Chemical Engineering

Degrees Offered

• Masters of Science, Chemical Engineering (M.S.Ch.E.)
• Doctor of Philosophy, Chemical Engineering (Ph.D.)

Degree Programs

The department is authorized to admit students to the following degree programs: master's of science in chemical engineering (M.S. Ch.E.), master's of science in engineering (M.S.E.), and doctor of philosophy (Ph.D.). A problem report option is also available as an alternative to the traditional research based master's degree. Students in these programs must comply with the rules and regulations as presented in the general requirements for graduate work in the college and in the Department of Chemical and Biomedical Engineering. Students interested in pursuing work for a master’s or doctoral degree in chemical engineering should contact the department for copies of the required guidelines and application information.

Program Outcomes

Holders of graduate degrees will understand the advanced principles of chemical engineering, which include reaction engineering, transport phenomena, and thermodynamics.

• Holders of graduate degrees will have an expert-level understanding of the background and theory/principles of their research topics.
• Holders of Ph.D. degrees will be able to initiate research ideas in order to solve specific problems and to write research proposals on these ideas.
• Holders of Ph.D. degrees will have furthered a novel research idea.
• Holders of graduate degrees will be able to plan research projects, to perform the tasks, and to draw conclusions based on sound scientific and engineering principles.
• Holders of graduate degrees will be able to write technical articles for publication in refereed journals and to make oral and poster presentations at technical meetings.
• Holders of graduate degrees will demonstrate initiative in research planning and management, including safety and environmental issues.
• Holders of graduate degrees will be technically prepared for a lifetime of continuing education.
• Holders of graduate degrees will understand professional and ethical responsibilities.

Chemical Engineering Masters and Doctoral Admissions Requirements

All applicants for Chemical Engineering Masters and Doctoral Programs must satisfy the following criteria to qualify for admission.

• A minimum cumulative grade point average of 3.0, or equivalent, (on a 4.0 scale) in all previous college work.
• Three letters of reference.
• A personal statement.
• International students must demonstrate proficiency in communicating in English (a minimum TOEFL score of 550, or iBT score of 79, or IELTS score of 6.5).
• International students must provide Graduate Record Examination scores. (This is recommended for all students and may be required of some students to assist in judging their chances for success in the program.)
• A baccalaureate degrees in chemical engineering, other engineering fields, mathematics, or basic sciences.

Chemical Engineering Masters and Doctoral Degree Programs

Students holding a baccalaureate degree in chemical engineering are eligible for the Master of Science in Chemical Engineering (M.S.Ch.E.) Program.

• Students not holding a baccalaureate degree in chemical engineering are eligible for the Masters of Science in Engineering (M.S.E.) Program. These students must take an additional nine hours of junior level course work in the first two semesters. Alternatively, students taking a total of 18 hours at junior level in the first two semesters are eligible for the M.S.Ch.E. Program. Admitted students will receive a letter specifying the course work required in the first two semesters.
• Admission to the Ph.D. Program is open to all qualified students. Generally, students without a B.S. or M.S. in chemical engineering are not admitted directly to the Ph.D. Program.
• A maximum of twelve semester hours from other institutions may be accepted at WVU for credit toward either the masters or doctoral degrees.
To remain in good standing, a regular student must achieve and maintain a minimum overall 3.0 GPA in all graduate level courses as well as in all junior level courses.

Curriculum in Master of Science in Chemical Engineering

A candidate for the M.S. degree in chemical engineering must comply with the rules and regulations as outlined in the WVU Graduate Catalog and the specific requirements of the Statler College and the Chemical Engineering Department.

Program Requirements

All M.S. degree candidates are required to perform research and follow a planned program of study. The student’s research advisor, in conjunction with the student’s Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student’s needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

Curriculum Requirements

A minimum GPA of 3.0 is required in all courses

Course Requirements

A minimum of 60% of courses must be from 500 level or above
A grade of C or higher must be earned in all required courses

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHE 615</td>
<td>Transport Phenomena</td>
<td>3</td>
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<tr>
<td>CHE 620</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHE 625</td>
<td>Chemical Reaction Engineering</td>
<td>3</td>
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Full-time Students are required to take a Seminar course each semester

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHE 796</td>
<td>Graduate Seminar</td>
<td>4-10</td>
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</table>

Select courses from the following based on degree path:

Any BIOM, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PHGE, PHYS, SAFM, SENG, or STAT courses 400-799

Complete 1 of the following options:

<table>
<thead>
<tr>
<th>Option</th>
<th>Credits</th>
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<tr>
<td>Thesis Option - 6 hours</td>
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<tr>
<td>Problem Report Option - 9 hours</td>
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Students who do not hold a baccalaureate degree in chemical engineering are required to take a set of undergraduate chemical engineering courses above and beyond the minimum coursework requirements.

For students without a B.S.Ch.E., the junior level courses may include: CHE 310, CHE 311, CHE 312, CHE 315, CHE 320, and CHE 325.
M.S.E. students take only CHE 315, CHE 320, and CHE 325.

EXAMINATION

M.S. students following the thesis or problem report option must prepare a written research proposal and oral presentation. The proposal must be approved by the student’s AEC at least one semester prior to the final oral examination. This oral defense is administered by the student’s AEC and must be completed by the end of the second semester after the student begins his/her research.

All students, regardless of option, are required to pass a final oral or written examination, administered by their AEC, covering the thesis or problem report and/or related course material.
Suggested Plan of Study

The plan below illustrates the Thesis Option. For students with a B.S.Ch.E., twenty-four months are typically required to complete the M.S.Ch.E. degree work. For students without a B.S.Ch.E., the time to complete the M.S.Ch.E. is typically thirty-six months, while the time to complete the M.S.E. is typically thirty months.

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical M.S.Ch.E degree program that completes degree requirements in two years is as follows.

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<th>First Year</th>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
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<tr>
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<td>CHE 620</td>
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<td>Additional Course</td>
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<th>Second Year</th>
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<th>Hours</th>
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<td>CHE 697</td>
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Total credit hours: 40

Curriculum in Doctor of Philosophy – Chemical Engineering

A candidate for the Ph.D. degree with a major in chemical engineering must comply with the rules and regulations as outlined in the WVU Graduate Catalog and the specific requirements of the Statler College and the Chemical Engineering Department.

Program Requirements

The doctor of philosophy degree with a major in chemical engineering is administered through the college’s interdisciplinary Ph.D. program. The research work for the doctoral dissertation must show a high degree of originality on the part of the student and must constitute an original contribution to the art and science of chemical engineering.

All Ph.D. degree candidates are required to perform research and follow a planned program of study. The student’s research advisor, in conjunction with the student’s Advising and Examining Committee (AEC) will be responsible for determining the plan of study appropriate to the student’s needs. The underlying principle of the planned program is to provide the students with the necessary support to complete their degree and prepare them for their career.

Curriculum Requirements

A minimum GPA of 3.0 is required in all courses exclusive of research credits.
A minimum GPA of 3.0 is required in all CHE courses exclusive of research credits.
A grade of C or higher must be earned in all required courses

Course Requirements

- CHE 615 Transport Phenomena 3
- CHE 620 Thermodynamics 3
- CHE 625 Chemical Reaction Engineering 3

Select from the following based on degree path: 9
- Any BIOM, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 500-799 excluding courses numbered 785, 796, or 797

Full-time Students are required to take one Seminar course each semester
- CHE 796 Graduate Seminar 4-10

Research
- CHE 797 Research 24

Examinations
Students who do not hold a baccalaureate degree in chemical engineering are required to take a set of undergraduate chemical engineering courses above and beyond the minimum coursework requirements.

A minimum of thirty-six hours of coursework and twenty-four hours of independent research beyond a bachelor’s degree, or eighteen hours of coursework and twenty-four hours of independent research beyond an M.S. degree are required.

Students must complete a minimum of nine semester hours of a coherent set of courses taken outside of the department. These courses may be related to the major research area. Non-technical courses are considered only under exceptional circumstances. All courses must be approved by the AEC and the academic advisor.

**Examinations**

**QUALIFYING EXAM**

All Ph.D. students must pass a Ph.D. qualifying examination given in their first year at WVU. This examination is designed to assess the basic competency of students in the chemical engineering field to determine whether or not they have sufficient knowledge to undertake independent research.

**CANDIDACY EXAMINATION**

In order to be admitted to candidacy, the student must pass a candidacy exam, which is designed to evaluate the student’s overall ability to engage in high-level research.

Within a maximum of one semester after passing the PhD qualifying examination or entering the Ph.D. program, whichever is later, a student must successfully defend his/her dissertation research proposal. This proposal is a written document which must be reviewed and accepted by their AEC and subsequently defended in an oral presentation. The research work for the doctoral dissertation should show a high order of originality on the part of the student and must offer an original contribution to the field of engineering science.

A student who has successfully completed all coursework, passed the qualifying examination, and successfully defended the research proposal is defined as one who is a candidate for the Ph.D. degree.

**FINAL EXAMINATION**

At the completion of the dissertation research, candidates must prepare a dissertation and pass the final oral examination (defense) administered by their AEC.

In order to complete the Ph.D. requirements, a student must pass a final oral examination on the results embodied in the dissertation. This examination is open to the public and, in order to evaluate critically the student’s competency, may include testing on material in related fields, as deemed necessary by the AEC. In addition, since the Ph.D. degree is primarily a research degree that embodies the results of an original research proposal and represents a significant contribution to scientific literature, the student must submit a manuscript on this research to the AEC.

**Suggested Plan of Study**

It is important for students to take courses in the order specified as much as possible; all prerequisites and concurrent requirements must be observed. A typical doctoral degree program that completes degree requirements in three years is as follows.

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<td><strong>Total</strong></td>
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Major Learning Outcomes

CHEMICAL ENGINEERING

Upon graduation, Chemical Engineering students will have:

• Understanding of advanced principles of chemical engineering, which include reaction engineering, transport phenomena, and thermodynamics.
• Expert-level understanding of the background and theory/principles of their research topics.
• Ability to plan research projects, to perform the tasks, and to draw conclusions based on sound scientific and engineering principles.
• Ability to write technical articles for publication in refereed journals and to make oral and poster presentations at technical meetings.
• Demonstrated initiative in research planning and management, including safety and environmental issues.
• Been technically prepared for a lifetime of continuing education.
• Understanding of professional and ethical responsibilities.