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: Chemical and Paper Engineering
PROPOSED EFFECTIVE FALL YEAR: 2020

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

Title of degree, curriculum, major, minor, concentration, or certificate: Ph.D. in Chemical Engineering

Chair, Department Curriculum Committee: [Signature] Date 10/21/19

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 10/21/19

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.

Chair, College Curriculum Committee: [Signature] Date

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

Dean: ____________________________ Date: ____________________________

FOR PROPOSALS REQUIRING REVIEW BY:
GSC/USC; EPGC, GRADUATE COLLEGE, and/or FACULTY SENATE EXECUTIVE BOARD

☐ Return to Dean
☐ Forward to: Curriculum Manager: ____________________________ Date: ____________________________
☐ Approve ☐ Disapprove *needs review by Chair, GSC/USC: ____________________________ Date: ____________________________
☐ Approve ☐ Disapprove Chair, EPGC: ____________________________ Date: ____________________________
☐ Approve ☐ Disapprove Graduate College Dean: ____________________________ Date: ____________________________
☐ Approve ☐ Disapprove Faculty Senate President: ____________________________ Date: ____________________________

☐ Approve ☐ Disapprove *needs review by Provost: ____________________________ Date: ____________________________

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NOT FOR USE FOR CURRICULAR COURSE CHANGES
REQUEST FOR PROGRAM IMPROVEMENTS

1. Explain briefly and clearly the proposed improvement:

   It is proposed to create a new program, Ph.D. in Chemical Engineering, to be in the Department of Chemical and Paper Engineering.

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

   There is currently not a Ph.D. in Chemical Engineering program at Western Michigan University. The college-wide Ph.D. in Engineering and Applied Sciences with an emphasis in Engineering is almost completely used for students who would like a Ph.D. focused in chemical engineering. This change would assist current WMU faculty with a research focus in chemical engineering to obtain research funding from major granting agencies, who are looking to fund universities and PIs with Ph.D. programs in their area of funding. Additionally, this program would also allow for better recruitment of Ph.D. students who would like a degree in chemical engineering. Finally, this would also assist in recruiting the best faculty to WMU with a research focus in chemical engineering.

   Adding a Ph.D. in Chemical Engineering program would offer several pleiotropic effects, complementing other elements in Western Michigan University, as well as other local institutions. Several local biotechnology companies, especially in the pharmaceutical industry, offer excellent support for chemical engineering research, including Pfizer, Stryker, Zoetis, and Perrigo, among others. These companies also have hired several of our students, both at the undergraduate and graduate levels. This research in chemical engineering will also offer support to other WMU efforts, including those in medical engineering, as well as strengthening ties with WMU Research, Bronson, and Borgess.

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.

   Strengthening research in chemical engineering will also strengthen other graduate programs in Western Michigan, including biomedical sciences, chemistry, and fellow engineering programs. Additionally, this program would also complementarily work with future programs in biomedical engineering.

   There is a great need to increase research productivity in chemical engineering in order to strengthen ties with local and national industry and improve prestige of WMU. Strength in chemical engineering research will allow for greater advances into medical research and associated funding opportunities, including the NIH and other agencies, such as the American Heart Association, the American Diabetes Association, the American Cancer Society, the Alzheimer’s Foundation, and several other organizations. Furthermore, this research will allow for better recruitment of faculty and Ph.D. students who will be able to take a lead in working with additional local companies including Kalsec, Kellogg, and Amway, while complementing our paper engineering programs and ties with the paper industry, including the Paper Technology Foundation, USG Otsego, and Graphic Packaging International.

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

   Addition of a Ph.D. in Chemical Engineering will allow for improved recruitment of Ph.D. students who would prefer a Ph.D. in Chemical Engineering. This change may also allow for greater retention of current WMU Masters students in Chemical Engineering to remain and earn a Ph.D.

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

   This change would allow for improvement in research productivity in chemical engineering at WMU.

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 change.

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?

   There is a potential increase in enrollment with the addition of a Ph.D. in Chemical Engineering.

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

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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.)

No change.

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.

See attached assessment plan for graduate programs in the Department of Chemical and Paper Engineering.

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.

Not applicable.

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.

Not applicable.

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.

Not applicable.

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Ph.D. in Engineering and Applied Sciences
Western Michigan University's Ph.D. in engineering and applied sciences is offered in two tracks: (1) Engineering and (2) Applied Sciences. In addition to the university minimum Ph.D. requirements for admission as outlined in the graduate catalog, all applicants are expected to meet the following minimum requirements for admission to the Ph.D. in engineering and applied sciences:

1. The student must contact a faculty member who agrees to champion the application and who will serve as the chair of the Ph.D. dissertation committee.
2. A minimum of a bachelor's degree (master's preferred) from an accredited institution:
   - In an engineering discipline relevant to the intended field of study as determined by the Ph.D. champion is required for admission to the engineering track, or
   - In applied sciences, or a closely related discipline, relevant to the intended field of study as determined by the Ph.D. champion is required for admission to the applied sciences track.
3. Two official transcripts from each institution attended since high school.
4. An overall minimum grade point average of 3.25.
5. The general GRE test scores.
6. Statement of purpose describing the applicant's research interests and professional goals and three letters of recommendation.
7. The admission process is competitive and is administered by the department of the champion.

ADMISSION POLICY
A student who has been dismissed from another Ph.D. program in the College of Engineering and Applied Sciences is not immediately admissible in the Ph.D. in engineering and applied sciences program. There will be a waiting period of five years after which the student can apply for this program with a set of improved credentials.

Program requirements
In addition to the minimum university requirements listed in the graduate catalog, the following must be fulfilled for the Ph.D. in engineering and applied sciences program:

1. Minimum Credit Hours: The majority of courses taken at Western Michigan University must be from the college.
   a. Students admitted after bachelor's degree: A minimum of 60 graduate-level credit hours, excluding the dissertation, beyond the bachelor's is required, of which 30 hours must be at Western Michigan University in an approved program of study. No more than 15 credit hours can be at the 5000 level and at least 30 credit hours of regularly offered courses, excluding independent study, independent research, seminars, doctoral research, professional field experience and internship courses.
   b. Students admitted after master's degree: A minimum of 30 graduate-level credit hours, excluding the dissertation, beyond the master's is required at Western Michigan University in an approved program of study.
2. Program of Study: A program of study in the student's field of interest must be completed in the first year of enrollment. This program of study is uniquely
defined and approved by the Ph.D. committee chair, the student, the
department chair of the Ph.D committee chair, the dean of CEAS or the
designee, and the dean of the Graduate College. The exact distribution of
courses, seminars, and research will depend upon the student's major and may
vary from one student to another. Each student is required to complete a
dissertation. Any subsequent changes in the Program of Study must be approved
by the student's advisor and a new Program of Study must be submitted to the
dean of the Graduate College for approval.

3. Doctoral Dissertation: 15 credit hours of Doctoral Dissertation (ENGR 7300 or
similar) are required.

4. Research Tools: Two appropriate research tools courses are required. Such
research tools may include, but are not limited to, statistics, numerical analysis,
research methodology and computer programming. These are determined by
the Ph.D. committee chair and the student.

5. Candidacy and Examination Requirements: Passing the following three
examinations in the intended specialty area is required. These exams are
designed and administered by the Qualifying Exam Committee.

a. Qualifying Exam: Before admission to candidacy for the doctoral degree, the student must
pass a written and oral qualifying examination. The exam must be completed before the
completion of 45 credit hours for students admitted after bachelor's degree, and before the
completion of 15 credit hours for students admitted after master's degree.
This exam covers the student's competence in their field of specialization (i.e., structural
engineering, transportation engineering, or construction engineering). The qualifying exam is
administered by the student's advisor and the Qualifying Exam Committee. The performance of
the student in the qualifying exam is used by the committee to determine competence of the
student to continue in the doctoral program. The Qualifying Exam Committee can directly find
the student competent to continue in the program or the committee can suggest additional
course work and modifications to the original Plan of Work.

b. Comprehensive Exam: Each doctoral candidate must obtain approval from his or her
dissertation committee for a dissertation topic and research plan through the comprehensive
exam. The exam requires a written proposal and oral presentation, and is typically taken near
the end of the course work outlined in the doctoral program of study. The comprehensive exam
must be completed within one year after passing the qualifying exam. Upon passing the
comprehensive exam, the student is advanced to the Ph.D. candidate status.

c. Dissertation Defense: The defense takes place at the conclusion of the dissertation research
with the approval of the committee. Upon a successful defense outcome, as determined by the
dissertation, the student earns the Ph.D in engineering and applied sciences degree.
If a student fails any of the above exams, the student can apply to retake the exam in the next
semester. A second failure will result in dismissal from the program.

**Doctoral dissertation committee**
A doctoral dissertation committee shall be appointed for each student during the first year of
enrollment. The purpose of the dissertation committee is:

1. Develop, with the student, the program of study for the intended specialty field under
the Ph.D. in engineering and applied sciences program.
2. Design and administer the required Ph.D. examinations.
3. Provide the technical guidance to the student during the dissertation portion of the doctoral program.
4. The doctoral dissertation committee shall consist of at least three members of the graduate faculty, including the chair of the Ph.D committee. Additional members of the committee must be either members or associate members of the graduate faculty.

View more information on the Ph.D. in engineering in the Graduate Catalog.

To apply you need:
1. Application International admissions, Resident (Select Ph.D. in engineering and applied sciences: Engineering Track Option)
2. English test scores for international students only

Contact
Dr. Andy Kline
Email: andrew.kline@wmich.edu
Ph.D. in Engineering

Qualifying Exams

Department of Chemical and Paper Engineering (ChP)
4601 Campus Drive, A-217 Parkview
Western Michigan University
Kalamazoo, MI 49008-5462

The following are the qualifying exams for students pursuing a PhD in Engineering in the Department of Chemical and Paper Engineering.

Effective date is for students with initial enrollment in the doctoral program as of the Spring 2018 semester. This document has been approved by a vote of the ChP Graduate Faculty at the xxx faculty meeting.

All students seeking a doctoral degree in engineering from Western Michigan University (WMU) must successfully complete the Level I and Level II qualifying exams.

Level I Qualifying Exam: Written Exam

This written exam will test a doctoral student’s general knowledge of chemical or paper engineering, based on the required graduate courses that have been taken. This exam will include information and topics related to required topic areas:

1. Transport Phenomena
2. Chemical Reaction Engineering
3. Thermodynamics

Students may elect to substitute subject areas for the three required exams by petitioning to the Graduate Advisor by November 1st. Generally, these requests will only be granted if the student was unable to take classes in these areas due to class offerings.

Students must successfully complete the Level I qualifying exam by the end of their third semester of enrollment in the doctoral program. Students currently enrolled in the master’s degree program may take the Level I qualifying exam if they so desire. Successfully completing the Level I qualifying exam while enrolled as a master’s candidate would fulfill the Level I qualifying exam requirement if the student enrolls in the doctoral program after completing the master’s degree.

Students that do not successfully pass the Level I qualifying exam after two attempts will be removed from the doctoral degree program.
Structure and Grading of the Level I Qualifying Exam

1. Students will be provided with a list of topic areas and recommended texts or reading materials during Fall semester graduate student orientation sessions.

2. The Level I qualifying exam will be prepared by graduate faculty members from the ChP department, as organized by the chair of the department graduate committee.

3. The Level I qualifying exam will be administered in three parts, one part to be completed in each 2-hour exam period.

4. The Level I qualifying exam will be held the second week of the Summer I session, as defined by the University calendar.

5. The graduate committee will work with students taking the Level I qualifying exam to schedule exam time periods. All students will take the same exam during each of the three examination periods.

6. Students taking the Level I qualifying exam will be assigned a number by the chair of the department graduate committee, and will use that number in place of their name when submitting their exam solutions. Other than informing the ChP department faculty which students are taking the Level I qualifying exam, the chair of the department graduate committee will not reveal the identity of any student until after the Level I qualifying exam is graded.

7. The faculty member writing a topic area exam will grade each of the exams.

8. A score of 70% in each of the three topic area exams is required to pass the Level I qualifying exam.

9. Students not achieving a score of 70% in one or more of the three topic areas must retake an examination only in those topic areas where a score of 70% was not achieved.

10. Students that do not successfully complete the Level I qualifying exam during the second week of the Summer I session may retake the exam during the first week of the Summer II session, as defined by the University calendar. The exam(s) may be modified for the exam retake. If the student chooses to wait until the following Summer I Level I qualifying exam time period, the student will not receive any funding during that academic year from general University funds (Fund 11 sources). The student may still be offered funding from a research contract administered by a faculty member.

11. Students will receive written notice from the department graduate committee within one month of their completion of the three topic area exams, as to whether or not they have successfully completed the Level I qualifying exam.

12. Graduate students who wish to be eligible to receive general University funds (Fund 11 sources) during the fourth semester of their doctoral program must successfully complete all four topic area exams by the end of their third semester of enrollment in the PhD program (see item 10).
Level II Qualifying Exam: Oral Defense of Dissertation Research Proposal, Research Topic Area, and Graduate-level Topics

The Level II qualifier will be an oral defense on the proposed dissertation research topic area, the dissertation proposal itself, and questions on graduate-level course materials. During this Level II qualifying exam, the students will demonstrate through oral discussion that they possess an acceptable knowledge of their area of chosen research and other graduate-level topics, in addition to defending their dissertation proposal.

1. The Level II qualifying exam will consist of a 40-60-minute oral presentation by the student on the dissertation proposal topic, followed by questions from the general public.

2. After completing the public session, the student and the student’s dissertation advisory committee will initiate a closed session for general questions from the committee on the student’s research topic area, additional questions on the dissertation proposal itself, and questions on graduate-level course material. Any member of the graduate faculty may participate in the closed session discussion.

3. The Level II qualifying exam will not exceed 2-hours in length, including the presentation by the student, public questions, and the closed session.

4. The student’s dissertation advisory committee will decide whether the student has passed or failed the Level II qualifying exam.

5. Students have two attempts to successfully complete the Level II qualifying exam. Students must complete the Level II qualifying exam within twelve calendar months of their successful completion of the Level I qualifying exam or present a compelling reason for the need of an extension to their dissertation committee who may appeal to the graduate committee to grant an extension.

6. Students are responsible for working with their dissertation advisory committee to set a schedule and test dates for meeting the deadline for successfully completing the Level II qualifying exam.

7. Students must complete the Level II qualifying exam within two attempts and within the specified time limit or they will be removed from the doctoral program.

Appeals of Results for Level I and Level II Qualifying Exams

All appeals of the results from the Level I and Level II qualifying exams are to be made to the department chair. The department chair will then review the results of the Level I and Level II qualifying exams, and determine a remedy, if any is warranted.