

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

DEPARTMENT: CHP

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: Chemical Engineering Major, CHEGJ

Chair, Department Curriculum Committee: 	Date 09/16/2020
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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: 	Date 23/09/20
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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.

Chair, College Curriculum Committee:	Date
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1. Explain briefly and clearly the proposed improvement:

Revise the Additional Cognates course list of the Chemical 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 Chemical Engineering majors.

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 core courses, and the need to improve scheduling flexibility for the Chemistry and Chemical Engineering undergraduate programs.

CURRENT CATALOG COPY

Accredited by the Engineering Accreditation Commission of ABET, 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: graduates are expected to attain: proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression or job advancement.
2. Professional Development: graduates are expected to attain: pursuit of additional educational activities, professional certifications or leadership opportunities.
3. Service: graduates are expected to have involvement in the local community, professional societies, K-12 education, industry or humanitarian endeavors.
4. Innovation and entrepreneurship: graduates are expected to attain: expertise in problem solving, new process, or methods development, in device or patent creation or in founding a business.

(For up-to-date educational objectives and learning outcomes, see the program's web page at wmich.edu/chemical-paper/chem-engineering-accreditation)

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.

WMU Essential Studies Program Requirements

Students who have chosen the Chemical Engineering curriculum will satisfy the WMU Essential Studies Program Requirements as outlined within the course listings below. To satisfy these requirements student take courses in twelve (12) categories. Six (6) of the courses are designated within the Chemical 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 CHEH 4870: 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 (Chemical) degree 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 "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 credit hours, which includes the courses in one the Emphasis Areas presented below at the end of the 8-semester example schedule. One emphasis area must be selected 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. No minor required.

- [PHYS 2070 - University Physics II](#) **Credits: 4 hours**
- [PHYS 2080 - University Physics II Laboratory](#) **Credits: 1 hour**
- [BIOS 1610 - Molecular and Cellular Biology](#) **Credits: 4 hours**
- [MATH 3740 - Differential Equations and Linear Algebra](#) **Credits: 4 hours**
- [CHEM 4300 - Physical Chemistry I](#) **Credits: 3 hours**
- [ECON 2010 - Principles of Microeconomics](#) **Credits: 3 hours**
- [CHEM 3750 - Organic Chemistry I](#) **Credits: 3 hours**
- [CHEM 3760 - Organic Chemistry Lab I](#) **Credits: 1 hour**
- [CHEM 3770 - Organic Chemistry II](#) **Credits: 3 hours**
- [CHEM 3780 - Organic Chemistry Lab II](#) **Credits: 1 hour**
- [CHEG 3550 - Bioprocess Engineering](#) **Credits: 3 hours**
- [CHEG 4100 - Chemical Reaction Engineering](#) **Credits: 3 hours**

Emphasis Areas

Emphasis in Energy Management (17 hours minimum)

Required Courses (3 credit hours)

- [CHEG 4440 - Energy Management Engineering](#) **Credits: 3 hours**

Elective Courses (choose 14 hours minimum)

- [CHEG 5200 - Renewable Energy and Energy Storage](#) **Credits: 3 hours**
- [CHEG 5250 - Sustainable Earth Resources Engineering](#) **Credits: 3 hours**
- [CHEG 5950 - Topics in Chemical Engineering](#) **Credits: 1 to 3 hours**
- [CHP 3100 - Work Experience/Co-op](#) **Credits: 1 hour**
- [ECE 2100 - Circuit Analysis](#) **Credits: 4 hours**
- [ECE 2110 - Machines and Electronic Circuits](#) **Credits: 3 hours**
- [EDMM 1420 - Engineering Graphics](#) **Credits: 3 hours**
- [ME 4320 - Thermodynamics II](#) **Credits: 3 hours**
- [ME 4330 - Environmental Systems Design in Buildings](#) **Credits: 3 hours**
- [ME 4390 - Design of Thermal Systems](#) **Credits: 3 hours**

Emphasis in Life Sciences (17 hours minimum)

Including at least one 3000-level course (not including CHP 3100):

- [BIOS 1620 - Ecology and Evolution](#) **Credits: 4 hours**
- [BIOS 2110 - Human Anatomy](#) **Credits: 4 hours**
- [BIOS 2320 - Microbiology and Infectious Diseases](#) **Credits: 4 hours**
- [BIOS 2400 - Human Physiology](#) **Credits: 4 hours**
- [BIOS 2500 - Genetics](#) **Credits: 4 hours**
- [BIOS 3500 - Human Physiology for Majors](#) **Credits: 5 hours**
- [BIOS 5310 - Biology of Aging](#) **Credits: 3 hours**
- [BIOS 5610 - Pharmacology](#) **Credits: 3 hours**
- [BIOS 5970 - Topics in Biological Sciences](#) **Credits: 3 to 4 hours**
- [CHEG 5100 - Medical and Biomolecular Engineering Concepts](#) **Credits: 3 hours**
- [CHEG 5950 - Topics in Chemical Engineering](#) **Credits: 1 to 3 hours**
- [CHEM 3550 - Introductory Biochemistry](#) **Credits: 3 hours**

- [MATH 1700 - Calculus I, Science and Engineering](#) **Credits: 4 hours**
- (Satisfies WMU Essential Studies Level 1: Foundations – Quantitative Literacy Category)

Second Semester (18 hours)

The following courses are pre-engineering requirements:

- WMU Essential Studies Level 2: Exploration and Discovery – Artistic Theory and Practice Category 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**
- [PHYS 2050 - University Physics I](#) **Credits: 4 hours**
- (Satisfies WMU Essential Studies Level 2: Exploration and Discovery – Scientific Literacy with Lab Category)
- [PHYS 2060 - University Physics I Laboratory](#) **Credits: 1 hour**
- (Satisfies WMU Essential Studies Level 2: Exploration and Discovery – Scientific Literacy with Lab Category)

Third Semester (17 hours)

- Emphasis Elective **Credits: 4 hours**
- [CHEG 2810 - Data Acquisition and Handling](#) **Credits: 1 hour**
- Pre-engineering requirement
- [IEE 2610 - Engineering Statistics](#) **Credits: 3 hours**
- (Satisfies WMU Essential Studies Level 1: Foundations – Oral and Digital Communication Category)
- [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**

Fourth Semester (19 hours)

- Emphasis Elective **Credits: 4 hours**
- [BIOS 1610 - Molecular and Cellular Biology](#) **Credits: 4 hours**
- [CHEG 2611 - Environmental Engineering I](#) **Credits: 3 hours**
- (Satisfies WMU Essential Studies Level 2: Exploration and Discovery – Science and Technology Category)
- [CHEG 2960 - Material and Energy Balance](#) **Credits: 4 hours**
- [MATH 3740 - Differential Equations and Linear Algebra](#) **Credits: 4 hours**

Fifth Semester (16 hours)

- WMU Essential Studies Level 2: Exploration and Discovery – Personal Wellness Category Course Elective **Credits: 3 hours**
- WMU Essential Studies Level 2: Exploration and Discovery – World Language and Culture Category **Credits: 3 hours**
- [CHEG 3110 - Unit Operations in Chemical Engineering I](#) **Credits: 3 hours**

PROPOSED CATALOG COPY

Accredited by the Engineering Accreditation Commission of ABET, 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: graduates are expected to attain: proficiency in current position, increasing responsibility, diversity of job functions, recognition, progression or job advancement.
2. Professional Development: graduates are expected to attain: pursuit of additional educational activities professional certifications or leadership opportunities.
3. Service. graduates are expected to have involvement in the local community, professional societies, K-12 education, industry or humanitarian endeavors.
4. Innovation and entrepreneurship: graduates are expected to attain: expertise in problem solving, new process, or methods development, in device or patent creation or in founding a business.

(For up-to-date educational objectives and learning outcomes, see the program's web page at wmich.edu/chemical-paper/chem-engineering-accreditation)

Admission

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4. No minor required.

Major courses (33 hours)

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 - [CHEG 3200 - Chemical Engineering Thermodynamics](#) **Credits: 3 hours**