

**NOT FOR USE FOR CURRICULAR COURSE CHANGES  
REQUEST FOR PROGRAM IMPROVEMENTS**

**NOTE: Changes to programs may require course changes, which must be processed electronically. Any questions should be directed to Associate Provost David Reinhold at 7-4564 or [david.reinhold@wmich.edu](mailto:david.reinhold@wmich.edu)**

**DEPARTMENT:** PAPR **COLLEGE:** CEAS  
**PROPOSED EFFECTIVE FALL YEAR:** 2021

**PROPOSED IMPROVEMENTS:** *Academic Program Proposed Improvements*

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> New degree*        | <input type="checkbox"/> New minor*               | <input type="checkbox"/> Admission requirements  |
| <input type="checkbox"/> New major*         | <input type="checkbox"/> Deletion*                | <input type="checkbox"/> Graduation requirements |
| <input type="checkbox"/> New curriculum*    | <input checked="" type="checkbox"/> Revised major | <input type="checkbox"/> Change in Title         |
| <input type="checkbox"/> New concentration* | <input type="checkbox"/> Revised minor            | <input type="checkbox"/> Transfer                |
| <input type="checkbox"/> New certificate*   |   |  |

Other (explain\*\*)    **\*\* Other:**

**Title of degree, curriculum, major, minor, concentration, or certificate:** Paper Engineering Major, PAPRJ

<b>Chair, Department Curriculum Committee:</b> 	<b>Date</b> 09/16/2020
---	------------------------

**CHECKLIST FOR DEPARTMENT CHAIRS/DIRECTORS**

- For new programs and other changes that have resource implications, the dean has been consulted.
- When appropriate, letters of support from department faculty are attached.
- When appropriate, letters of support from other departments in the same college are attached.
- When appropriate, letters of support from other college deans, whose programs/courses may be affected by the change, are attached.
- The proposal has been reviewed by HIGE for possible implications for international student enrollment.
- The proposal is consistent with the departmental assessment plan, and identifies measurable learning outcomes for assessment.
- Detailed resource plan is attached where appropriate.
- All questions attached have been completed and supporting documents are attached.
- The proposal is written and complete as outlined in the Faculty Senate guidelines and the curriculum change guides.

<b>Chair/Director:</b>	<b>Date</b>
------------------------	-------------

**CHECKLIST FOR COLLEGE CURRICULUM COMMITTEE**

- The academic quality of the proposal and the faculty involved has been reviewed.
- Detailed resource plan is attached where appropriate.
- Consistency between the proposal and the relevant catalog language has been confirmed.
- The proposal has been reviewed for effect on students transferring from Michigan community colleges. Detailed information on transfer articulation must be included with undergraduate proposals.
- Consistency between the proposal and the College and department assessment plans has been confirmed.
- Consistency between the proposal and the College and department strategic plans has been confirmed.
- All questions attached have been completed and supporting documents are attached.
- The proposal is written and complete as outlined in the Faculty Senate guidelines and the curriculum change guides.

<b>Chair, College Curriculum Committee:</b>	<b>Date</b>
---	-------------

**NOT FOR USE FOR CURRICULAR COURSE CHANGES  
REQUEST FOR PROGRAM IMPROVEMENTS**

1. Explain briefly and clearly the proposed improvement:

Revise the Additional Cognates course list of the Paper Engineering major to reflect changes in the Chemistry Department's Physical Chemistry offerings, specifically renaming CHEM 4300 "Physical Chemistry I" to "Chemical Thermodynamics and Kinetics" In addition, CHEM 4300 will switch from being offered in both Fall and Spring, to Spring-only.

2. Rationale. Give your reason(s) for the proposed improvement.

The CHEM 4300 course title will be changed as a result of course re-structuring in Chemistry. The course-offering schedule is driven by two forces: first, to eliminate a scheduling conflict between CHEG 4100 and CHEM 4300, and second, recent reductions in the number of faculty in the Chemistry Department's Physical division.

3. Effect on other colleges, departments, or programs. If consultation with others is required, attach evidence of consultation and support. If objections have been raised, document the resolution. Demonstrate that the program you propose is not a duplication of an existing one.

This change is being proposed by Chemistry, but with the approval of the Chemical and Paper Engineering Department. Chemistry is also consulting with Geological and Environmental Sciences and English, which are both also affected.

4. Effect on your department's programs. Show how the proposed change fits with other departmental offerings.

The only effect on the Chemical and Paper Engineering Department's programs is to switch semesters for CHEM 4300 and CHEM 3750/3760 in the proposed course sequence.

5. Alignment with college's and department's strategic plan, mission, and vision.

These proposed changes are consistent with the Chemistry Department's strategic assessment goal of acting on feedback regarding curricular structure, and with the College of Arts and Sciences goal 4.1.c, to develop and promote deliberate curricular pathways.

6. Effects on enrolled students: Are program conflicts avoided? Will your proposal make it easier or harder for students to meet graduation requirements? Can students complete the program in a reasonable time? Show that you have considered scheduling needs and demands on students' time.

Chemistry's proposed course changes will not have any effect on Paper Engineering major.

7. Student or external market demand. What is your anticipated student audience? What evidence of student or market demand or need exists? What is the estimated enrollment? What other factors make your proposal beneficial to students?

The student audience and market demand will be unaffected by this change.

8. Effects on resources. Explain how your proposal would affect department and University resources, including faculty, equipment, space, technology, and library holdings. If proposing a new program, include a letter and/or email of support from the university libraries affirming that the library resource issues have been reviewed. Tell how you will staff additions to the program. If more advising will be needed, how will you provide for it? What will be the initial one-time costs and the ongoing base-funding costs for the proposed program? (Attach additional pages, as necessary.)

There will be no effect on the Chemical and Paper Engineering Department's resources, as the modified course is already being taught by the Chemistry Department.

9. List the learning outcomes for the revised or proposed major, minor, or concentration. The department will use these outcomes for future assessments of the program.

No change

10. Describe how this change is a response to assessment outcomes that are part of a department or college assessment plan or informal assessment activities.

The proposed change in the Chemistry course was driven by two factors: analysis of the topical dependence between the two semesters of the Physical Chemistry core courses, and the need to improve scheduling flexibility for the Chemistry and Chemical Engineering undergraduate programs.

- **PAPR 4300 - Surface and Wet End Science Credits: 3 hours**

## Paper Engineering

Accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://www.abet.org).

Program Educational Objectives: Our graduates are expected within a few years of graduation to attain the following in the areas of career growth, professional development, innovation, and service:

1. **Career Growth:** as measured by metrics such as achieving proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression and/or job advancement.
2. **Professional Development:** as measured by metrics such as pursuing additional educational activities, professional certifications, leadership effectiveness, staying current with evolving technologies and/or demonstrating initiative.
3. **Service:** as measured by metrics such as involvement in their communities, professional societies, and/or humanitarian endeavors.
4. **Innovation and entrepreneurship:** as measured by metrics such as the development of new processes, devices, methods, patents, and/or founding a business.

For up-to-date educational objectives and learning outcomes, see the Department's web page at [www.wmich.edu/chemical-paper/academics/paper](http://www.wmich.edu/chemical-paper/academics/paper).

### Admission

1. To be admitted to this engineering curriculum, a student must complete all pre-engineering requirements with grades of "C" or better. These requirements may be found in the beginning of the College of Engineering and Applied Sciences section of this catalog.
2. Students seeking admission to this curriculum must submit an application following procedures established by the College of Engineering and Applied Sciences. Upper level transfer students should complete an application prior to their first semester of enrollment. Only students in good academic standing as defined by the University will be admitted to this curriculum.

### Baccalaureate-Level Writing Requirement

Students who have chosen the Paper Engineering major will satisfy the Baccalaureate-Level Writing Requirement by successfully completing PAPR 4850: Research Design.

### Requirements

Candidates for the Bachelor of Science in Engineering (Paper) must satisfy the following requirements in addition to those required by Western Michigan University:

1. The requirement of departmental prefixed prerequisite will not be fulfilled with a grade less than a "C". Requests for exceptions to this policy must follow the departmental appeal policy (available in the department office). If an exception is granted, the policy requires that the less than "C" grade be replaced within two regular semesters.
2. No more than two grades of "D" or "DC" may be presented for graduation.
3. Students must complete the following program of 135 semester credit hours, which includes the courses in one of the following emphasis areas: Process Engineering or Environmental Engineering and Sustainable Processes. One emphasis area must be elected and taken in its entirety. The schedules below are examples leading to graduation in eight semesters, beginning in fall. However, depending on the individual's curricular and scheduling needs, the program can take more than eight semesters.
4. The Paper Engineering curriculum requires students to complete a course in General Education Area I, Area II, Area III, Area IV, Area V, and Area VIII. At least two of the General Education Area courses must be at

#### Fourth Semester (19 hours)

- Emphasis Elective **Credits: 3 hours**
- CHEG 2611 - Environmental Engineering I **Credits: 3 hours**  
Pre-engineering requirement
- CHEG 2960 - Material and Energy Balance **Credits: 4 hours**
- MATH 2720 - Multivariate Calculus and Matrix Algebra **Credits: 4 hours**  
Pre-engineering requirement
- PHYS 2070 - University Physics II **Credits: 4 hours**
- PHYS 2080 - University Physics II Laboratory **Credits: 1 hour**

#### Fifth Semester (17 hours)

- General Education **Credits: 4 hours**
- General Education **Credits: 3 hours**
- CHEM 4300 - Physical Chemistry I **Credits: 3 hours**
- CHEG 3110 - Unit Operations in Chemical Engineering I **Credits: 3 hours**
- PAPR 3030 - Pulping and Bleaching **Credits: 4 hours**

#### Sixth Semester (16 hours)

- General Education **Credits: 3 hours**
- CHEG 3120 - Unit Operations in Chemical Engineering II **Credits: 3 hours**
- CHEG 3300 - Mass Transfer **Credits: 3 hours**
- MATH 3740 - Differential Equations and Linear Algebra **Credits: 4 hours**
- PAPR 3330 - Carbohydrate and Lignin Chemistry **Credits: 3 hours**  
or
- CHEM 3770 - Organic Chemistry II **Credits: 3 hours**

#### Seventh Semester (16 hours)

- Emphasis Elective **Credits: 3 hours**
- Emphasis Elective **Credits: 4 hours**
- CHEG 3810 - Computer Modeling and Simulation - Chemical Processes **Credits: 1 hour**
- CHEG 4830 - Process Control I **Credits: 4 hours**
- PAPR 4400 - Seminar **Credits: 1 hour**
- PAPR 4600 - Plant Economics and Project Design **Credits: 3 hours**

#### Eighth Semester (15 hours)

- Emphasis Elective **Credits: 3 hours**
- Emphasis Elective **Credits: 3 hours**
- CHEG 4810 - Unit Operations Lab: Fluid Flow, Heat and Mass Transfer **Credits: 2 hours**
- CHEG 4870 - Senior Design Project **Credits: 3 hours**
- PAPR 4300 - Surface and Wet End Science **Credits: 3 hours**
- CHEG 4400 - Safety and Hazards Management in Chemical Processes **Credits: 1 hour**  
or
- GPS 4400 - Seminar **Credits: 1 hour**

- PAPR 4300 - Surface and Wet End Science **Credits:** 3 hours

## Paper Engineering

Accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://www.abet.org).

Program Educational Objectives: Our graduates are expected within a few years of graduation to attain the following in the areas of career growth, professional development, innovation, and service:

1. Career Growth: as measured by metrics such as achieving proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression and/or job advancement.
2. Professional Development: as measured by metrics such as pursuing additional educational activities, professional certifications, leadership effectiveness, staying current with evolving technologies and/or demonstrating initiative.
3. Service: as measured by metrics such as involvement in their communities, professional societies, and/or humanitarian endeavors.
4. Innovation and entrepreneurship: as measured by metrics such as the development of new processes, devices, methods, patents, and/or founding a business.

For up-to-date educational objectives and learning outcomes, see the Department's web page at [www.wmich.edu/chemical-paper/academics/paper](http://www.wmich.edu/chemical-paper/academics/paper).

### Admission

1. To be admitted to this engineering curriculum, a student must complete all pre-engineering requirements with grades of "C" or better. These requirements may be found in the beginning of the College of Engineering and Applied Sciences section of this catalog.
2. Students seeking admission to this curriculum must submit an application following procedures established by the College of Engineering and Applied Sciences. Upper level transfer students should complete an application prior to their first semester of enrollment. Only students in good academic standing as defined by the University will be admitted to this curriculum.

### Baccalaureate-Level Writing Requirement

Students who have chosen the Paper Engineering major will satisfy the Baccalaureate-Level Writing Requirement by successfully completing PAPR 4850: Research Design.

### Requirements

Candidates for the Bachelor of Science in Engineering (Paper) must satisfy the following requirements in addition to those required by Western Michigan University:

1. The requirement of departmental prefixed prerequisite will not be fulfilled with a grade less than a "C". Requests for exceptions to this policy must follow the departmental appeal policy (available in the department office). If an exception is granted, the policy requires that the less than "C" grade be replaced within two regular semesters.
2. No more than two grades of "D" or "DC" may be presented for graduation.
3. Students must complete the following program of 135 semester credit hours, which includes the courses in one of the following emphasis areas: Process Engineering or Environmental Engineering and Sustainable Processes. One emphasis area must be elected and taken in its entirety. The schedules below are examples leading to graduation in eight semesters, beginning in fall. However, depending on the individual's curricular and scheduling needs, the program can take more than eight semesters.
4. The Paper Engineering curriculum requires students to complete a course in General Education Area I, Area II, Area III, Area IV, Area V, and Area VIII. At least two of the General Education Area courses must be at

the 3000-4000 level, and no more than two courses from any one department may be used to satisfy the Area requirements. Paper Engineering majors are required to take ECON 2010 for Area V.

## Paper Engineering

### First Semester (17 hours)

- General Education **Credits: 3 hours**  
Pre-engineering requirement
- CHEM 1100 - General Chemistry I **Credits: 3 hours**  
Pre-engineering requirement
- CHEM 1110 - General Chemistry Laboratory I **Credits: 1 hour**  
Pre-engineering requirement
- IEE 1020 - Technical Communication **Credits: 3 hours**  
Pre-engineering requirement
- MATH 1220 - Calculus I **Credits: 4 hours**  
or
- MATH 1700 - Calculus I, Science and Engineering **Credits: 4 hours**  
Pre-engineering requirement
- PAPR 1000 - Introduction to Pulp and Paper Manufacture **Credits: 3 hours**

### Second Semester (16 hours)

- General Education **Credits: 2 hours**
- CHEG 1810 - Introduction to Chemical Engineering Computation **Credits: 2 hours**  
Pre-engineering requirement
- CHEM 1120 - General Chemistry II **Credits: 3 hours**  
Pre-engineering requirement
- CHEM 1130 - General Chemistry Laboratory II **Credits: 1 hour**  
Pre-engineering requirement
- MATH 1230 - Calculus II **Credits: 4 hours**  
or
- MATH 1710 - Calculus II, Science and Engineering **Credits: 4 hours**  
Pre-engineering requirement
- PAPR 2040 - Stock Preparation and Papermaking **Credits: 4 hours**  
Pre-engineering requirement

### Third Semester (19 hours)

- CHEM 3750 - Organic Chemistry I **Credits: 3 hours**
- CHEM 3760 - Organic Chemistry Lab I **Credits: 1 hour**
- ECON 2010 - Principles of Microeconomics **Credits: 3 hours**  
Pre-engineering requirement
- IEE 2610 - Engineering Statistics **Credits: 3 hours**
- PAPR 2550 - Paper Physics Fundamentals **Credits: 4 hours**
- PHYS 2050 - University Physics I **Credits: 4 hours**  
Pre-engineering requirement
- PHYS 2060 - University Physics I Laboratory **Credits: 1 hour**  
Pre-engineering requirement

#### Fourth Semester (19 hours)

- Emphasis Elective **Credits: 3 hours**
- CHEG 2611 - Environmental Engineering I **Credits: 3 hours**  
Pre-engineering requirement
- CHEG 2960 - Material and Energy Balance **Credits: 4 hours**
- MATH 2720 - Multivariate Calculus and Matrix Algebra **Credits: 4 hours**  
Pre-engineering requirement
- PHYS 2070 - University Physics II **Credits: 4 hours**
- PHYS 2080 - University Physics II Laboratory **Credits: 1 hour**

#### Fifth Semester (17 hours)

- General Education **Credits: 4 hours**
- General Education **Credits: 3 hours**
- CHEM 4300 - Physical Chemistry I **Credits: 3 hours**
- CHEG 3110 - Unit Operations in Chemical Engineering I **Credits: 3 hours**
- PAPR 3030 - Pulping and Bleaching **Credits: 4 hours**

*CHEM 3770 organic Chemistry II*

#### Sixth Semester (16 hours)

- General Education **Credits: 3 hours**
- CHEG 3120 - Unit Operations in Chemical Engineering II **Credits: 3 hours**
- CHEG 3300 - Mass Transfer **Credits: 3 hours**
- MATH 3740 - Differential Equations and Linear Algebra **Credits: 4 hours**
- PAPR 3330 - Carbohydrate and Lignin Chemistry **Credits: 3 hours**
- or
- CHEM 3770 - Organic Chemistry II **Credits: 3 hours**

*CHEM 4300: Chemical Thermodynamics and Kinetics*

#### Seventh Semester (16 hours)

- Emphasis Elective **Credits: 3 hours**
- Emphasis Elective **Credits: 4 hours**
- CHEG 3810 - Computer Modeling and Simulation - Chemical Processes **Credits: 1 hour**
- CHEG 4830 - Process Control I **Credits: 4 hours**
- PAPR 4400 - Seminar **Credits: 1 hour**
- PAPR 4600 - Plant Economics and Project Design **Credits: 3 hours**

#### Eighth Semester (15 hours)

- Emphasis Elective **Credits: 3 hours**
- Emphasis Elective **Credits: 3 hours**
- CHEG 4810 - Unit Operations Lab: Fluid Flow, Heat and Mass Transfer **Credits: 2 hours**
- CHEG 4870 - Senior Design Project **Credits: 3 hours**
- PAPR 4300 - Surface and Wet End Science **Credits: 3 hours**
- CHEG 4400 - Safety and Hazards Management in Chemical Processes **Credits: 1 hour**
- or
- GPS 4400 - Seminar **Credits: 1 hour**