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 7-4664 or david.reinhold@wmich.edu

DEPARTMENT: CHP
PROPOSED EFFECTIVE FALL YEAR: 2020

PROPOSED IMPROVEMENTS: Academic Program Proposed Improvements
☐ New degree*
☐ New major*
☐ New curriculum*
☐ New concentration*
☐ New certificate*
☐ New minor*
☐ Admission
☐ Deletion*
☐ Revised major
☐ Revised minor
☐ Graduation
☐ Change in Title
☐ Transfer

☐ Other (explain**)
** Other: Incorporation of WMU Essential Studies Requirements replacing the current general education requirements

Title of degree, curriculum, major, minor, concentration, or certificate: B.SE in Paper Engineering

Chair, Department Curriculum Committee: [Signature] Date 10/15/19

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.

Chair/Director: [Signature] Date 10/15/19

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.

<table>
<thead>
<tr>
<th>Chair, College Curriculum Committee:</th>
<th>Date</th>
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<td><strong>NOT FOR USE FOR CURRICULAR COURSE CHANGES</strong></td>
<td><strong>REQUEST FOR PROGRAM IMPROVEMENTS</strong></td>
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**CHECKLIST FOR COLLEGE DEANS**

☐ For new programs and proposed program deletions, the provost has been consulted.
☐ For new programs, letter of support from University Libraries Dean indicating library resource requirements have been met.
☐ When appropriate, letters of support from other college faculty and/or chairs 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 for implications for accreditation, certification, or licensure.
☐ 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.

<table>
<thead>
<tr>
<th>Dean:</th>
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**FOR PROPOSALS REQUIRING REVIEW BY:**
GSC/USC, EPGC, GRADUATE COLLEGE, and/or FACULTY SENATE EXECUTIVE BOARD

☐ Return to Dean
☐ Forward to:

<table>
<thead>
<tr>
<th>Curriculum Manager:</th>
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<td>Graduate College Dean:</td>
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<td>☐ Approve ☐ Disapprove</td>
<td>Faculty Senate President:</td>
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<td>Provost:</td>
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NOT FOR USE FOR CURRICULAR COURSE CHANGES
REQUEST FOR PROGRAM IMPROVEMENTS

1. Explain briefly and clearly the proposed improvement:

To update the curriculum replacing the current general education requirements with those of Western Essential Studies, the program is modified to a) to remove ECON 2010 from the program requirements, and b) replace CHEG 4870 by PAPR 4870. The details are attached in the catalog copy with changes tracked suitably. Updated program content is to mainly address WMU Essential Studies Program requirements.

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

Modification of the curriculum to meet the requirements of Western Essential Studies without changing the overall credit requirements of the program or the credit requirements of the different options in the program. The content of ECON 2010 is otherwise met in the program through various other courses. The replacement of CHEG 4870 by PAPR 4870 is a long awaited one to meet the ABET requirements for the program by a specific PAPR course. It is required to remove references to general education requirements and update with WMU Essential Studies Program requirements.

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.

No significant changes foreseen, as we are not increasing the overall credit load for the student in the "gen.ed." category.

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

No change is expected as we keep all the required courses as well as option credits in the program.

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

Provides broad-based liberal arts education for civil engineering students and supports both ABET requirements and ASCE Body of Knowledge recommendations to ensure we graduate well-rounded civil engineers ready to lead challenges facing our society.

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.

No effect on enrolled students as they will continue under the catalog year with which they entered. A deliberate transition will occur university-wide to address any issues that arise for current students. They will be taking the same number of program required courses outside of their WES courses and the overall credit hour requirements will not increase.

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?

No 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.)

None. All revisions to the civil engineering program in response to the new WMU Essential Studies Program were coordinated across the college and university through the WMU Essential Studies Program design.

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 to program outcomes. They remain the same as before and they are:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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 changes were in response to a university-wide revised general education program.

11. (Undergraduate proposals only) Describe in detail how this change affects transfer articulation for Michigan community colleges. For new majors or minors, describe transfer guidelines to be developed with Michigan community colleges. For revisions to majors or minors, describe necessary revisions to Michigan community college guidelines. Department chairs should seek assistance from college advising directors or from the admissions office in completing this section.

This aspect is being addressed by the Director of the WMU Essential Studies Program, the Associate Provost for Assessment and Undergraduate Studies, and the advising staff.

12. Please offer both “Current Catalog Language” and “Proposed Catalog Language” if there is to be a change in the catalog description for a given program. For the “current” language, please copy and paste relevant language from the most current catalog and for the “proposed” language, please share the exact proposed new catalog language. As possible, bold or otherwise note the key changes in the new proposed catalog language.

Attached.
Paper Engineering

🔗 Return to: Departments and Programs

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

Career Growth: as measured by metrics such as achieving proficiency in current position, increasing responsibilities, recognition, progression and/or job advancement.
Professional Development: as measured by metrics such as pursuing additional educational activities, professional leadership effectiveness, staying current with evolving technologies and/or demonstrating initiative.
Service: as measured by metrics such as involvement in their communities, professional societies, and/or human innovation and entrepreneurship: as measured by metrics such as the development of new processes, devices, founding a business.
(For up-to-date educational objectives and learning outcomes, see the Department’s web page at wnmich.edu/paper/academics/paper)

Admission
To be admitted to this engineering curriculum, a student must complete all pre-engineering requirements with a grade of “C” or better. These requirements may be found in the beginning of the College of Engineering and Applied Sciences section of the University catalog. 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 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 completing PAPR 4850: Research Design.

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

The requirement of departmental prefixed prerequisite will not be fulfilled with a grade less than a “C”. Requirements must follow the departmental appeal policy (available in the department office). If an exception is granted, the less than “C” grade must be replaced within two regular semesters.

No more than two grades of “D” or “DC” may be presented for graduation.

Students must complete the following program of 135 semester credit hours, which includes the courses in on emphasis areas: Process Engineering or Environmental Engineering and Sustainable Processes. One emphasis must be taken in its entirety. The schedules below are examples leading to graduation in eight semesters, beginning in on the individual’s curricular and scheduling needs, the program can take more than eight semesters.

The Paper Engineering curriculum requires students to complete a course in General Education Area I, Area IV, and Area VIII. At least two of the General Education Area courses must be at the 3000-4000 level, and no
from any one department may be used to satisfy the Area requirements. Paper Engineering majors are required to fulfill Area V.

Paper Engineering

First Semester (17 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>General Education</td>
<td>3 hours</td>
</tr>
<tr>
<td>Pre-engineering requirement</td>
<td></td>
</tr>
<tr>
<td>CHEM 1100 - General Chemistry</td>
<td>3 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
<td></td>
</tr>
<tr>
<td>CHEM 1110 - General Chemistry Laboratory</td>
<td>1 hour</td>
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<tr>
<td>Pre-engineering requirement</td>
<td></td>
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<tr>
<td>IEE 1020 - Technical Communication</td>
<td>3 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>MATH 1220 - Calculus I</td>
<td>4 hours</td>
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<td>or</td>
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<tr>
<td>MATH 1700 - Calculus I, Science and Engineering</td>
<td>4 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>PAPR 1000 - Introduction to Pulp and Paper Manufacture</td>
<td>3 hours</td>
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Second Semester (16 hours)

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>General Education</td>
<td>2 hours</td>
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<tr>
<td>CHEG 1810 - Introduction to Chemical Engineering Computation</td>
<td>2 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>CHEM 1120 - General Chemistry II</td>
<td>3 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
<td></td>
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<tr>
<td>CHEM 1130 - General Chemistry Laboratory II</td>
<td>1 hour</td>
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<td>Pre-engineering requirement</td>
<td></td>
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<tr>
<td>MATH 1230 - Calculus II</td>
<td>4 hours</td>
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<td>or</td>
<td></td>
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<tr>
<td>MATH 1710 - Calculus II, Science and Engineering</td>
<td>4 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
<td></td>
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<tr>
<td>PAPR 2040 - Stock Preparation and Papermaking</td>
<td>4 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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Third Semester (19 hours)

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<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 3750 - Organic Chemistry I</td>
<td>3 hours</td>
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<tr>
<td>CHEM 3760 - Organic Chemistry Lab I</td>
<td>1 hour</td>
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<tr>
<td>ECON 2010 - Principles of Microeconomics</td>
<td>3 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>IEE 2610 - Engineering Statistics</td>
<td>3 hours</td>
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<tr>
<td>PAPR 2550 - Paper Physics Fundamentals</td>
<td>4 hours</td>
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<tr>
<td>PHYS 2050 - University Physics I</td>
<td>4 hours</td>
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<tr>
<td>Course Details</td>
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<tr>
<td><strong>Pre-engineering requirement</strong></td>
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<tr>
<td>PHYS 2060 - University Physics I Laboratory</td>
<td><strong>Credits:</strong> 1 hour</td>
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<tr>
<td><strong>Fourth Semester (19 hours)</strong></td>
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<tr>
<td>Emphasis Elective</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>CHEG 2611 - Environmental Engineering</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>CHEG 2960 - Material and Energy Balance</td>
<td><strong>Credits:</strong> 4 hours</td>
</tr>
<tr>
<td>MATH 2720 - Multivariate Calculus and Matrix Algebra</td>
<td><strong>Credits:</strong> 4 hours</td>
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<tr>
<td>Pre-engineering requirement</td>
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<tr>
<td>PHYS 2070 - University Physics II</td>
<td><strong>Credits:</strong> 4 hours</td>
</tr>
<tr>
<td>PHYS 2080 - University Physics II Laboratory</td>
<td><strong>Credits:</strong> 1 hour</td>
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<td><strong>Fifth Semester (17 hours)</strong></td>
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<tr>
<td>General Education</td>
<td><strong>Credits:</strong> 4 hours</td>
</tr>
<tr>
<td>General Education</td>
<td><strong>Credits:</strong> 3 hours</td>
</tr>
<tr>
<td>CHEM 4300 - Physical Chemistry</td>
<td><strong>Credits:</strong> 3 hours</td>
</tr>
<tr>
<td>CHEG 3110 - Unit Operations in Chemical Engineering</td>
<td><strong>Credits:</strong> 3 hours</td>
</tr>
<tr>
<td>PAPR 3030 - Pulp and Bleaching</td>
<td><strong>Credits:</strong> 4 hours</td>
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<td><strong>Sixth Semester (16 hours)</strong></td>
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<tr>
<td>General Education</td>
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<tr>
<td>CHEG 3120 - Unit Operations in Chemical Engineering II</td>
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<td>CHEG 3300 - Mass Transfer</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>MATH 3740 - Differential Equations and Linear Algebra</td>
<td><strong>Credits:</strong> 4 hours</td>
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<tr>
<td>PAPR 3330 - Carbohydrate and Lignin Chemistry</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>CHEM 3770 - Organic Chemistry II</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>Emphasis Elective</td>
<td><strong>Credits:</strong> 4 hours</td>
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<tr>
<td>CHEG 3810 - Computer Modeling and Simulation - Chemical Processes</td>
<td><strong>Credits:</strong> 1 hour</td>
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<tr>
<td>CHEG 4830 - Process Control</td>
<td><strong>Credits:</strong> 4 hours</td>
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<tr>
<td>PAPR 4400 - Seminar</td>
<td><strong>Credits:</strong> 1 hour</td>
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<tr>
<td>PAPR 4600 - Plant Economics and Project Design</td>
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<tr>
<td>Emphasis Elective</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>CHEG 4810 - Unit Operations Lab: Fluid Flow, Heat and Mass Transfer</td>
<td><strong>Credits:</strong> 2 hours</td>
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<td>CHEG 4870 - Senior Design Project</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>PAPR 4300 - Surface and Wet End Science</td>
<td><strong>Credits:</strong> 3 hours</td>
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<tr>
<td>CHEG 4400 - Safety and Hazards Management in Chemical Processes</td>
<td><strong>Credits:</strong> 1 hour</td>
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OR
GPS 4400 - Seminar Credits: 1 hour

Areas of Emphasis

Emphasis in Process Engineering (16 hours minimum)

Required Electives (4 hours)

PAPR 2420 - Coating Credits: 4 hours

Elective Courses (choose 12 hours minimum):

- CHEG 3200 - Chemical Engineering Thermodynamics Credits: 3 hours
- CHEG 4100 - Chemical Reaction Engineering Credits: 3 hours
- CHP 3100 - Work Experience/Co-op Credits: 1 hour
- ECE 2100 - Circuit Analysis Credits: 4 hours
- GPS 5100 - Printability Analysis Credits: 3 hours
- IEE 3100 - Engineering Economy Credits: 3 hours

(Another course in IEE, MGMT, or COM can be substituted for IEE 3100 with approval of the advisor.)
- ME 2560 - Statics Credits: 3 hours
- STAT 5670 - Statistical Design and Analysis of Experiments Credits: 3 hours

Preferred Elective

Emphasis in Environmental Engineering and Sustainable Processes (16 hours minimum)

Required Electives (3 hours)

CHEG 4440 - Energy Management Engineering Credits: 3 hours

Elective Courses (choose 13 hours minimum):

- CHP 3100 - Work Experience/Co-op Credits: 1 hour
- PAPR 3531 - Wastewater Treatment Systems Credits: 3 hours
- PAPR 2420 - Coating Credits: 4 hours
- ECON 3190 - Environmental Economics Credits: 3 hours
- BIOS 2320 - Microbiology and Infectious Diseases Credits: 4 hours
- CHEG 3200 - Chemical Engineering Thermodynamics Credits: 3 hours
- CHEG 4100 - Chemical Reaction Engineering Credits: 3 hours
- CHEG 5200 - Renewable Energy and Energy Storage Credits: 3 hours
- CHEG 5250 - Sustainable Earth Resources Engineering Credits: 3 hours
- CHEM 2250 - Quantitative Analysis Credits: 3 hours
- CHEM 2260 - Quantitative Analysis Laboratory Credits: 1 hour
- CHEM 3550 - Introductory Biochemistry Credits: 3 hours
- CHEM 3560 - Introductory Biochemistry Laboratory Credits: 1 hour
- IEE 3100 - Engineering Economy Credits: 3 hours
Paper Engineering

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:

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.
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.
Service: as measured by metrics such as involvement in their communities, professional societies, and/or humanitarian endeavors.
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 wumich.edu/chemical-paper/academics/paper)

Admission
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. 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.

WMU Essential Studies Program Requirements

Students who have chosen the Paper Engineering curriculum will satisfy the WMU Essential Studies Program Requirements as course listings below. To satisfy these requirements students take courses in twelve (12) categories. Six (6) of the courses are required for the civil engineering program requirements and six (6) are free electives which students choose from a list of courses in the corresponding course category. Students will meet the planetary sustainability outcome in PAPR4870: Senior Design Project and must select a course that satisfies the diversity and inclusion outcome when choosing a course in the other six (6) categories.

Requirements

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

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.
No more than two grades of “D” or “DC” may be presented for graduation.

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. How on the individual’s curricular and scheduling needs, the program can take more than eight semesters.

Revised Sept. 2018. All previous forms are obsolete and should not be used.
Paper Engineering

First Semester (17 hours)

- WMU Essential Studies Level 1: Inquiry and Engagement Course Elective 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
  - EEE 1020 - Technical Communication Credits: 3 hours
    (Satisfies WMU Essential Studies Level 1: Writing Course Requirement)
  - Pre-engineering requirement
  - MATH 1220 - Calculus I Credits: 4 hours
  - or
  - MATH 1700 - Calculus I, Science and Engineering Credits: 4 hours
    (Satisfies WMU Essential Studies Level 1: Quantitative Literacy Course Requirement)
  - Pre-engineering requirement
  - PAPP 1060 - Introduction to Pulp and Paper Manufacture Credits: 3 hours

Second Semester (17 hours)

The following courses are pre-engineering requirements:

- WMU Essential Studies Level 2: Personal Wellness Course Elective Credits: 3 hours
- CHEG 1810 - Introduction to Chemical Engineering Computation Credits: 2 hours
- CHEM 1120 - General Chemistry II Credits: 3 hours
- CHEM 1130 - General Chemistry Laboratory II Credits: 1 hour
- MATH 1230 - Calculus II Credits: 4 hours
- or
- MATH 1710 - Calculus II, Science and Engineering Credits: 4 hours
- PAPP 2040 - Stock Preparation and Permanenting Credits: 4 hours

Third Semester (19 hours)

- CHEM 3750 - Organic Chemistry I Credits: 3 hours
- CHEM 3760 - Organic Chemistry Lab I Credits: 1 hour
- WMU Essential Studies Level 3: World Language and Culture Course Elective Credits: 3 hours
- EEE 2610 - Engineering Statistics Credits: 3 hours
- Satisfies WMU Essential Studies Level 2: Oral and Digital Communication Course Requirement
- PAPP 2550 - Paper Physics Fundamentals Credits: 4 hours
- PHYS 2050 - University Physics I Credits: 4 hours
- Satisfies WMU Essential Studies Level 2: Laboratory Science Course Requirement

Pre-engineering requirement

- PHYS 2060 - University Physics I Laboratory Credits: 1 hour
  (Satisfies WMU Essential Studies Level 2: Laboratory Science Course Requirement)
- Pre-engineering requirement

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Fourth Semester (19 hours)

- Emphasis Elective Credits: 3 hours
- CHEG 2611 - Environmental Engineering I Credits: 3 hours
  Satisfies WMU Essential Studies Level 2: Science and Technology Course Requirement
- 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 (16 hours)

- WMU Essential Studies Level 2: Artistic Theory and Practice Course Elective Credits: 3 hours
- WMU Essential Studies Level 2: Societies and Cultures Course Elective Credits: 3 hours
- CHEM 4800 - 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)

- Emphasis Elective 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
- CHEG 4810 - Unit Operations Lab: Fluid Flow, Heat and Mass Transfer Credits: 2 hours
- PAPR 4870 - Senior Design Project Credits: 3 hours,
  Satisfies WMU Essential Studies Level 3: Local and National Perspectives Course Requirement and the required Planet outcome.
- WMU Essential Studies Level 3: Global Perspectives Course Elective 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

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Areas of Emphasis

Emphasis in Process Engineering (16 hours minimum)

Required Electives (4 hours)
- PAPR 2420 - Coating Credits: 4 hours

Elective Courses (choose 12 hours minimum):
- CHEG 3200 - Chemical Engineering Thermodynamics Credits: 3 hours
- CHEG 4100 - Chemical Reaction Engineering Credits: 3 hours
- CHP 3100 - Work Experience/Co-op Credits: 1 hour
- ECE 2100 - Circuit Analysis Credits: 4 hours
- GPS 5100 - Printability Analysis Credits: 3 hours
- IEE 3100 - Engineering Economy Credits: 3 hours
- (Another course in IEE, MGMT, or COM can be substituted for IEE 3100 with approval of the advisor.)
- ME 2560 - Statics Credits: 3 hours
- STAT 5870 - Statistical Design and Analysis of Experiments Credits: 3 hours
- Preferred Elective

Emphasis in Environmental Engineering and Sustainable Processes (16 hours minimum)

Required Electives (3 hours)
- CHEG 4440 - Energy Management Engineering Credits: 3 hours

Elective Courses (choose 13 hours minimum):
- CHP 3100 - Work Experience/Co-op Credits: 1 hour
- PAPR 3551 - Wastewater Treatment Systems Credits: 3 hours
- PAPR 2420 - Coating Credits: 4 hours
- ECON 3190 - Environmental Economics Credits: 3 hours
- BIOS 2320 - Microbiology and Infectious Diseases Credits: 4 hours
- CHEG 3200 - Chemical Engineering Thermodynamics Credits: 3 hours
- CHEG 4100 - Chemical Reaction Engineering Credits: 3 hours
- CHEG 5200 - Renewable Energy and Energy Storage Credits: 3 hours
- CHEG 5250 - Sustainable Earth Resources Engineering Credits: 3 hours
- CHEM 2250 - Quantitative Analysis Credits: 3 hours
- CHEM 2280 - Quantitative Analysis Laboratory Credits: 1 hour
- CHEM 3550 - Introductory Biochemistry Credits: 3 hours
- CHEM 3560 - Introductory Biochemistry Laboratory Credits: 1 hour
- IEE 3100 - Engineering Economy Credits: 3 hours