
- Computer Committee (1994-99)
- Human Resources Committee (1990-91)
- Ad Hoc Committee on Tenure and Promotion Guidelines (1992)
- CNR Career Days (1990-1997)
- Natural Resources Careers Workshops for High School Teachers and Guidance Counselors (1990-1997)

SERVICE TO THE DEPARTMENT OF PAPER SCIENCE AND ENGINEERING
- Department Engineering Accreditation Coordinator (2006-)
- American Society for Engineering Education Campus Representative (2000-present)
- Assessment Coordinator (1997-present)
- Faculty Advisor to the Student Chapter of TAPPI/PIMA (1993-present)
- Schedule Paper Science courses for the Timetable (1991-present)
- Prospective Student Visits (ongoing)
- High school presentations for student recruiting (ongoing)

OUTREACH EDUCATION FOR THE PAPER INDUSTRY
- PAPER Academy Hands-On Papermaking (1998-present)
- Introduction to Pulping and Bleaching (1998-present)
- Customized courses for industry clients (1998-present)
- Introduction to Pulp Bleaching (1993)
- Introduction to Pulp and Paper Technology (1993)

POSITIONS IN PROFESSIONAL ORGANIZATIONS
- Continuing Education Chair, Pulp Manufacture Division, Technical Association of the Pulp and Paper Industry (TAPPI) (1992-93)

Appointment: 100% Paper Science and Engineering
Donald F. Guay
Assistant Professor

EDUCATION
University of Maine
Doctorate of Philosophy in Chemistry
Graduation Date: December, 1999
  Dissertation Topic - Mechanisms of Oxidative Degradation of Carbohydrates During Oxygen Delignification
University of Wisconsin-Stevens Point
Bachelor of Science Degree
Graduation Date: May 1996
  Major: Paper Science
  Minor: Chemistry

EXPERIENCE
2004 – Present  University of Wisconsin-Stevens Point, Assistant Professor, Paper Science & Engineering Department
1999 – 2000  Marathon Engineers/Architects/Planners, LLC Appleton, Wisconsin, Process Engineer

PUBLICATIONS
Peer-Reviewed Articles

Scientific Meetings

Seminars
The Use of Hydroxy Acids From Black Liquor as Additives During Oxygen Delignification (Guay, D.) 2005 UWSP Chemistry Colloquium Series, 2005.

SERVICE
Professional Service
I have been very active within the Technical Association of the Pulp and Paper Industry (TAPPI) and the American Society for Testing Materials (ASTM).
  • TAPPI Pulp and Process Quality Division Chair  (2006 – Present)  

* * *
• TAPPI Quality and Standards Management Committee (2006 – Present)
• TAPPI ISO/TC6/WG4 Representative (2005 – Present)
• ASTM D6 Committee Representative (2003 – Present)
• TAPPI Ask the Experts (2003 – Present)
• TAPPI Pulp and Process Quality Division Vice-Chair (2004 – 2005)
• TAPPI Pulp and Process Quality Chemical Properties Committee Chair (2003 – 2005)

University Service
• Faculty Senate (2005 – Present)
• University Curriculum Committee (2005 – Present)
• EL GDR Assessment Committee (2005 – Present)
• CNR Curriculum Committee (2004 – Present)
• Student TAPPI/PIMA Organization Advisor (2004 – Present)

Outreach Service
• Hydrite Chemical Co. Consulting (2006 – Present)
• Hands-On Papermaking (2004 – Present)
• Georgia-Pacific Resins Consulting (2004 – Present)
• NuWay Speaker Products, Inc. UWSP Paper Machine Operation (2005 – Present)

Appointment: 100% Paper Science and Engineering
## APPENDIX C – LABORATORY EQUIPMENT

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Location</th>
<th>Courses Using</th>
<th>Estimated Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot; Fourdrinier Paper Machine with 1400 gallon pulper, two stock tanks, white water tank, saveall screen, disc refiner, stock cleaning equipment vacuum pumps, stock pumps, consistency control, level control, flow meters, DCS and PLC controls</td>
<td>D-135</td>
<td>PAPR 210, 355, 385, 410, 460, 475, 484, 486</td>
<td>$4,000,000</td>
</tr>
<tr>
<td>Sprout Waldron Lab Refiner</td>
<td>D-135</td>
<td>PAPR 350</td>
<td>$35,000</td>
</tr>
<tr>
<td>PFI Mill</td>
<td>D-135</td>
<td>PAPR 210, 350</td>
<td>$50,000</td>
</tr>
<tr>
<td>Valley Beater, Handsheet Molds, Lab Pulper, Speed Dryers, Lab Press, TMI Disintegrator</td>
<td>D-135</td>
<td>PAPR 210, 350, 355</td>
<td>$25,000</td>
</tr>
<tr>
<td>MorFi Fiber Length Analyzer</td>
<td>D-135</td>
<td>PAPR 210, 355</td>
<td>$50,000</td>
</tr>
<tr>
<td>Rosenthal Sheeter</td>
<td>D-271</td>
<td>PAPR 210, 410</td>
<td>$14,000</td>
</tr>
<tr>
<td>Multi 2020 Guillotine Trimmer</td>
<td>D-271</td>
<td>PAPR 210, 410</td>
<td>$10,000</td>
</tr>
<tr>
<td>L&amp;W Elphro Color and Brightness Meter</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$15,000</td>
</tr>
<tr>
<td>Lab Coater</td>
<td>D-001</td>
<td></td>
<td>$500</td>
</tr>
<tr>
<td>Lab Floatation Cell</td>
<td>D-001</td>
<td>PAPR 210, 410</td>
<td>$250</td>
</tr>
<tr>
<td>Quantum Mixer</td>
<td>D-135</td>
<td>PAPR 350</td>
<td>$40,000</td>
</tr>
<tr>
<td>Technidyne Brightmeter</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$15,000</td>
</tr>
<tr>
<td>Pulmac Zero-Span TS-100</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$20,000</td>
</tr>
<tr>
<td>Technidyne Gloss Meter</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$2,500</td>
</tr>
<tr>
<td>TMI Internal Bond</td>
<td>D-285</td>
<td></td>
<td>$15,000</td>
</tr>
<tr>
<td>TMI Tear Tester</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$15,000</td>
</tr>
<tr>
<td>TMI Burst Tester</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$500</td>
</tr>
<tr>
<td>TMI Ring Crush</td>
<td>D-285</td>
<td></td>
<td>$5,000</td>
</tr>
<tr>
<td>Instron Vertical Tensile Tester</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$500</td>
</tr>
<tr>
<td>TMI Caliper</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$10,000</td>
</tr>
<tr>
<td>Teledyne Gurley Stiffness Tester</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$10,000</td>
</tr>
<tr>
<td>TMI Print/ Surf</td>
<td>D-285</td>
<td></td>
<td>$500</td>
</tr>
<tr>
<td>Gurley Porosity</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$250</td>
</tr>
<tr>
<td>Taber Stiffness</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$10,000</td>
</tr>
<tr>
<td>TechPap Dirt Analyzer</td>
<td>D-285</td>
<td>PAPR 210, 410</td>
<td>$9,000</td>
</tr>
<tr>
<td>Beloit Sheet Splitter</td>
<td>D-285</td>
<td></td>
<td>$1,000</td>
</tr>
</tbody>
</table>
APPENDIX D – INSTITUTIONAL SUMMARY

The Institution
The University of Wisconsin – Stevens Point
2100 Main St.
Stevens Point, WI 54481
Linda Bunnell, Chancellor

Type of Control
UWSP is part of the University of Wisconsin System, a state supported university system. The University of Wisconsin System, in accordance with state statutes, is governed by an eighteen-member Board of Regents. Sixteen of these are appointed by the state Governor to seven-year terms, and two student representatives are appointed to two-year terms. The President of the UW System, the thirteen Chancellors of the universities, the Deans of the two-year colleges, and the Chancellor of Extension and the two-year colleges are appointed by the Board of Regents. The Regents establish the basic parameters within which the different constituencies of the UW System function, including budgets, admission standards, and tuition rates.

At each of the universities the chief executive officer and the person responsible for programs and operations is the Chancellor. UWSP’s current Chancellor (its thirteenth) is Linda Bunnell. She was officially inaugurated on June 1st, 2004, succeeding Interim Chancellor Virginia M. Helm (2003-2004) and prior Chancellor Thomas George (1996-2003).

The administrative staff who report directly to the Chancellor are the Vice Chancellors of the three major divisions of the University, two unit directors, and three staff officers:

- Provost and Vice Chancellor for Academic Affairs—Mark A. Nook;
- Vice Chancellor for Business Affairs—Greg Diemer;
- Vice Chancellor for Student Affairs—Bob Tomlinson;
- Executive Assistant to the Chancellor—Rob Manske;
- Special Assistant to the Chancellor for Affirmative Action—Mai Vang;
- Administrative Specialist—Jean Scherer;
- Director of the Office of Institutional Research—Shari Ellertson;
- Director of the UWSP Foundation—Todd Kuckhan;
- Director of University Relations and Communications—Stephen Ward.

These administrative units operate in an environment of shared governance with the Faculty Senate and the Student Government Association (SGA). Faculty governance is an important tradition at UWSP. Faculty are responsible primarily for curriculum and for the hiring, promotion, tenure, and retention policies for faculty; they also play an important role in recommending policies to the administration in many other areas.

History of Institution
The University of Wisconsin-Stevens Point was founded in 1894 as Stevens Point Normal School, a teacher-training institution with an initial enrollment of 152 students. It was first accredited (as Stevens Point Normal School) in 1916 and maintained this status.
until 1922, when it was dropped because of failure to submit required documents. Reaccredited in 1951, UWSP has remained accredited ever since. In 1967 accreditation was extended to include preliminary accreditation for the Master of Science in Teaching Home Economics. In 1969 preliminary accreditation was also granted for the Master’s of Science in Teaching-Biology and the Master’s of Science in Speech Pathology-Audiology. UWSP is accredited without stipulation for bachelors- and masters-level degrees. Its Clinical Doctorate in Audiology was accredited by the HLC in May, 2006. The University does not offer degrees at off-campus venues and is not accredited to offer programs via distance education. However, it is in the process of obtaining UW System approval and, thereafter, HLC accreditation for asynchronous delivery of its degrees.

Originally part of the Wisconsin State University System, the Stevens Point campus became part of the University of Wisconsin System in 1971. The University of Wisconsin System comprises two doctoral institutions, eleven comprehensive institutions (collectively known as the University Cluster), and thirteen two-year colleges. The UW System also has several substantive articulation agreements with the Wisconsin Technical College System that allow students to transfer between the two statewide (but operationally separate) postsecondary systems. UWSP is one of the eleven comprehensive institutions, offering bachelor’s degrees, master’s degrees, and a Doctorate in Audiology (in collaboration with UW-Madison). It offers 48 majors and 78 minors leading to Bachelor of Arts, Bachelor of Science, Bachelor of Music, and Bachelor of Fine Arts degrees. UWSP also offers an associate’s degree and a variety of master’s degrees.

UWSP is now home to approximately 8,700 undergraduate and graduate students and 400 faculty, of whom nearly two-thirds possess doctorates or other terminal degrees; the campus boasts a 20:1 student to faculty ratio and also the highest percentage in the UW System of undergraduate courses taught by tenure-track faculty. This point is frequently cited by students as a major factor in their decision to attend UWSP. The campus is frequently ranked as one of the top public midwestern universities in U. S. News and World Report’s College Rankings. Half of all incoming freshmen rank in the top 25 percent of their high school graduating classes, with an average high school GPA of 3.4 and an average ACT score of 23.

The campus supports over 180 student clubs and organizations, including student government, multicultural clubs and organizations, community service and professional clubs, professional and academic organizations, and Greek organizations. The campus television and radio stations, as well as the campus newspaper, are staffed and run by students. Students and faculty can also participate in 25 intramural and 22 club sports, and opportunities abound to attend theater, concerts, dance programs, and art exhibitions. In addition, more than one in five UWSP students spend time in one or more of twenty different foreign countries as part of study-abroad programs offered by UWSP’s Office of International Programs.

UWSP’s main campus comprises roughly 400 acres and 35 buildings, including fourteen residence halls housing around 3,100 students. Recent additions include an expanded and enhanced University Center (which opened in January, 2008) and the Noel Fine Arts Center, which includes theaters, a concert hall, an art gallery, and state-of-the-art practice
and performance spaces. Just to the north (though still part of the campus) lies the 275-acre Schmeeckle Reserve, a natural area that provides a managed habitat for native ecologies as well as affording campus and community members a wide variety of outdoor education and leisure opportunities, including biking, canoeing, nature walks, and fishing. UWSP also maintains a number of facilities off-campus, including the Central Wisconsin Environmental Station (CWES) and Treehaven, both of which are teaching, learning, and recreational environmental centers that are wholly owned and operated by UWSP.

As these last comments suggest, one of UWSP’s distinctive features is its focus on the environment: helping students, faculty, staff, and members of the community become more responsive and responsible stewards of the earth’s resources is the main thrust of many of the University’s most innovative and important programs. UWSP is striving to become a more self-sustaining campus. Many examples of this initiative exist, including the student-staffed College of Professional Studies Café and its commitment to using food from local organic producers, the increasing use of solar domestic hot water, the Learning Resource Center’s “green roof,” the inclusion of photovoltaic panels on one of the residence halls and the Noel Fine Arts Center addition, and the overall campus commitment to go “off the grid” in five years. The College of Natural Resources (CNR) clearly represents the University’s commitment to a global outlook on environmental issues, not least through its establishment of the internationally-recognized Global Environmental Management Center (GEM). Established in 2000 as a world-class center for outreach education in natural resources and environmental management, GEM’s purpose is to link faculty, students, and citizens worldwide in pioneering and applying practical learning methods and technology to solve natural resource problems. The CNR also operates three field stations mentioned above—CWES, Schmeeckle Reserve, and Treehaven—that serve both students and the community as sources of environmental information, education, and recreation.

Beyond this, UWSP demonstrates that it is fulfilling its educational mission through many points of strength. External reviewers in November, 2006 noted that UWSP offers strong academic programs with regional and, in some cases, national prominence; that students cite the strength of its academic programs as one of the major reasons for choosing UWSP; and that retention and graduation rates (79% and 58%, respectively) are high, significantly higher than at most peer institutions. Assessment data reflect strong skills among UWSP graduates, who are regularly sought by employers because of their reputation for being highly qualified.
Student Body

The Fall 2007 enrollment characteristics of UWSP are as follows:

Headcount Enrollment:
Total Enrollment -- 8,897
Freshmen -- 2,389
Sophomores -- 1,746
Juniors -- 1,775
Seniors -- 2,594
Specials -- 142
Graduates -- 251

Enrollment Profile:
Females -- 54%
Wisconsin Resident -- 92%
Minority -- 5%
Full-time -- 90%
Under 25 Years of Age -- 87%
Living on Campus -- 36%

Regional or Institutional Accreditation

UWSP is accredited by the North Central Association of the Higher Learning Commission. The most recent accreditation site visit was March 30-April 2, 2008.

Personnel and Policies

Retention, tenure and promotion policies are described completely in the University Handbook, Chapter 4, Section 3. A brief summary appears here.

An individual to be considered for appointment or promotion must meet at least the stated minimum qualifications of training and experience for the appropriate rank:

Instructor: master's degree or equivalent, preferably with evidence of progress toward a higher degree;
Assistant Professor: earned doctorate or the highest degree normally earned in the field;
Associate Professor: earned doctorate or the highest degree normally earned in the field and, normally, a minimum of 5 years (7 years for part-time) of teaching experience at the college level;
Professor: earned doctorate or the highest degree normally earned in the field and, normally, a minimum of 10 years (13 years for part-time) of teaching experience at the college level, plus evidence of scholarly academic standing as demonstrated through publication or other professional attainment.

The primary responsibility for evaluation of faculty for purposes of retention, promotion, merit, tenure, salary, and post-tenure review rests with the faculty of the individual departments. All faculty and administrators who appraise performance shall have completed appropriate training provided through the vice chancellor's office. Evaluation of the faculty member’s teaching ability by students and peers is required.
The hiring salary schedule is updated annually to help establish starting salaries for new hires. The salary schedule considers previous experience and the assigned educational preparation code and specifies the minimum salary at the time of hire. Market factors may dictate a higher starting salary than that suggested by the hiring schedule. Starting salaries are negotiated among the applicant, the chairperson, and the dean. The provost or appropriate vice chancellor must approve all salaries.

A comprehensive benefits package is provided to all faculty, described in detail in the University Handbook, Chapter 8. Standard benefits include a retirement package, health, dental, optical and disability insurance, sick leave, liability insurance, and domestic partner benefits.

**Educational Unit**

The Paper Science and Engineering (PSE) Department, although physically located in the Science Building on the UWSP campus, is administratively located in the College of Natural Resources. The current administrative structure appears below. The PSE Department chair reports to the Dean of the College, who in turn reports to the Provost.

The College of Natural Resources at the University of Wisconsin Stevens Point is the nation's largest and premier undergraduate institution for natural resources and environmental management. The College has deep roots in Wisconsin's strong conservation heritage, inspired by Aldo Leopold, John Muir, Gaylord Nelson and others.

The program's beginnings can be traced to 1946, when the nation's first "conservation education" major was established at UWSP. Today, the College emphasizes hands-on field training and an integrated core curriculum that exposes students to the multiple disciplines of forestry, soils, water resources, wildlife and human dimensions of natural resource management. To facilitate this field-oriented approach to learning, the College has 3 field stations -- Central Wisconsin Environmental Station, Schmeeckle Reserve, and Treehaven. In addition, the College offers a renowned program in paper science and engineering.

The College's strong reputation can be attributed largely to its longstanding commitment to recruit faculty who enjoy and excel at teaching. CNR faculty also led the campus in research grants, creating opportunities for students to participate in scholarly research. Individual student success is a high priority in the College, as evidenced by an excellent job placement rate for our graduates.

The College currently has 10,000 alumni, 1300 undergraduate majors and 80 plus faculty and staff.

**Credit Unit**

One semester credit normally represents one class hour or three laboratory hours per week. One academic year normally represents 30 weeks of classes, exclusive of final examinations.

The Paper Science and Engineering major requires 142 semester credits. Students typically require five years to complete their degree because of their cooperative work experience taking them off-campus for a semester during their sophomore year.
**Instructional Modes**

The UWSP Paper Science and Engineering major is an on-campus, daytime program.

**Grade-Point Average**

A minimum grade point average of 2.0 (on a 4.0 scale) is required for graduation. There are no exceptions.

**Academic Supporting Units**

<table>
<thead>
<tr>
<th>Chemistry Department</th>
<th>Mathematical Sciences</th>
<th>Department of Physics and Astronomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>James Brummer, Chair</td>
<td>Nate Wetzel, Chair</td>
<td>Robert Beeken, Chair</td>
</tr>
</tbody>
</table>

**Non-Academic Supporting Units**

<table>
<thead>
<tr>
<th>University Library</th>
<th>Information Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kathy Davis, Director</td>
<td>David Dumke, Director</td>
</tr>
<tr>
<td></td>
<td>and Chief Information Officer</td>
</tr>
</tbody>
</table>

**Faculty Workload**

The department chairperson is responsible for establishing individual teaching loads within the department. A full-time teaching load is 24 credit hours or the equivalent. Each faculty member should have a maximum of 3 separate class preparations per semester. Laboratory hours are typically equated to lecture hours on a 3 to 2 ratio. Supervision of student teachers and practica are typically equated to lecture hours on a 2.5 to 1 ratio. There should be a maximum of 18 contact hours per week for each faculty member, except for faculty on temporary appointments.

**Tables**

The tables that follow will provide information about the College of Natural Resources and the Paper Science and Engineering program. The tables include:

Table D-1. Programs Offered by the College of Natural Resources
Table D-2. Degrees Awarded and Transcript Designations by the College of Natural Resources
Table D-3 a, b. Support Expenditures
Table D-4 a, b. Personnel and Students
Table D-5 a, b. Program Enrollment and Degree Data
Table D-6 a, b. Faculty Salary Data
### Table D-1. Programs Offered by the College of Natural Resources

<table>
<thead>
<tr>
<th>Program Title</th>
<th>Day</th>
<th>Cooperative Education</th>
<th>Off Campus</th>
<th>Alternate Mode</th>
<th>Nominal Years to Complete</th>
<th>Administrative Head</th>
<th>Administrative Unit or Units (e.g. Dept.) Exercising Budgetary Control</th>
<th>Submitted for Evaluation</th>
<th>Offered, Not Submitted for Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Science and Engineering (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>Gerard Ring</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fisheries &amp; Water Resources (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>John Houghton</td>
<td>See Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>John Houghton</td>
<td>SAF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Dimensions of Natural Resource Mgmt. (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>John Houghton</td>
<td>See Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil and Waste Resources (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>John Houghton</td>
<td>See Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife Ecology (BS)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>John Houghton</td>
<td>See Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Resources (MS)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>2</td>
<td>John Houghton</td>
<td>See Note</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Most professional organization affiliates do not accredit programs. All programs of the College meet the individual certification standards of the professional organizations with which they are affiliated.
Table D-2. Degrees Awarded and Transcript Designations by College of Natural Resources

<table>
<thead>
<tr>
<th>Program Title</th>
<th>Modes Offered</th>
<th>Name of Degree Awarded</th>
<th>Designation on Transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper Science and Engineering</td>
<td>Day: X, Co-op: , Off Campus:</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Paper Science and Engineering</td>
</tr>
<tr>
<td>Fisheries and Water Resources</td>
<td>Day: X</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Fisheries and Water Resources</td>
</tr>
<tr>
<td>Forestry</td>
<td>Day: X</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Forestry</td>
</tr>
<tr>
<td>Human Dimensions of Natural Resource Management</td>
<td>Day: X</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Natural Resource Management</td>
</tr>
<tr>
<td>Soil and Waste Resources</td>
<td>Day: X</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Soil and Waste Resources</td>
</tr>
<tr>
<td>Wildlife Ecology</td>
<td>Day: X</td>
<td>Bachelor of Science</td>
<td>Bachelor of Science Major: Wildlife Ecology</td>
</tr>
<tr>
<td>Natural Resources</td>
<td>Day: X, X</td>
<td>Master of Science</td>
<td>Master of Science Major: Natural Resources</td>
</tr>
</tbody>
</table>
### Table D-3a. Support Expenditures
College of Natural Resources

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2007</th>
<th>2008&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2009&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expenditure Category</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations (not including staff)</td>
<td>$98,123</td>
<td>$91,980</td>
<td>$72,913</td>
</tr>
<tr>
<td>Travel</td>
<td>$20,897</td>
<td>$14,741</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Institutional Funds</td>
<td>$2,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Grants and Gifts</td>
<td>$28,956</td>
<td>$29,212</td>
<td>$29,000</td>
</tr>
<tr>
<td>Graduate Teaching Assistants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time Assistance (other than teaching)</td>
<td>$27,735</td>
<td>$6,200</td>
<td>$15,700</td>
</tr>
<tr>
<td>Faculty Salaries</td>
<td>$1,944,822</td>
<td>$1,953,638</td>
<td>$1,847,782</td>
</tr>
<tr>
<td>Academic Staff Salaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classified Staff Salaries</td>
<td>$266,637</td>
<td>$240,798</td>
<td>$290,316</td>
</tr>
<tr>
<td>Sales Credits</td>
<td>-$128,059</td>
<td>-$124,540</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table D-3b. Support Expenditures
Department of Paper Science and Engineering

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2007</th>
<th>2008&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2009&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expenditure Category</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations (not including staff)</td>
<td>$6,230</td>
<td>$4,300</td>
<td>$5,000</td>
</tr>
<tr>
<td>Travel</td>
<td>$1150</td>
<td>$2,173</td>
<td>$1,200</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Institutional Funds</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$11,000</td>
</tr>
<tr>
<td>(b) Grants and Gifts</td>
<td>$9,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Teaching Assistants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part-time Assistance (other than teaching)</td>
<td>$185,594</td>
<td>$191,183</td>
<td>$212,734</td>
</tr>
<tr>
<td>Faculty Salaries</td>
<td>$67,031</td>
<td>$31,238</td>
<td>$65,000</td>
</tr>
<tr>
<td>Academic Staff Salaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classified Staff Salaries</td>
<td>$27,233</td>
<td>$27,193</td>
<td>$28,000</td>
</tr>
<tr>
<td>ABET expenses</td>
<td>$9,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Revenue Income</td>
<td>$68,618</td>
<td>$43,102</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

**Notes:**

- **a** Through May 2008 of FY 2007-2008
- **b** Estimated
- **c** Support for paper machine operation from Paper Science Foundation
### Table D-4a. Personnel and Students
#### College of Natural Resources
#### Year: 2007-08

<table>
<thead>
<tr>
<th></th>
<th>HEAD COUNT</th>
<th>FTE</th>
<th>RATIO TO FACULTY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FT</td>
<td>PT</td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>7</td>
<td>--</td>
<td>7</td>
</tr>
<tr>
<td>Faculty (tenure-track)</td>
<td>36</td>
<td>3</td>
<td>39</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Student Teaching Assistants</td>
<td>11</td>
<td>--</td>
<td>11 0.28</td>
</tr>
<tr>
<td>Student Research Assistants</td>
<td>47</td>
<td>--</td>
<td>47 1.21</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>3</td>
<td>--</td>
<td>3 0.08</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
<td>6</td>
<td>--</td>
<td>6 0.15</td>
</tr>
<tr>
<td>Others</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Undergraduate Student enrollment (includes freshmen and sophomores)</td>
<td>1304</td>
<td>--</td>
<td>1304 33.44</td>
</tr>
<tr>
<td>Graduate Student enrollment</td>
<td>58 *</td>
<td>45</td>
<td>34 ** 0.87***</td>
</tr>
</tbody>
</table>

* Part time graduate students are in Master of Science Natural Resources Environmental Education program
** University policy defines a “full load” for graduate students as 9 semester hours.
*** Does not include part-time graduate students in Master of Science Natural Resources Environmental Education program.

### Table D-4b. Personnel and Students
#### Paper Science and Engineering
#### Year: 2007-08

<table>
<thead>
<tr>
<th></th>
<th>HEAD COUNT</th>
<th>FTE</th>
<th>RATIO TO FACULTY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FT</td>
<td>PT</td>
<td></td>
</tr>
<tr>
<td>Administrative*</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Faculty (tenure-track)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Other Faculty (excluding student Assistants)</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Student Teaching Assistants</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Student Research Assistants</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Technicians/Specialists</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Office/Clerical Employees</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Others*</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Undergraduate Student enrollment*</td>
<td>33</td>
<td>33</td>
<td>11.0</td>
</tr>
<tr>
<td>Includes freshmen and sophomores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Student enrollment</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

* * *
Table D-5a. Program Enrollment and Degree Data  
College of Natural Resources

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>Total Undergrad</th>
<th>Total Grad</th>
<th>Degrees Conferred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st 2nd 3rd 4th 5th</td>
<td></td>
<td></td>
<td>Bachelor Master Doctor Other</td>
</tr>
<tr>
<td>CURRENT</td>
<td>FT 349 247 251 457 NA</td>
<td>1304</td>
<td>58</td>
<td>226 33 NA NA</td>
</tr>
<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>45</td>
<td>244 37 NA NA</td>
</tr>
<tr>
<td>1 2006-2007</td>
<td>FT 364 223 247 462 NA</td>
<td>1296</td>
<td>59</td>
<td>221 19 NA NA</td>
</tr>
<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>51</td>
<td>244 37 NA NA</td>
</tr>
<tr>
<td>2 2005-2006</td>
<td>FT 315 225 246 453 NA</td>
<td>1239</td>
<td>46</td>
<td>227 29 NA NA</td>
</tr>
<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>49</td>
<td>244 37 NA NA</td>
</tr>
<tr>
<td>3 2004-2005</td>
<td>FT 299 195 260 425 NA</td>
<td>1179</td>
<td>39</td>
<td>227 29 NA NA</td>
</tr>
<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>47</td>
<td>244 37 NA NA</td>
</tr>
<tr>
<td>4 2003-2004</td>
<td>FT 281 218 235 446 NA</td>
<td>1180</td>
<td>46</td>
<td>269 27 NA NA</td>
</tr>
<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>41</td>
<td>244 37 NA NA</td>
</tr>
<tr>
<td>5 2002-2003</td>
<td>FT 309 228 246 453 NA</td>
<td>1236</td>
<td>42</td>
<td>240 38 NA NA</td>
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<tr>
<td></td>
<td>PT -- -- -- -- --</td>
<td>--</td>
<td>54</td>
<td>244 37 NA NA</td>
</tr>
</tbody>
</table>

NA—not applicable
FT—full time
PT—part time
Note: “Part-time” are graduate students enrolled in Master of Science Natural Resources Environmental Education (MSNREE) program.
<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year – Fall Term Only</th>
<th>Total Undergrad</th>
<th>Total Grad</th>
<th>Paper Science and Engineering Degrees Conferred by Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd</td>
<td>4th</td>
</tr>
<tr>
<td>CURRENT</td>
<td>FT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 2006-07</td>
<td>FT</td>
<td>7</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 2005-06</td>
<td>FT</td>
<td>8</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 2004-03</td>
<td>FT</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>PT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 2003-04</td>
<td>FT</td>
<td>3</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>PT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5 2002-03</td>
<td>FT</td>
<td>9</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>PT</td>
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</tr>
</tbody>
</table>

**NOTE:** NA = not applicable
### Table D-6a. Faculty Salary Data  
**College of Natural Resources**  
**Academic Year 2007-2008**

<table>
<thead>
<tr>
<th></th>
<th>Professor</th>
<th>Associate Professor</th>
<th>Assistant Professor</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>14</td>
<td>9</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>$110,900</td>
<td>$79,250</td>
<td>$50,925</td>
<td>$46,800</td>
</tr>
<tr>
<td>Mean</td>
<td>$70,550</td>
<td>$61,400</td>
<td>$49,200</td>
<td>$41,650</td>
</tr>
<tr>
<td>Low</td>
<td>$62,375</td>
<td>$49,100</td>
<td>$39,550</td>
<td>$39,550</td>
</tr>
</tbody>
</table>

### Table D-6b. Faculty Salary Data  
**Paper Science and Engineering**  
**Academic Year 2007-08**

<table>
<thead>
<tr>
<th></th>
<th>Professor</th>
<th>Associate Professor</th>
<th>Assistant Professor</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
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<td></td>
</tr>
<tr>
<td>High</td>
<td>79,610</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
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<td>48,005</td>
</tr>
<tr>
<td>Low</td>
<td>76,816</td>
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</table>