

# Chemical Engineering, Ph.D.

## 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 and Biomedical 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. Research performed 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 (BS-PhD Pathway)

Code	Title	Hours
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		
<b>Course Requirements <sup>+</sup></b>		
CHE 531	Mathematical Methods in Chemical Engineering	3
CHE 615	Transport Phenomena	3
CHE 620	Thermodynamics	3
CHE 625	Chemical Reaction Engineering	3
Electives: <sup>++</sup>		18
CHE (500-795) Elective Courses (9 credit hours)		
General Elective Courses (9 credit hours)		
Seminar		
CHE 786	Professional Development Seminar for Chemical and Biomedical Engineering <sup>+++</sup>	
Research		24
CHE 797	Research	
<b>Examinations</b>		
Plan of Study		
Qualifying Examination		
Candidacy Examination		
Final Examination		
Dissertation		
Total Hours		54

### GENERAL ELECTIVES <sup>++</sup>

Code	Title	Hours
Any CHE Elective Course		
Any BIOM, BMEG, CE, CHEM, CPE, CS, EE, EMGT, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 500-795, as approved by the student's AEC (excluding courses numbered 785, 786, 796, or 797)		

<sup>+</sup>

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

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Students must complete a minimum of nine semester hours of a coherent set of courses in an area 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.

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Full-time Students are required to take one Seminar course each semester

## Curriculum Requirements (MS-PhD Pathway)

Code	Title	Hours
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		
<b>Course Requirements *</b>		
Electives: **		18
CHE (500-795) Elective Courses (9 credit hours)		
General Elective Courses (9 credit hours)		
Seminar ***		
CHE 786	Professional Development Seminar for Chemical and Biomedical Engineering	
Research		24
CHE 797	Research	
<b>Examinations</b>		
Plan of Study		
Qualifying Examination		
Candidacy Examination		
Final Examination		
Dissertation		
Total Hours		42

## GENERAL ELECTIVES \*\*

Code	Title	Hours
Any CHE elective course		
Any BIOM, BMEG, CE, CHEM, CPE, CS, EE, EMGT, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, or STAT courses 500-795, as approved by the student's AEC (excluding courses numbered 785, 786, 796, or 797)		

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

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Students must complete a minimum of nine semester hours of a coherent set of courses in an area 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.

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Full-time Students are required to take one Seminar course each semester

## 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 should 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.

## **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.