Benjamin M. Statler College of Engineering and Mineral Resources

Contact Information
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Degrees Offered
- Masters of Science, Aerospace Engineering (M.S.A.E.)
- Masters of Science, Chemical Engineering (M.S.Ch.E.)
- Masters of Science, Civil Engineering (M.S.C.E.)
- Masters of Science, Computer Science (M.S.C.S.)
- Masters of Science, Electrical Engineering (M.S.E.E.)
- Masters of Science, Energy Systems Engineering (M.S.E.S.E.)
- Masters of Science, Engineering (M.S.E.)
- Masters of Science, Industrial Engineering (M.S.I.E.)
- Masters of Science, Industrial Hygiene (M.S.)
- Masters of Science, Material Science and Engineering (M.S.M.S.E)
- Masters of Science, Mechanical Engineering (M.S.M.E.)
- Masters of Science, Mining Engineering (M.S.Min.E.)
- Masters of Science, Petroleum and Natural Gas Engineering (M.S.P.N.G.E.)
- Masters of Science, Safety Management (M.S.)
- Masters of Science, Software Engineering (M.S.S.E)
- Doctor of Philosophy, Aerospace Engineering (Ph.D.)
- Doctor of Philosophy, Chemical Engineering (Ph.D.)
- Doctor of Philosophy, Civil Engineering (Ph.D.)
- Doctor of Philosophy, Computer Science (Ph.D.)
- Doctor of Philosophy, Computer Engineering (Ph.D.)
- Doctor of Philosophy, Electrical Engineering (Ph.D.)
- Doctor of Philosophy, Industrial Engineering (Ph.D.)
- Doctor of Philosophy, Materials Science and Engineering (Ph.D.)
- Doctor of Philosophy, Mechanical Engineering (Ph.D.)
- Doctor of Philosophy, Mining Engineering (Ph.D.)
- Doctor of Philosophy, Occupational Safety and Health (Ph.D.)
- Doctor of Philosophy, Petroleum and Natural Gas Engineering (Ph.D.)

Degree Programs
The Benjamin M. Statler College of Engineering and Mineral Resources graduate programs are administered through the Departments of Chemical Engineering, Civil and Environmental Engineering, the Lane Department of Computer Science and Electrical Engineering, Industrial and Management Systems Engineering, Mechanical and Aerospace Engineering, Mining Engineering, and Petroleum and Natural Gas Engineering. The M.S. degree in Energy Systems Engineering, the M.S. in Engineering and the M.S. in Material Science and Engineering are degrees administered by the Statler College and available to students from of its academic units participating in those degree programs. Statler College facilities are primarily housed on the Evansdale campus in the Engineering Sciences Building, the Mineral Resources Building, and the Engineering Research Building and the Advanced Engineering Research Building. These buildings house state-of-the-art research facilities, well-equipped teaching laboratories, computer classrooms, and offices for the faculty and administration of the graduate programs.

The Ph.D. program prepares graduates for leadership in industrial, government, or academic fields. The college offers a doctor of philosophy with areas of specialization in aerospace, chemical, civil, computer, electrical, industrial, mechanical, mining, and petroleum and natural gas engineering, in computer science, in material science and engineering, and in occupational safety and health.

Designated master's degree programs in engineering are offered in aerospace, chemical, civil, electrical, industrial, mechanical, mining, petroleum and natural gas, and software engineering, in computer science, in energy systems engineering, and in material science and engineering. The college offers
two accredited masters of Science degrees in industrial hygiene and in safety management. These programs are accredited by the Applied Science Accreditation Commission (ASAC) of ABET, http://abet.org. A Master's of Science in Engineering (M.S.E.) degree is offered to qualified students as determined at the departmental level.

Currently, the college offers graduate certificate programs in computer forensics, information assurance and biometrics, interactive technologies and serious gaming, and software engineering. For specific information about a program, students should review research and graduate studies information on the college website.

**ADMINISTRATION**

**DEAN**
- Eugene V. Cilento - Ph.D. (University of Cincinnati)
  Glen H. Hiner Dean

**ASSOCIATE DEAN FOR ACADEMIC AFFAIRS**
- David A. Wyrick - Ph.D. (University of Missouri-Rolla)

**ASSOCIATE DEAN FOR ADMINISTRATION**
- Royce J. Watts - M.S. (West Virginia University)

**ASSOCIATE DEAN FOR RESEARCH**
- Pradeep P. Fulay - Ph.D. (University of Arizona)

**ASSISTANT DEAN FOR FRESHMAN EXPERIENCE**
- Robin A. Hensel - Ed.D. (West Virginia University)

**Degree Designation Learning Goals**

**MASTER OF SCIENCE (MS)**

**Industrial Hygiene**

The M.S. in Industrial Hygiene is accredited by the Applied Science Accreditation Commission of ABET. Upon graduation, with a Masters of Science degree in Industrial Hygiene, students will have:

- Ability to use the techniques, skills, and modern scientific and technical tools necessary for professional practice such as:
  - Principles and methods of industrial hygiene
  - Principles and methods of ergonomics
  - Principles and methods of safety
  - Principles of environmental sciences (environmental elective)
  - Principles of epidemiology and biostatistics
  - Principles and methods of control of physical and chemical hazards

- Ability to apply knowledge of math, science, and industrial hygiene
- Ability to design and conduct experiments, analyze and interpret data, develop implementation strategies, and shape recommendations so that results will be achieved and findings will be communicated effectively
- Ability to work individually, in teams, and/or in multi-disciplinary teams to identify, formulate, and solve problems using industrial hygiene, safety, and ergonomics knowledge, skills, and tools
- Ability to formulate or design a system, process, or program to meet desired needs
- Understanding of professional and ethical responsibility and the broad education and knowledge of contemporary issues necessary to understand the impact of solutions in a global and societal context
- Recognition of the need for and an ability to engage in life-long learning

**Safety Management**

Graduates of the Safety Management program must be able to meet the following outcomes at the time of their graduation:

- Demonstrate knowledge and skills to build a comprehensive Safety and Health program based on loss control and regulations
- Demonstrate knowledge and skills to use analytical techniques in the Safety and Health function
- Demonstrate knowledge and skills with federal, state, and non-governmental Safety and Health program standards and best practices
- Demonstrate skills in written and oral communications at the level of professionals in safety and health positions
- Demonstrate knowledge and skills in writing and evaluating safety and health research proposals
• Demonstrate knowledge and skills in using management tools to implement and evaluate Safety and Health programs

MASTER OF SCIENCE IN AEROSPACE ENGINEERING (MSAE)
Upon graduation with a Masters of Science degree in Aerospace Engineering, students will have:

• Expert-level understanding of the advanced principles of aerospace engineering, which include aerospace systems design, aircraft or spacecraft dynamics, stability and control, flight mechanics and simulation, advanced materials, vehicle propulsion, aerodynamics, aeroelasticity, and computational mechanics.
• Ability to complete on time specific research tasks
• Strong oral and written communication skills
• Ability to work independently in a collaborative environment
• Understanding for holding the highest standards of ethical and professional responsibility in the practice of their profession to contribute to the well-being of society and to the advancement of the aerospace engineering profession.

MASTER OF SCIENCE IN CHEMICAL ENGINEERING (MSCHE)
Upon graduation, with a Masters of Science degree in 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.

MASTER OF SCIENCE IN CIVIL ENGINEERING (MSCE)
Upon graduation, with a Masters of Science degree in Civil Engineering, students will have:

• Ability to function on teams involving multiple civil engineering specialties.
• Ability to apply advanced methodologies in their specialty area.
• Ability to effectively communicate technical information.
• Ability to design and conduct experiments, analyze and interpret data, and develop recommendations.
• An understanding of professional and ethical responsibility.
• An ability to understand the impact of engineering solutions in global and societal context.
• Recognition of the need to engage in life-long learning.
• Ability to use contemporary techniques, skills, and tools necessary for engineering practice in education, industry, and/or government.

MASTER OF SCIENCE IN COMPUTER SCIENCE (MSCS)
Upon graduation, with a Masters of Science degree in Computer Science, students will:

• Have obtained knowledge, skills, and attitudes that will ensure success in professional positions in business, industry, research, government service, or in further graduate or professional study
• Achieve a depth of proficiency in a specific field of Computer Science by completing major courses in one of three areas: computer systems, software and knowledge engineering, or the theory of computation.
• Achieve a breadth of understanding of Computer Science by completing minor coursework requirements in other areas, and by participation in graduate seminar requirements.
• Demonstrate professionalism and communication skills through completion of coursework, project, or thesis defense.

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING (MSEE)
Upon graduation, with a Masters of Science degree in Electrical Engineering, students will:

• Have obtained knowledge, skills, and attitudes that will ensure success in professional positions in business, industry, research, government service, or in further graduate or professional study
• Achieve a depth of proficiency in a specific field of electrical engineering by completing major courses in one of four areas: electronics and photonics; systems and signals; computer systems; or software and knowledge engineering.
• Achieve a breadth of understanding of electrical engineering by completing minor coursework requirements in another area, and by participation in graduate seminar requirements.
• Demonstrate professionalism and communication skills through completion of coursework, project or thesis defense.

MASTER OF SCIENCE IN ENERGY SYSTEMS ENGINEERING (MSESE)
Upon graduation, with a Masters of Science degree in Energy Systems Engineering, students will have:

• Understanding of the supply chain for carbon based and “green” energy, for production, conversion or processing, transmission, and point of utilization;
• Advanced training in specialized areas of energy systems engineering;
• Ability to function at the highest levels of expertise in their chosen sub-discipline of energy, and who are well versed in the overall concepts of getting energy to consumers;
• Ability to complete on time specific professional-paper tasks
• Strong oral and written communication skills
• Ability to work independently in a collaborative environment
• Understanding of professional and ethical responsibility
• Ability to understand the impact of engineering solutions in global and societal context
• Recognition of the need to engage in life-long learning

MASTER OF SCIENCE IN ENGINEERING (MSE)
Upon graduation, with a Masters of Science degree in Engineering, students will have:

• An expert level understanding of the advanced principles of their engineering specialty
• Ability to apply advanced methodologies in their specialty area
• Ability to design and conduct original experiments, analyze and interpret data, and develop recommendations with a high degree of independence
• Advanced ability to use contemporary techniques, skills, and tools necessary for engineering practice in education, industry, and/or government
• Ability to effectively communicate technical information in the form of a thesis, scientific publication or presentation
• Understanding of professional and ethical responsibility
• Ability to understand the impact of engineering solutions in global and societal context
• Recognition of the need to engage in life-long learning
• Foundational preparation to pursue doctoral studies

MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING (MSIE)
Upon graduation, with a Masters of Science degree in Industrial Engineering, students will have:

• Ability to use and master modern and classical industrial engineering methodologies in their area of concentration
• Ability to apply knowledge of math, science, and engineering
• Ability to do research, and to design and conduct experiments, analyze and interpret data, develop implementation strategies, and shape recommendations so that results will be achieved and findings will be communicated effectively
• Ability to work individually, on teams, and/or on multi-disciplinary teams to identify, formulate, and solve problems using industrial engineering knowledge, skills, and tools
• Ability to design and implement or improve integrated systems that include people, materials, information, equipment, and energy using appropriate analytical, computational, and experimental practices
• Understanding of professional and ethical responsibility and the broad education and knowledge of contemporary issues necessary to understand the impact of solutions in a global and societal context
• Recognition of the need for and an ability to engage in life-long learning
• Professional characteristics expected of a successful industrial engineer

MASTER OF SCIENCE IN MATERIAL SCIENCE AND ENGINEERING (MSMSE)
Upon graduation, with a Masters of Science degree in Material Science and Engineering, students will have:

• An expert level understanding of the advanced principles of their engineering specialty
• Ability to apply advanced methodologies in their specialty area
• Ability to design and conduct original experiments, analyze and interpret data, and develop recommendations with a high degree of independence
• Advanced ability to use contemporary techniques, skills, and tools necessary for engineering practice in education, industry, and/or government
• Ability to effectively communicate technical information in the form of a thesis, scientific publication or presentation
• Understanding of professional and ethical responsibility
• Ability to understand the impact of engineering solutions in global and societal context
• Recognition of the need to engage in life-long learning
• Foundational preparation to pursue doctoral studies

**MASTER OF SCIENCE IN MECHANICAL ENGINEERING (MSME)**

Upon graduation, with a Masters of Science degree in Mechanical Engineering, students will have:

- Expert-level understanding of the advanced principles of mechanical engineering, which include mechanical systems design, system dynamics, solid mechanics, energy systems, engineering materials, automatic controls, mechatronics, and computational mechanics
- Ability to complete on time specific research tasks
- Strong oral and written communication skills
- Ability to work independently in a collaborative environment
- Understanding for holding the highest standards of ethical and professional responsibility in the practice of their profession to contribute to the well-being of society and to the advancement of the aerospace engineering profession.

**MASTER OF SCIENCE IN MINING ENGINEERING (MSMINE)**

Upon graduation, with a Masters of Science degree in Mining Engineering, students will have:

- Ability to investigate and develop solutions to advanced mining engineering problems
- Advanced technical knowledge and research experience needed to address the most challenging contemporary issues within a specialized area of study

**MASTER OF SCIENCE IN PETROLEUM AND NATURAL GAS ENGINEERING (MSPNGE)**

Upon graduation, with a Masters of Science degree in Petroleum and Natural Gas Engineering, students will have:

- Advanced technical knowledge and engineering skills needed by the oil and gas industry in the state, the nation, and the world
- In-depth knowledge of petroleum and natural gas engineering principles and applications to function effectively in their profession or continue their education
- Ability to perform independent research to solve engineering and scientific problems encountered in their profession
- In-depth petroleum and natural gas scientific and engineering knowledge to provide high quality education in petroleum and natural gas engineering

**MASTER OF SCIENCE IN SOFTWARE ENGINEERING (MSSE)**

Upon graduation, with a Masters of Science degree in Software Engineering, students will have:

- Knowledge, skills, and attitudes that will ensure success in professional positions in business, industry, research, or governmental service
- Achieved proficiency in the area of Software Project Management.
- Achieved proficiency in Software Analysis and Design.
- Understanding of the process of software Validation and Verification.
- Understanding of the process of Software Evolution.
- Achieved proficiency in Object-Oriented Design of software.

**DOCTOR OF PHILOSOPHY (PHD)**

Upon graduation with a Ph.D. degree from the Statler College of Engineering and Mineral Resources students will have:

- Ability to initiate research ideas in order to solve specific problems and to write research proposals on these ideas
- Have an expert-level understanding of the advanced principles of their fields of study
- Furthered a novel research idea which has contributed to the state of the art in their specific areas of expertise
- Ability to plan original research projects, to perform laboratory or field based experimental tasks, generate data from those tasks, and draw conclusions based on sound scientific and engineering principles
- Ability to develop innovative research in order to advance the frontiers of knowledge and secure sponsored research
- Ability to write technical articles for dissemination through peer-reviewed, refereed journals or other venues
- Ability to make oral and poster presentations at technical meetings
- Understanding of professional and ethical responsibilities in the practice of their profession to contribute to the well-being of society and to the advancement of their profession
- Demonstrated initiative in research planning and management, including safety and environmental issues
- Technical preparation for and an awareness of the need for life-long learning and continuing education
A student desiring to take courses for graduate credit in the college must comply with the appropriate university regulations for graduate study. To become enrolled in a Statler College graduate program, a student must apply for admission through the Office of Admissions to the department housing the student’s choice of major. Acceptance will depend upon review of the student’s academic background and available facilities in the major program’s department.

An applicant with a baccalaureate degree, or its equivalent, from a program accredited by ABET or an internationally recognized program in engineering or computer science will be admitted on the same basis as engineering or computer science graduates of WVU. Lacking these qualifications, an applicant must first fulfill any special requirements of the department in which the student is seeking an advanced degree.

**Masters Program**

There are three types of degrees granted within the Statler College of Engineering and Mineral Resources:

- M.S. in an engineering discipline (e.g., M.S.I.E., M.S.E.E., etc.)
- M.S. in engineering (e.g., M.S.E.)
- M.S. in an applied science area (i.e., M.S.I.H., M.S.S.M., M.S.S.E., M.S.C.S.)

The M.S. degree in an engineering discipline requires an undergraduate degree in the same discipline. The master’s in engineering degree is intended for students who want an engineering master’s degree but do not have an undergraduate degree in the same field or a closely-allied field. The applied science programs are intended for students wishing to obtain a master’s in these non-engineering disciplines.

The two types of engineering degrees both require a calculus-based undergraduate education in an accredited program or an internationally recognized program; the applied science areas do not. Note: The admissions requirements are set by the individual department and program areas. Students may be required to take preparatory classes in addition to the required courses to ensure they have the appropriate knowledge expected for holders of the degree.

Students wishing to pursue a master’s of science degree who do not hold a correspondingly named bachelor’s degree may be admitted into either a discipline-designated program (including the M.S. degrees in computer science, industrial hygiene, safety management, and software engineering) or the undesignated Master of Science in Engineering Degree Program, depending on their credentials. For engineering degree programs, such students will normally be required to obtain a baccalaureate level of proficiency in subjects directly related to their area of graduate study by taking undergraduate prerequisite courses, either prior to starting or as an integral part of their M.S. degree program. The degree designation and additional course requirements will be determined by the department admitting the student.

**ENTRANCE AND CLASSIFICATION**

Students admitted to the master’s degree program will be classified in one of three categories:

1. Regular – To be admitted as a regular graduate student, an applicant must have a grade point average (GPA) of 3.0 or better (out of a possible 4.0) in all previous college work and must meet all other requirements set by the department.

2. Provisional – An applicant not qualifying for the regular graduate student admission status, either due to insufficient GPA, incomplete credentials, or inadequate academic background, may be admitted as a provisional student. Any applicant with a GPA below 2.75 in any of his previous college work cannot be admitted without approval from the dean or designate. Requirements for attaining regular student status must be determined by the regularly constituted Admissions Committee and stated in a letter or form sent to the student by the department or program area prior to registration for coursework. The letter or form should include the following: Reason not qualified for regular admission (e.g., deficient prerequisites, GPA, or both); Coursework deficiencies, if any, and courses at WVU to correct the deficiencies (which must be passed with a “C” or better); Notification that the student must attain at least a 3.0 in his or her first nine hours of graduate coursework; Notification that the student cannot graduate until all coursework deficiencies have been satisfied.

3. Non-degree – A student who is not deemed qualified for admission to regular or provisional status, or who does not desire to pursue a degree, may be admitted as a non-degree student. Each department determines the minimum qualification requirements for admission as non-degree students. Such students are allowed to take graduate courses but are not allowed to pursue a graduate degree. These students may later request a change of status (see Section 3, Classification Change, and Section 12, Status Change).

**Doctoral Program**

Admission as a graduate student is required of all applicants for admission to a program of study and research leading to the degree of Ph.D. To be eligible for admission into a doctorate program in any engineering field, a candidate is expected to hold or to receive by time of enrollment a B.S. or an M.S. degree in one of the following fields:

- Some discipline of engineering from an institution which has an ABET-accredited program in that discipline or which has an internationally-recognized program in engineering/mineral resources
- Mathematics and physical sciences (as specified by individual programs)
To be eligible for admission into the doctoral program in the field of computer science, a candidate is expected to hold a B.S. or an M.S. degree in one of the following fields:

- Computer science
- Engineering
- Mathematics and physical sciences (as specified by the program)

To be eligible for admission into the doctoral program in the field of occupational safety and health, a candidate is expected to hold a B.S. or an M.S. degree in one of the following fields:

- Industrial hygiene
- Safety
- Engineering
- Mathematics and physical and life sciences (as specified by the program)

Although a bachelor's degree is the minimum requirement, applicants are normally encouraged to hold a master's degree in a relevant discipline. Admission to graduate study does not necessarily assure entrance into the college's doctoral program. For complete details about admission criteria and other governance details of the doctor of philosophy programs please refer to the Guidelines for Doctor of Philosophy Programs which can be found on the college's home page.

ENTRANCE AND CLASSIFICATION

Not all students who meet minimum college and program requirements will necessarily be accepted. Faculty members in a given graduate program have the right to set standards and conditions more restrictive than those set forth in these guidelines and the right to limit enrollment. For example, a program may choose to reject an applicant because his or her goals are not perceived to match the current needs and resources of the program. Similarly, although a student may be admitted solely for the purpose of enrolling in advanced coursework (e.g., non-degree students), program faculty may decline to allow that student to continue towards a doctoral degree even though the student has completed all required coursework successfully.

Students admitted to the Ph.D. program will be classified in one of two categories:

1. Regular - To be admitted as a regular graduate student, an applicant must have an equivalent grade point average (GPA) of 3.0 or better (out of a possible 4.0) in all previous college work, and must meet all other requirements set by the department and program, including minimum GRE scores. Any exceptions to the stated requirements must be approved by the dean.

2. Provisional - An applicant not qualifying for the regular graduate student admission status, either due to insufficient GPA, insufficient GRE scores, incomplete credentials, or inadequate academic background, may be admitted as a provisional student. Any applicant with a GPA below 2.75 in any of his/her previous college work cannot be admitted without a special approval from the dean. Applications will be returned to the program coordinator if the application shows a GPA less than 2.75 unless it is accompanied by a signed approval from the dean. Students are notified of their provisional status by Admissions and Records. The admitting college program is responsible for communicating to the student the requirements they must meet before attaining regular status.

Note: Admission to the graduate program does not confer or guarantee candidacy for the Ph.D., which requires a separate decision.

In this section:

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- Course Load (p. 7)
- Masters Program Policies (p. 8)
- Doctoral Program Policies (p. 8)

Minimum Course Standards

No credits which are reported with a grade lower than C are acceptable toward an advanced degree. To qualify for an advanced degree, the graduate student must have a grade point average of at least 3.0 based on all courses acceptable for graduate credit for which the student has received a grade from WVU. Graduate students in the college must also comply with the regulations of their major department.

Departments may establish more stringent requirements than those adopted for the college as a whole. These departmental requirements are contained in the individual program sections of the graduate catalog.

Course Load

A full-time graduate student must register for at least nine, but no more than fifteen, credit hours during each regular semester, or at least six, but no more than twelve, credit hours in the summer session. Permission to carry a heavier load must be obtained in writing from the dean.
Masters Programs

PROGRAM OPTIONS

For all master's degree students, an advisory and examining committee (AEC) consisting of at least three faculty members will be appointed. A plan of study must be jointly prepared and approved by the student and all members of the student’s AEC, the department chair, and the dean or dean’s designate, either at the end of the second semester of the student’s attendance or at the completion of the twelfth course credit hour, whichever is later. The college is authorized to grant master's degrees under each of the following three options:

- Thesis Option – This option requires a minimum of twenty-four credit hours of coursework and at least six credit hours of research leading to the thesis.
- Problem Report Option – This option requires a minimum of thirty credit hours of coursework and at least three credit hours of a research or design project leading to a formal written report.
- Coursework Option – This option requires a minimum of thirty-three credit hours of coursework. There are two ways this option is implemented. First, although rarely permitted, this option is open to students who have practical engineering experience and/or have demonstrated the ability to organize and develop a project and write a technical report. Approval to pursue this option must be obtained from the student’s AEC, the graduate program coordinator, and the department chair. Second, a department can choose to offer students within a designated program the coursework-only option. Normally, for each option the coursework required is greater than that required for a student doing a thesis or problem report. In addition, the department must require successful completion of a written or oral comprehensive examination.

ADVISORY AND EXAMINING COMMITTEE

Each department will form an advisory and examining committee (AEC) for each of its master's degree students, consisting of at least three members (with one member clearly designated as chairperson). The chair of the AEC and the majority of its members must be regular members of the graduate faculty and must have a primary faculty appointment in the Statler College of Engineering and Mineral Resources. The majority of the AEC members must be tenured/tenure-track Statler College faculty. No more than one person may be a non-member of the graduate faculty.

The committee must be formed by the end of the second semester of attendance by the student or by the completion of the twelfth course credit hour applicable to the master’s degree requirements, whichever is later. Otherwise, the student will not be allowed to register for the following semester.

PLAN OF STUDY

A plan of study must be prepared by the student and the AEC chair. This plan must be approved by the student, all members of the AEC, the graduate program coordinator, the department chair, and the dean, before the end of the second semester of the student’s attendance or before the completion of the twelfth course credit hour applicable to the master's degree requirements, whichever is later. This plan must include any required preparatory coursework and include a preliminary thesis research topic or problem report topic, if applicable.

Any revisions to a plan of study (including any changes to the AEC) will necessitate submission of a revised plan which incorporates all approved signatures. Any changes to the AEC must be signed by the previous and new members of the committee, to the extent that a previous committee member is available on campus. In addition, the removal of any member of the AEC requires submission of a Plan of Study Attachment.

TIME TO COMPLETION

All requirements for the master's degree must be completed within eight years preceding the student's graduation.

APPLICATION FOR TRANSFER OF GRADUATE CREDIT

A student wishing to apply graduate credit earned at another institution to a master's degree at WVU must complete an application for transfer of graduate credit to WVU and have an official transcript submitted to the WVU Office of Admissions from the external institution. A maximum of twelve semester hours from other institutions may be acceptable for credit at WVU in master's degree programs in Statler College. Departmental programs may choose to accept fewer transfer credit hours with the restriction that only courses with grades of A or B may be considered for transfer.

Doctoral Programs

ADVISORY AND EXAMINING COMMITTEE

Each department will form an advisory and examining committee (AEC) for each of its doctoral-level students, consisting of a minimum of five members. The chair of the AEC should be selected by the student in consultation with the graduate program coordinator or the chair of the department. Normally, the AEC chair should be a member of the degree-granting program. The chair must be a regular member of the college graduate faculty. Non-tenure track faculty may serve as chair if they are a regular member of the graduate faculty. Members should be selected by the student in consultation with
the chair of the committee. The chair and all members should be selected based on their perceived ability to contribute to the progress and evaluation of the student’s research and their ability to work cooperatively with other members and the student. The members of the AEC must be listed on the plan of study, which must be signed by the graduate coordinator, chair of the department, and the dean to gain approval.

PROGRAM REQUIREMENTS

RESIDENCY

Full-time attendance on campus is required for two consecutive semesters consisting of a minimum of nine credit hours each. A full summer, consisting of registration in both sessions and completion of a minimum of nine credit hours over both sessions, is considered equivalent to one semester of residence. However, an alternative plan by which the student can get an equivalent education experience may be followed if approved in the plan of study.

COURSE REQUIREMENTS

Specific course requirements are determined by the student’s advisory and examining committee. A minimum of eighteen semester hours of coursework at WVU is required at the 500 and higher-levels with an average of 3.0 or better.

REQUIREMENTS FOR CANDIDACY

Programs that admit students with only a B.S. degree are encouraged to require such students to demonstrate the competencies expected of a master's graduate, in addition to the competencies required by the doctoral program before achieving candidacy.

Each department will specify in writing its own requirements and standards for a student to be admitted to candidacy. At a minimum, these requirements will include one written examination, completion of all course requirements, and an oral defense of a written research proposal. The successful outcome of this exam will demonstrate the student has the following:

- A grasp of the important phases and problems of the field of study and an appreciation of their relation to other fields of human knowledge and accomplishments
- The ability to employ the instruments of research developed in the student’s area of interest

The AEC may approve the research proposal conditioned upon stipulated changes to the proposal. In such cases, the chair of the AEC should ensure that the required changes to the proposal are made by the student before signing the Approval of Candidacy. The chair of the AEC must provide a copy of the revised research proposal to all members of the AEC before signing his or her approval.

At the completion of the candidacy requirements, the results must be reported to the dean by the student’s AEC. For a positive recommendation for admission to candidacy, no more than one negative vote may be cast. A minimum of one opportunity for reexamination must be available for each student. Students who fail to receive a positive recommendation for admission to candidacy are terminated at the end of that semester and may not reenter the program.

RESEARCH REQUIREMENTS

The faculty of the college believe that the experience gained in performing and reporting a research endeavor should be over a prolonged period. Therefore, the Ph.D. in engineering and the Ph.D. in occupational safety and health degrees require a minimum of twenty-four credit hours of research at the Ph.D. level leading to a dissertation, while the Ph.D. in computer science requires eighteen research hours.

CREDIT REQUIREMENTS

The degree of doctor of philosophy is not awarded solely on the basis of the accumulation of course credits and completion of a definite residence requirement. The amount and nature of the coursework undertaken by a doctoral student will be established for each individual student with the objective of ensuring a reasonable and coherent progression of academic development beyond the baccalaureate and/or master's degree.

APPLICATION FOR TRANSFER OF GRADUATE CREDIT

A student wishing to apply credit earned at another institution to a doctoral degree program at WVU must submit an application for transfer of graduate credit to WVU and have an official transcript from the institution forwarded to the WVU Office of Admissions. The approval of transfer credit is at the discretion of the student’s AEC with the restriction that only courses with grades of A or B may be considered for transfer.

Curriculum in Master of Science in Engineering

The following programs participate in the Master of Science in Engineering Program:

- Chemical Engineering
- Civil Engineering
- Computer Science
- Electrical Engineering
- Industrial Engineering
A candidate for the M.S. degree in 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 specific department in which the student’s concentration is in.

**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 cumulative GPA of 3.0 is required in all courses

**Course Requirements**

- A minimum of 60% of courses must be from 500 level or above
- Select from the following based on degree path:

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

  Complete 1 of the following options:

**Thesis Option - 6 hours**

- Research - any 697 (6 hours)
- Written Research Proposal
- Thesis
- Final Oral or Written Examination

**Problem Report Option - 9 hours**

- Complete 6 additional hours of coursework
- Research - any 697 (3 hours)
- Written Research Proposal
- Formal written report or professional report/paper
- Final Oral or Written Examination

**Coursework Option - 9 hours**

- Complete 8 additional hours of coursework
- Final Oral or Written Examination

**Total Hours**

30-33

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

**Final Examination**

M.S. students following the thesis or problem report option must prepare a written research proposal. The proposal must be approved by the student’s AEC at least one semester prior to the final oral examination.

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. 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.E degree program that completes degree requirements in two years is as follows.

**First Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
<td>3</td>
<td>Course</td>
<td>3</td>
</tr>
<tr>
<td>Course</td>
<td>3</td>
<td>Course</td>
<td>3</td>
</tr>
<tr>
<td>Course</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

9 9
The M.S.E.S.E. may be completed in one year by students with a strong background in the energy aspects of engineering. For students without this preparation, one or two semesters of preparatory and prerequisite work may be necessary to ensure success in the program.

Curriculum in Master of Science in Energy Systems Engineering

A candidate for the M.S. degree in energy systems 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 specific department in which the student’s concentration is in.

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 cumulative GPA of 3.0 is required in all courses

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>3</th>
</tr>
</thead>
</table>

A minimum of 60% of courses must be from 500 level or above

Extraction

- Examples include:
  - MINE 411 Rock Mechanics/Ground Control
  - MINE 505 Integrated Mining Systems
  - MINE 611 Advanced Ground Control-Coal Mines
  - or any other approved course in the area of extraction

Conversion

- Examples include:
  - CHE 414 Coal Conversion Engineering
  - MINE 427 Coal Preparation
  - MAE 438 Introduction to Gas Dynamics
  - MAE 528 Introduction to Fuel Cell Technology
  - MINE 627 Advanced Coal Preparation
  - or any other approved course in the area of conversion

Distribution/storage

- Examples include:
  - EE 533 Computer Applications in Power System Analysis
  - PNGE 471 Natural Gas Production and Storage
  - or any other approved course in the area of distribution/storage

Utilization

- Examples include:
  - MAE 424 Applications in Heat Transfer
  - MAE 425 Internal Combustion Engines
  - IENG 433 Energy Efficiency and Sustainability
  - MAE 427 Heating, Ventilating, and Air Conditioning
  - MAE 525 Heavy Duty Vehicle Emissions
  - or any other approved course in the area of utilization

Technical Electives selected from the table of technical electives below.
Complete 1 of the following options: 6-9

**Thesis Option - 6 hours**
- Research (6 hours)
- Written Research Proposal
- Thesis
- Final Oral or Written Examination

**Problem Report Option - 9 hours**
- Complete 6 additional hours of Technical Electives. A minimum of 12 credit hours of the 18 credit hours of technical elective course work must be taken in the Statler College.
- Research (3 hours)
- Written Research Proposal
- Formal written report or professional report/paper
- Final Oral or Written Examination

**Coursework Option - 9 hours**
- Complete 9 additional hours of Technical Electives.
- Final Oral or Written Examination

Total Hours 30-33

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

**TECHNICAL ELECTIVES**

Any 400 level or higher CE, CHE, CPE, EE, IENG, MAE, MINE, or PNGE course dealing with issues related to extraction, conversion, distribution/storage, and utilization of energy.

- ARE 445 Energy Economics 3
- WDSC 444 Bio-based Energy Systems 3
- ARE 410 Environmental and Resource Economics 3
- ARE 632 Natural Resource and Environmental Economics 3
- RESM 440 Foundations of Applied Geographic Information Systems 2
- RESM 480 Environmental Regulation 3
- FOR 670 Human Dimensions of Natural Resource Management 3
- BADM 511 Managerial Economics 3
- BADM 531 Operation/Supply Chain 3
- BADM 532 Corporate Finance 3
- ILR 511 Human Capital Management 3
- LAW 613 International Environmental Law 2-3
- LAW 604 Natural Resources 3
- LAW 630 Energy Law 3
- LAW 689D Seminar: Environmental Law 2
- LAW 689W Seminar: Issues in Energy Law 2

**Final Examination**

M.S. students following the thesis or problem report option must prepare a written research proposal. The proposal must be approved by the student's AEC at least one semester prior to the final oral examination.

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 Problem Report Option. 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.E.S.E degree program that completes degree requirements in one year is as follows.
First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Subject Area</td>
<td>12</td>
<td>Technical Elective Courses</td>
<td>15</td>
<td>Research</td>
<td>3</td>
</tr>
<tr>
<td>Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>15</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Total credit hours: 33

Curriculum in Master of Science in Materials Science and Engineering

A candidate for the M.S. degree in Materials Science and Engineering must comply with the rules and regulations outlined in the WVU Graduate catalog and the specific requirements of the Statler College and the specific department in which the student’s concentration is in.

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 cumulative GPA of 3.0 is required in all courses.

**Course Requirements**

A minimum of 60% of courses must be from 500 level or above.

**Core Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 583</td>
<td>Thermodynamics and Kinetics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MAE 580</td>
<td>Crystallography and Crystals</td>
<td>3</td>
</tr>
<tr>
<td>MAE 649</td>
<td>Microscopy of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MAE 694</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

**Area of Emphasis Requirement**

Complete 1 of the following options:

- **Thesis Option - 6 hours**
  - Any 697 Research (6 hours)
  - Written Proposal/Oral Presentation
  - Oral Defense
  - Thesis
  - Final Oral or Written Examination

- **Problem Report Option - 9 hours**
  - Complete 6 additional hours of coursework
  - Any 697 Research (3 hours)
  - Written Proposal/Oral Presentation
  - Oral Defense
  - Formal written report or professional report/paper
  - Final Oral or Written Examination

Total Hours: 31-34

* All M.S.M.S.E. students, whether pursuing the thesis option or the problem report option, are allowed to include up to a maximum of three (3), 3-credit courses at the 400 level towards the coursework requirements for their degrees.

Final Examination

M.S. students following the thesis or problem report option must prepare a written research proposal. The proposal must be approved by the student’s AEC at least one semester prior to the final oral examination.

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. 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.M.S.E. degree program that completes degree requirements in two years is as follows.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAE 580</td>
<td>3</td>
<td>3 AOE Course 1</td>
<td>3</td>
</tr>
<tr>
<td>MAE 583</td>
<td>3</td>
<td>3 AOE Course 2</td>
<td>3</td>
</tr>
<tr>
<td>MAE 649</td>
<td>3</td>
<td>MAE 697</td>
<td>3</td>
</tr>
<tr>
<td>MAE 694</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AOE Course 3</td>
<td>3</td>
<td>AOE Course 5</td>
<td>3</td>
</tr>
<tr>
<td>AOE Course 4</td>
<td>3</td>
<td>MAE 697</td>
<td>6</td>
</tr>
<tr>
<td>MAE 697</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>

Total credit hours: 37

Areas of Emphasis

Students must complete one of the following Areas of Emphasis

- Chemical Engineering Materials (p. 14)
- Electrical Engineering Materials (p. 15)
- Mechanical Engineering Materials (p. 15)

Chemical Engineering Materials Area of Emphasis Requirements

**CHE Electives**

Select 2 of the following:

<table>
<thead>
<tr>
<th>CHE 461</th>
<th>Polymer Science and Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 462</td>
<td>Polymer Processing</td>
</tr>
<tr>
<td>CHE 463</td>
<td>Polymer Composites Processing</td>
</tr>
<tr>
<td>CHE 466</td>
<td>Electronic Materials Processing</td>
</tr>
<tr>
<td>CHE 475</td>
<td>Chemical Process Safety</td>
</tr>
<tr>
<td>CHE 531</td>
<td>Mathematical Methods in Chemical Engineering</td>
</tr>
<tr>
<td>CHE 615</td>
<td>Transport Phenomena</td>
</tr>
<tr>
<td>CHE 620</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>CHE 625</td>
<td>Chemical Reaction Engineering</td>
</tr>
<tr>
<td>CHE 720</td>
<td>Applied Statistical and Molecular Thermodynamics</td>
</tr>
<tr>
<td>CHE 761</td>
<td>Polymer Rheology</td>
</tr>
<tr>
<td>BMEG 482</td>
<td>Introduction to Tissue Engineering</td>
</tr>
</tbody>
</table>

**Additional Electives**

Select 3 of the following:

<table>
<thead>
<tr>
<th>CHEM 422</th>
<th>Intermediate Inorganic Chemistry</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 423</td>
<td>Inorganic Synthesis Laboratory</td>
</tr>
<tr>
<td>CHEM 444</td>
<td>Colloid and Surface Chemistry</td>
</tr>
<tr>
<td>CHEM 514</td>
<td>Mass Spectrometry Principles and Practices</td>
</tr>
<tr>
<td>CHEM 521</td>
<td>Organometallic Chemistry</td>
</tr>
<tr>
<td>CHEM 540</td>
<td>Bonding and Molecular Structure</td>
</tr>
<tr>
<td>CHEM 547</td>
<td>Chemical Crystallography</td>
</tr>
<tr>
<td>CHEM 713</td>
<td>Electrochemistry and Instrumentation</td>
</tr>
<tr>
<td>CHEM 714</td>
<td>Analytical Atomic Spectrometry</td>
</tr>
<tr>
<td>CHEM 723</td>
<td>Physical Methods in Inorganic Chemistry</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>CHEM 725</td>
<td>Inorganic Reactions and Mechanisms</td>
</tr>
<tr>
<td>EE 528</td>
<td>Biomedical Microdevices</td>
</tr>
<tr>
<td>EE 550</td>
<td>Advanced Semiconductor Electronics</td>
</tr>
<tr>
<td>EE 650</td>
<td>Optoelectronics</td>
</tr>
<tr>
<td>MAE 446</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 528</td>
<td>Introduction to Fuel Cell Technology</td>
</tr>
<tr>
<td>MAE 543</td>
<td>Advanced Mechanics of Materials</td>
</tr>
<tr>
<td>MAE 640</td>
<td>Continuum Mechanics</td>
</tr>
<tr>
<td>MAE 641</td>
<td>Theory of Elasticity 1</td>
</tr>
<tr>
<td>MAE 643</td>
<td>Inelastic Behavior of Engineering Materials</td>
</tr>
<tr>
<td>MAE 644</td>
<td>Fracture Mechanics</td>
</tr>
<tr>
<td>MAE 646</td>
<td>Advanced Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 687</td>
<td>Materials Engineering</td>
</tr>
<tr>
<td>MAE 650</td>
<td>Mechanical Metallurgy</td>
</tr>
<tr>
<td>PHYS 471</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>PHYS 771</td>
<td>Introduction to Solid State Physics</td>
</tr>
<tr>
<td>PHYS 772</td>
<td>Semiconductor Physics</td>
</tr>
<tr>
<td>PHYS 773</td>
<td>Collective Phenomena in Solids</td>
</tr>
<tr>
<td>PHYS 774</td>
<td>Optical Properties of Solids</td>
</tr>
</tbody>
</table>

Total Hours: 15

* Students completing the problem report option must take an additional 2 courses (6 credit hours) from either set of electives.

**Electrical Engineering Materials Area of Emphasis Requirements**

Select 4 of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE 466</td>
<td>Electronic Materials Processing</td>
</tr>
<tr>
<td>EE 435</td>
<td>Introduction to Power Electronics</td>
</tr>
<tr>
<td>EE 437</td>
<td>Fiber Optics Communications</td>
</tr>
<tr>
<td>EE 455</td>
<td>Introduction to Microfabrication</td>
</tr>
<tr>
<td>EE 457</td>
<td>Fundamentals of Photonics</td>
</tr>
<tr>
<td>EE 528</td>
<td>Biomedical Microdevices</td>
</tr>
<tr>
<td>EE 550</td>
<td>Advanced Semiconductor Electronics</td>
</tr>
<tr>
<td>EE 551</td>
<td>Linear Integrated Circuits</td>
</tr>
<tr>
<td>EE 650</td>
<td>Optoelectronics</td>
</tr>
<tr>
<td>PHYS 771</td>
<td>Introduction to Solid State Physics</td>
</tr>
<tr>
<td>PHYS 772</td>
<td>Semiconductor Physics</td>
</tr>
<tr>
<td>PHYS 773</td>
<td>Collective Phenomena in Solids</td>
</tr>
</tbody>
</table>

Select 1 additional course in consultation by the AEC.

Total Hours: 15

* Students completing the problem report option must take an additional 2 courses (6 credit hours).

**Mechanical Engineering Materials Area of Emphasis Requirements**

**MAE Electives**

Complete at least 2 of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAE 446</td>
<td>Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 528</td>
<td>Introduction to Fuel Cell Technology</td>
</tr>
<tr>
<td>MAE 543</td>
<td>Advanced Mechanics of Materials</td>
</tr>
<tr>
<td>MAE 640</td>
<td>Continuum Mechanics</td>
</tr>
<tr>
<td>MAE 641</td>
<td>Theory of Elasticity 1</td>
</tr>
<tr>
<td>MAE 643</td>
<td>Inelastic Behavior of Engineering Materials</td>
</tr>
<tr>
<td>MAE 644</td>
<td>Fracture Mechanics</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>MAE 646</td>
<td>Advanced Mechanics of Composite Materials</td>
</tr>
<tr>
<td>MAE 650</td>
<td>Mechanical Metallurgy</td>
</tr>
<tr>
<td>MAE 687</td>
<td>Materials Engineering</td>
</tr>
<tr>
<td><strong>Math and Science Electives</strong> *</td>
<td></td>
</tr>
<tr>
<td>Complete at least 2 of the following:</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CHE 531</td>
<td>Mathematical Methods in Chemical Engineering</td>
</tr>
<tr>
<td>EE 463</td>
<td>Digital Signal Processing Fundamentals</td>
</tr>
<tr>
<td>EE 465</td>
<td>Introduction to Digital Image Processing</td>
</tr>
<tr>
<td>EE 515</td>
<td>Linear Control Systems</td>
</tr>
<tr>
<td>EE 517</td>
<td>Optimal Control</td>
</tr>
<tr>
<td>IENG 518</td>
<td>Technology Forecasting</td>
</tr>
<tr>
<td>IENG 553</td>
<td>Applied Linear Programming</td>
</tr>
<tr>
<td>MAE 623</td>
<td>Conduction Heat Transfer</td>
</tr>
<tr>
<td>MAE 633</td>
<td>Computational Fluid Dynamics</td>
</tr>
<tr>
<td>MAE 640</td>
<td>Continuum Mechanics</td>
</tr>
<tr>
<td>MAE 645</td>
<td>Energy Methods in Applied Mechanics</td>
</tr>
<tr>
<td>MATH 420</td>
<td>Numerical Analysis 1</td>
</tr>
<tr>
<td>MATH 441</td>
<td>Applied Linear Algebra</td>
</tr>
<tr>
<td>MATH 456</td>
<td>Complex Variables</td>
</tr>
<tr>
<td>MATH 465</td>
<td>Partial Differential Equations</td>
</tr>
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<td>MATH 521</td>
<td>Numerical Analysis</td>
</tr>
<tr>
<td>MATH 522</td>
<td>Numerical Solution of PDE</td>
</tr>
<tr>
<td>MATH 541</td>
<td>Modern Algebra</td>
</tr>
<tr>
<td>MATH 543</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>MATH 545</td>
<td>Number Theory 1</td>
</tr>
<tr>
<td>MATH 551</td>
<td>Real Variables 1</td>
</tr>
<tr>
<td>MATH 555</td>
<td>Complex Variables 1</td>
</tr>
<tr>
<td>MATH 563</td>
<td>Mathematics Modeling</td>
</tr>
<tr>
<td>MATH 564</td>
<td>Intermediate Differential Equations</td>
</tr>
<tr>
<td>MATH 567</td>
<td>Advanced Calculus</td>
</tr>
<tr>
<td>MATH 568</td>
<td>Advanced Calculus</td>
</tr>
<tr>
<td>MATH 573</td>
<td>Graph Theory</td>
</tr>
<tr>
<td>PHYS 461</td>
<td>Thermodynamics and Statistical Mechanics</td>
</tr>
<tr>
<td>PHYS 611</td>
<td>Introduction to Mathematical Physics</td>
</tr>
<tr>
<td>STAT 513</td>
<td>Design of Experiments</td>
</tr>
<tr>
<td>STAT 545</td>
<td>Applied Regression Analysis</td>
</tr>
<tr>
<td>STAT 561</td>
<td>Theory of Statistics 1</td>
</tr>
<tr>
<td>STAT 562</td>
<td>Theory of Statistics 2</td>
</tr>
<tr>
<td><strong>Additional Electives</strong> *</td>
<td></td>
</tr>
<tr>
<td>Complete at least 1 of the following:</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHE 461</td>
<td>Polymer Science and Engineering</td>
</tr>
<tr>
<td>CHE 462</td>
<td>Polymer Processing</td>
</tr>
<tr>
<td>CHE 463</td>
<td>Polymer Composites Processing</td>
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<tr>
<td>CHE 615</td>
<td>Transport Phenomena</td>
</tr>
<tr>
<td>CHE 620</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>CHE 625</td>
<td>Chemical Reaction Engineering</td>
</tr>
<tr>
<td>CHE 720</td>
<td>Applied Statistical and Molecular Thermodynamics</td>
</tr>
<tr>
<td>CHE 761</td>
<td>Polymer Rheology</td>
</tr>
<tr>
<td>BMEG 482</td>
<td>Introduction to Tissue Engineering</td>
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Curriculum in Doctor of Philosophy – Materials Science and Engineering

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

Program Requirements

The doctor of philosophy degree with a major in materials science and 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 materials science and 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.

Course Requirements

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<th>Course Requirement</th>
<th>Hours</th>
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<tr>
<td>500-level or higher coursework</td>
<td>18</td>
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<tr>
<td>Seminar</td>
<td>2</td>
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<td>Research</td>
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Examinations

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<td>Qualifying Exam</td>
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<td>Candidacy Exam</td>
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<td>Final Exam</td>
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Total Hours

| Total Hours | 44    |

* Students admitted to the Ph.D. program must have completed or will need to complete the following set of core courses or equivalent: MAE 583, MAE 580, MAE 649.
Examinations

QUALIFYING EXAM

All students must take and pass a written qualifying examination. Normally, the qualifying examination is given no later than the end of the third semester of enrollment in their Ph.D. program. This examination is designed to assess the basic competency of students to determine whether or not they have sufficient knowledge of the discipline to undertake independent research. The structure of the Ph.D. qualifying examination for all students pursuing the Ph.D. degree in Materials Science and Engineering will be comprised of two components: a written examination that will test on the student’s knowledge in the three core areas studied in MAE 583 Thermodynamics and Kinetics of Materials, MAE 580 Crystallography and Crystals, and MAE 649 Microscopy of Materials or their equivalent, and a second examination that will be administered by the MS&E Faculty in the home department of the student’s Ph.D. advisor, and which should be consistent with the format used by that program/department for their qualifying exam. These two examinations will receive equal weighting in determining the student’s overall score on the qualifying examination. Students who do not pass either part or both parts of this exam on their initial attempt will be allowed a second attempt to pass either or both parts of the qualifying exam. If they are not successful on their second attempt, then they will be dismissed from the program.

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. After passing the qualifying examination, the student must submit to the AEC a written research proposal of his/her planned dissertation work and successfully defend it in an oral examination. The research proposal must be approved by the student’s AEC. A student who has successfully completed all coursework, passed the qualifying examination, and successfully defended the research proposal, and receives the college’s approval becomes a candidate for a Ph.D. degree. Thereafter, the student will officially be engaged in dissertation research.

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. 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.