

**DEPARTMENT OF CHEMICAL ENGINEERING
WEST VIRGINIA UNIVERSITY**

GUIDE TO GRADUATE STUDY FOR MSCHE AND MSE DEGREES

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I. GENERAL ADMISSION REQUIREMENTS

Students holding baccalaureate degrees in Chemical Engineering, other engineering fields, mathematics, or basic sciences are eligible for admission to the Master of Science in Chemical Engineering (MSChE) program. Students not holding a BSChE will be required to take a series of junior-level courses. Student not holding a BSChE also have the option of obtaining a Master of Science in Engineering (MSE). The MSE requires fewer junior-level courses and enables students to begin their research within the first semester. A maximum of twelve (12) semester hours from other institutions may be accepted at WVU for credit toward the Master's degree. Forms for transfer of credit are available online at the URL given in Section XII. The Chemical Engineering Department may require Graduate Record Examination (GRE) scores or other evidence to assist in judging a student's chances for success in a graduate program.

A full-time student is defined as a student taking 9-15 graduate credits per semester. A full-time Teaching or Research Assistant usually registers for 13 course credits including research and seminar each semester, unless special permission to the contrary is received from the Academic Advisor. The Academic Advisor will indicate the appropriate course load of any non-degree or part-time student. The course selection must be approved by the Academic Advisor at all registrations. For further information on general requirements, see the CEMR Guidelines for graduate degree programs.

A. Regular Admission

To be eligible for admission as a regular student, an applicant must have a baccalaureate degree as specified above and a grade point average (GPA) of 3.0 (on a basis of A = 4.0) in all previous college work. Students entering the program without a BSChE will receive a letter specifying the additional course work which they must take in the first two semesters.

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. A full-time student failing to achieve or maintain this standard will be placed on probation. In addition, a regular student who obtains grades of D or F in one-half or more of the course work during any enrollment period will be suspended from the college for one semester.

B. Provisional Admission

Graduates whose scholastic records are below the standards for admission to full graduate standing (3.0/4.0 GPA) may be admitted *provisionally* in certain special cases, at the discretion of the Department Chair or Graduate Admissions Committee. These students must attain a 3.0 GPA, within the first 18 hours attempted. Failure to meet the provisions as stated in the letter of admission, or failure to attain a 3.0 GPA, will result in suspension from the college for one semester. Students who meet the requirements will be reclassified as regular students and the regulations governing good standing for regular students will apply. Such students should ensure that the appropriate form (available online – see section XII) is processed by the Academic Advisor by the end of the semester in which the 18th hour is attempted. Failure to change status may result in the student being restricted from subsequent registration.

C. Probation and Suspension

A regular graduate student failing to achieve or maintain the standards for graduate status will be placed on probation, and must achieve a 3.0 cumulative GPA by the end of the next regular enrollment period at WVU. A probationary graduate student who cannot attain the required average, or a regular graduate student who obtains grades of D or F in more than one-half of the course work, will be suspended from the College for one semester. A provisional student who cannot attain the required average and provisions specified in the admission letter will also be suspended from the College for one semester.

A graduate student suspended from the college can apply for reinstatement only by direct petition to the Dean. A suspended graduate student may be readmitted only once and must achieve a GPA of 3.0 or better in each semester following readmission until a cumulative 3.0 GPA is reached.

II. FINANCIAL AID AVAILABLE

Financial support for graduate students in the Chemical Engineering program is available from the sources listed below.

Research Assistantships. Appointments are usually available for the student to participate in particular research projects which may often serve as thesis research topics. A tuition scholarship is usually included. During the academic year, the Research Assistant devotes nominally one-half of his/her weekly effort to the research project to which he/she has been assigned. More time is expected to be devoted to research during the summer.

Teaching Assistantships. Teaching Assistantships may be available to qualified individuals. During the academic year, the student is expected to devote half-time to assisting a faculty member in courses. This is in addition to the time spent on research for the graduate degree.

Fellowships. These are special forms of financial aid which are sponsored by industry or government agencies. Fellowships may be granted for support of specified research, or private donations may be unrestricted.

III. FINANCIAL SUPPORT POLICY

It is the intention of the Department to support students receiving aid so long as they continue to demonstrate satisfactory academic performance and progress. Supported students must complete work assignments in a satisfactory manner, as judged by the faculty. However, this general statement of intent is subject to the following specific regulations adopted by the faculty:

1. Students supported are required to register for at least 13 hours, including Research (ChE 697) and excluding Seminar (ChE 796). Students are required to take 3 courses in each of their first two semesters.
2. It is understood that any suspension from the Graduate Program also involves loss of financial support.
3. Full-time students usually take 18 months to complete the course requirements, but will not be supported beyond two years in residence or the completion of the degree requirements, whichever occurs first. Only students who have successfully petitioned the faculty will be permitted to continue beyond 2 years.

A student may, at any time, with the approval of the Research Advisor, request an exception to these provisions by submitting a written petition to the Academic Advisor indicating reasons why he/she believes the circumstances are exceptional. The final decision on such provisions will be made by the entire faculty.

Students should recognize that the awarding of financial aid, either as a continuation of previous support or as a new award, is subject to the availability of funds and any restrictions which may apply.

Finally, it should be recognized that Departmental decisions on financial aid are based on consideration of all aspects of each individual situation within the framework of the guidelines indicated above. In the final analysis, the best assurance that a student has regarding continued financial support is to devote his/her best effort towards the completion of degree objectives.

IV. GENERAL CREDIT AND GRADE REQUIREMENTS

At least one full year of graduate study, and satisfactory completion of such credits, thesis, and examination requirements as specified by the College and by the Department, are required of candidates for the Master's degree. For further information on general requirements, see the CEMR Guidelines for Graduate Degree Programs.

In order to be awarded the degree of Master of Science, the candidate must complete graduate course work with an overall GPA of 3.0 or better and have a 3.0 GPA in all Chemical Engineering courses, excluding Thesis, Seminar, Readings and Special Project credits. He/she must also satisfactorily complete the Thesis or Problem Report.

All graduate courses taken will count in computing the student's overall GPA. The grade of D or F is not counted toward completion of degree requirements and therefore that course must be retaken. For the course retaken, the second grade only will be used in computing the student's Chemical Engineering GPA. Only in the most exceptional cases will an alternate procedure suitable for the case be permitted, provided such a procedure has the approval of the course instructor, the student's Research Advisor, and the Department Chair.

The grade of "S" carries no grade value and is not used in calculation of the GPA. The grade of "U" carries a zero grade point and is used in the calculation of the GPA. Therefore, the "U" grade would be treated the same as a failure.

Special approval is required by the AEC and the Academic Advisor to count a pass/fail course toward a student's plan of study, and this may be done only if this course is not offered for a letter grade.

V. SPECIFIC COURSE REQUIREMENTS

A minimum of 24 coursework credits (excluding required junior-level courses) in the major and related fields will be required of all candidates for the Master's degree. The following Chemical Engineering courses are required:

1. ChE 531 - Mathematical Methods in Chemical Engineering
2. ChE 615 - Transport Phenomena (3 credits)
3. ChE 620 - Thermodynamics (3 credits)
4. ChE 625 - Chemical Reaction Engineering (3 credits)

ChE 531 and ChE 620 typically are offered in the fall semester while ChE 615 and ChE 625 are offered in the spring semester. All students are also required to take one credit of Chemical Engineering Seminar (on a Satisfactory/Unsatisfactory basis) each semester of full-time residence. Only six credit hours of 400-level courses can count toward completing requirements for the Master's degree. Some suggested courses for graduate level study are given in Appendix A. Suggested schedules for the MSChE with a BSChE, MSChE without a BSChE, and MSE are given in Appendices B, C, and D, respectively.

VI. THESIS/PROBLEM REPORT OPTION

The recommended path to a MSChE or MSE degree is to complete a research-based thesis. All students who are awarded Research Assistantships or Fellowships will be required to take the Thesis option and to follow the guidelines for completion of the Thesis as discussed in the following Sections.

The Problem Report option provides an alternative to the traditional Thesis Master's degree for students who are not on Research Assistantships. Qualified applicants should apply in writing to the Academic Advisor indicating their intent to elect the non-Thesis option program. This should be done within 6 weeks after the beginning of the semester in which they are scheduled to complete 12 credit hours, or the semester after removal of any provisional admission requirements. Students who select this option will be required to use the same guidelines discussed in Section VII below.

To be awarded an MSChE/MSE degree, the Problem Report student must satisfy the following requirements:

1. Complete a minimum of 33 credit hours of graduate course work with a cumulative GPA of 3.0 or better and have a 3.0 average in all Chemical Engineering courses.
2. The total of 36 credit hours must include 3 credit hours of Project work, supervised and evaluated by a Faculty Committee of at least three members. A written Problem Report and an oral exam on that Report approved by that same Committee is required. It is generally understood that a Problem Report is less comprehensive than a Thesis, but is subject to the expectations expressed and agreed to by the student and the Committee.
3. Complete the course requirements specified in Section V.

VII. MAJOR PROFESSOR ASSIGNMENT PROCEDURE

It is expected that students with research assistantships will select funded topics of interest from (at least) three different professors and arrange meetings to discuss each topic on an individual basis. The purpose of such meetings is twofold: (1) it serves to identify areas of mutual interest, and (2) it provides both the professor and student a chance to gauge their respective abilities to collaborate with one another to solve a problem which will constitute the Thesis. This is clearly a matter of utmost importance, hence more than one meeting may be desirable on any one topic. Since the situation can become somewhat competitive, especially for the case of extramurally funded research, it will be necessary for each student to provide the Chair with a list of topics and professors, in priority order. This should be done as soon as possible after the student has thoroughly explored his/her research interests as detailed above, but within 4 weeks after the semester has begun. MSChE candidates fulfilling junior-level course requirements are usually not assigned advisors until their third semester of enrollment.

Students with research assistantships will be notified of their thesis assignments as early as possible but within 5 weeks after the semester begins. The Department will strive to match up students and Research Advisors based upon first choices. In some cases, however, when there is competition for a particular topic, this may not always be feasible.

Graduate students admitted without research assistantships will be required to select a project and Research Advisor during the semester in which they enter (for regularly admitted students) or in which they attain full graduate status (for provisionally admitted students).

VIII. PLAN OF STUDY AND THESIS PROPOSAL

The student, with the help of his/her Research Advisor and Department, will form an Advisory and Examining Committee (AEC) consisting of at least three members, with a designated Chair, as soon as possible after the project is selected. At least two members of the AEC must be members of the Department. A Plan of Study (available online – see section XII) must be jointly prepared and approved by the student, all members of the AEC, Academic Advisor, Department Chair, and the CEMR Dean. This plan must include provisions for a preliminary Thesis or Problem Report proposal. Any revision to this Plan of Study will necessitate preparation and submission of a revised plan which incorporates all the above approval signatures.

The student is required to present a detailed written statement on the proposed Thesis to the AEC. It should outline the work the student proposes to do. The format and length of the written statement should follow the proposal guidelines set forth by the National Science Foundation ([NSF Proposal Guidelines](#)) or another relevant funding agency. The contents of the proposal must include a) a project summary, b) the intellectual merit and broader impacts of the project, c) brief literature review of current research in the field, d) specific statement of objectives for the project, e) a detailed plan of approach to complete the research, f) preliminary results, g) a statement of safety concerns (may not be applicable to all projects), and h) a bibliography. Additional requirements set forth by funding agencies, such as supplemental information and page limits, will be enforced. See Appendix E for more guidance on the information to include in the written statement. Examples of previous proposals can be requested from the Research Advisor, and additional resources for preparing the proposal can also be requested from the Graduate Academic Advisor. The completed proposal is to be submitted to the AEC no less than seven days prior to the oral defense date. Failure to submit in advance will result in a delay of the defense.

During the oral presentation of the Thesis proposal, students will be required to defend the importance of the project and the plan of approach they have proposed. Questions may be asked concerning the proposal and other material in the area of research. When this evaluation is considered satisfactory by the Committee, the proposal is approved and the student is permitted to continue with the thesis project. If the Committee does not approve the statement, it shall be returned to the student for revision and resubmission to the Committee. This proposal process should be completed as early as possible after the student begins graduate work, but not later than the end of the second semester of research activity.

IX. THESIS SUBMISSION AND ACCEPTANCE

Final printed draft copies of the Thesis should be submitted to the AEC not less than four weeks before Commencement. This Committee will evaluate and review the Thesis and, after successful completion of an Oral Exam, will suggest appropriate changes to the Thesis as deemed necessary. The Oral Exam can be scheduled a minimum of one week after the AEC has received the printed draft copies for review. The Thesis is accepted when each of the three or more members of the AEC recommends its acceptance. Should the AEC be composed of more than three members, then only one dissenting vote will be permitted. The final hard-bound copies of the Thesis should be prepared according to the WVU guidelines for theses. ETD Submission Packet (forms and fee) must be submitted to the by the date set each semester by the University. These forms are available online (see section XII). One bound copy also is required for the Research Advisor, one for each member of the AEC, and one for the Department. The costs involved in making copies of the Thesis and in binding these copies are the responsibility of the student. Students should be aware that at least one week is needed for binding copies of the Thesis. Receipts are not acceptable.

X. ORAL EXAMINATION

All candidates for the Master's degree must pass a final Oral Exam no later than 10 days before Commencement. Requests for final exams must be made by the student on the Graduate Final Exam Check-Form (available online – see section XII) at least four weeks before Commencement. Approval by the Dean's Office (which requires at least one week) will be signified by return of the Check-Form to the Research Advisor. No Oral Exam can be given until the Research Advisor receives this signed form from the Dean's Office. Candidates for the Master's Degree will be examined orally by their AEC and by other interested parties during their final examinations. This examination will be limited to questions covering the Thesis and the area of research. The Committee will notify the Academic Advisor and the Department Chair upon successful completion of this Oral Examination, and such further investigations or examinations as it finds necessary, and report the results by returning the Check-Form to the Dean's Office. One opportunity for re-examination will be made available.

XI. FINAL APPROVAL FOR GRADUATION

It is the student's responsibility to make sure that all tools, equipment and keys are returned in good order, as verified by the Research Advisor and Departmental Secretary. The signature of the Department Chair on the Final Approval Form (available online – see section XII) is required before a student's name is placed on the Graduation List. Then, assuming that all other requirements for the degree have been satisfied, the degree will be awarded at Commencement.

Students must be enrolled during the semester they graduate. Students who are not enrolled should consult their Research Advisor and the CEMR Guidelines for Graduate Degree Programs.

XII. FORMS

See the following URL for all CEMR forms:

<http://www.statler.wvu.edu/statler-student-services/graduate-forms>

APPENDIX A. Some Suggested Courses for Graduate Level Study
(check online Departmental course catalogues for additions and deletions)

Chemistry

- 401 - Chemical Literature
- 411 - Intermediate Analytical Chemistry
- 444 - Colloid and Surface Chemistry
- 532 - Advanced Organic Chemistry II
- 793A - Chemistry and Physics of Nanomaterials

Civil Engineering

- 540 - Sanitary Chemistry and Biology
- 546 - Principles of Biological Waste Treatment
- 549 - Solid Waste Disposal
- 553 - Advanced Finite Element Methods
- 742 - Water Treatment Theory
- 744 - Industrial and Advanced Waste Treatment

Industrial Engineering

- 525 - Engineering Management
- 677 - Advanced Engineering Economy

Mathematics

- 420 - Introduction to Numerical Analysis I
- 421 - Introduction to Numerical Analysis II
- 441 - Applied Linear Algebra
- 451 - Introduction to Real Analysis I
- 452 - Introduction to Real Analysis II
- 456 - Complex Variables II
- 465 - Partial Differential Equations II
- 534 - Linear Algebra II
- 557 - Calculus of Variations II
- 564 - Intermediate Differential Equations II
- 567 - Advanced Calculus I
- 568 - Advanced Calculus II
- 753 - Special Function I, II

Mechanical & Aerospace Engineering

- 423 - Heat Transfer
- 424 - Application in Heat Transfer
- 446 Mechanics of Composite Materials
- 473 - Bioengineering II
- 515 - Analytical Methods in Engineering I
- 531 - Fluid Mechanics I
- 621 - Advanced Thermodynamics I
- 623 - Conduction Heat Transfer
- 624 - Convection Heat Transfer
- 625 - Radiation Heat Transfer
- 660 - Controls in Mechanical Engineering
- 731 - Fundamentals of Turbulent Flow
- 721 - Fundamentals of Combustion

Physics

- Physics 451 Introductory Quantum Mechanics
- Physics 471 Solid State Physics
- 611 - Mathematics for Physicists and Engineers
- Physics 651 Quantum Mechanics 1
- Physics 652 Quantum Mechanics 2
- Physics 761 Statistical Mechanics
- Physics 771 Solid State Physics
- Physics 772 Semiconductor Physics
- Physics 773 Collective Phenomena in Solids
- Physics 774 Optical Properties of Solids

APPENDIX B. Suggested Schedule for MSChE with a BSChE

Typically 24 months of full-time graduate study are necessary to complete the requirements for the MSChE degree when the student enters with a BSChE.

First Semester

ChE 531	Math Methods	3 credits
ChE 620	Thermodynamics	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Second Semester

ChE 615	Transport Phenomena	3 credits
ChE 625	Chemical Reaction Engineering	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Third Semester

	Graduate Elective	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	6 credits
ChE 796	Graduate Seminar	1 credit

Fourth Semester

ChE 697	Graduate Research	9 credits
ChE 796	Graduate Seminar	1 credit

APPENDIX C. Suggested Schedule for MSChE without a BSChE

Typically 24 months of full-time graduate study (i.e. after junior-level courses are completed) are necessary to complete the requirements for the MSChE degree, for a student entering in good standing, or after a student satisfies any provisional admission requirements.

First Semester

ChE 310	Process Fluid Mechanics	3 credits
ChE 311	Process Heat Transfer	3 credits
ChE 320	Chemical Engineering Thermodynamics	3 credits
ChE 796	Graduate Seminar	1 credit

Second Semester

ChE 312	Separation Processes	4 credits
ChE 315	Chemical Engineering Transport Analysis	3 credits
ChE 325	Chemical Reaction Engineering	3 credits
ChE 796	Graduate Seminar	1 credit

Third Semester

ChE 531	Math Methods	3 credits
ChE 620	Thermodynamics	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Fourth Semester

ChE 615	Transport Phenomena	3 credits
ChE 625	Chemical Reaction Engineering	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Fifth Semester

	Graduate Elective	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	6 credits
ChE 796	Graduate Seminar	1 credit

Sixth Semester

ChE 697	Graduate Research	9 credits
ChE 796	Graduate Seminar	1 credit

APPENDIX D. Suggested Schedule for MSE

Typically 18 months of full-time graduate study (i.e. after junior-level courses are completed) are necessary to complete the requirements for the MSE degree, for a student entering in good standing, or after a student satisfies any provisional admission requirements.

First Semester

ChE 320	Chemical Engineering Thermodynamics	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Second Semester

ChE 315	Chemical Engineering Transport Analysis	3 credits
ChE 325	Chemical Reaction Engineering	3 credits
ChE 697	Graduate Research	6 credits
ChE 796	Graduate Seminar	1 credit

Third Semester

ChE 531	Math Methods	3 credits
ChE 620	Thermodynamics	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Fourth Semester

ChE 615	Transport Phenomena	3 credits
ChE 625	Chemical Reaction Engineering	3 credits
	Graduate Elective	3 credits
ChE 697	Graduate Research	3 credits
ChE 796	Graduate Seminar	1 credit

Fifth Semester and subsequent

	Graduate Elective	3 credits
ChE 697	Graduate Research	9 credits
ChE 796	Graduate Seminar	1 credit

APPENDIX E

Guidelines for Preparation of Thesis Proposal*

The Proposal

The Dissertation Research Proposal (DRP) should present (1) the objectives and scientific significance of the proposed work; and (2) the suitability of the methods to be employed. It should present the scientific merit of the proposed project clearly and convincingly, and should be prepared with the care and thoroughness of a paper submitted for publication. The DRP should be reviewed carefully to ensure that all essential data are included or summarized, unless they are readily available in published literature.

What to Submit

The DRP should cover the points discussed in the following paragraphs insofar as they are applicable. The proposal must be typewritten and must not exceed 15 double-spaced pages, including graphs, tables and figures. Copies of any appendices, or the materials to be considered with the DRP, must be attached to the proposal. The contents of the DRP should be assembled in the following standard sequence: cover page, project summary, project description, nomenclature (if necessary), and bibliography.

Cover Page

The title of the DRP should be brief, scientifically valid and intelligible to a scientifically literate reader.

Project Summary

The DRP must contain a 1-page summary of the proposed research. The summary should include a statement of the research objectives, the intellectual merit of the proposed research to the advancement of scientific knowledge, and broader impacts the research will have on the field. It should be informative to other scientists in the same or related fields and, insofar as possible, understandable by a scientifically literate reader.

Project Description

The main body of the DRP should include a) a detailed statement of objectives and expected significance, b) a brief literature review of current research in the field, c) a detailed research plan addressing what will be done, why it should be done, how it will be done, and criteria for success. Preliminary results should be included to validate the research approach

Safety Considerations (if applicable)

The student should evaluate the safety hazards associated with research being proposed and indicate the strategies to maintain a safe working environment.

Timeline

The timeline should be presented as a Gantt chart to show the sequence, expected duration, and expected completion dates of all tasks proposed.

Bibliography

A bibliography of pertinent literature cited in the proposal is required. It should be listed in numerical sequence in order of appearance in the proposal document.

*Based on the NSF Guidelines (page II-5): "Proposal and Award Policies and Procedures Guide"
[NSF Proposal Guidelines](#)