Materials Science and Engineering, Ph.D.

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 and the Department of Mechanical, Materials, and Aerospace Engineering (MMAE).

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.

PUBLICATION REQUIREMENT FOR PHD STUDENTS

Prior to scheduling the dissertation defense, Ph.D. students are required to provide written documentation that they have received formal proof of submission of either:

a.) At least one manuscript, generally co-authored with their research supervisor and about some portion of their PhD dissertation research, to an archival journal for publication, or

b.) At least one patent disclosure, also generally about some portion of their PhD dissertation research.
This publication requirement will have to be satisfied prior to scheduling the defense of the Ph.D. Dissertation.

Curriculum Requirements (BS-PhD Pathway)

Code	Title	Hours
A minimum GPA of 3.0 is required in all courses.		
Coursework Requirements *		
MSEN 583	Thermodynamics and Kinetics of Materials	3
MSEN 580	Crystallography and Crystals	3
MSEN 649	Microscopy of Materials	3
Select courses from the following list:		21
CHE 531	Mathematical Methods in Chemical Engineering	
CHE 565	Corrosion Engineering	
CHE 625	Chemical Reaction Engineering	
CHE 615	Transport Phenomena	
CHE 720	Applied Statistical and Molecular Thermodynamics	
CHE 726	Catalysis	
CHEM 514	Mass Spectrometry Principles and Practices	
CHEM 521	Organometallic Chemistry	
CHEM 547	Chemical Crystallography	
CHEM 713	Electrochemistry and Instrumentation	
CHEM 723	Physical Methods in Inorganic Chemistry	
EE 528	Biomedial Microdevices	
EE 550	Advanced Semiconductor Electronics	
EE 551	Linear Integrated Circuits	
EE 650	Optoelectronics	
PHYS 771	Advanced Solid State Physics	
PHYS 772	Semiconductor Physics	
PHYS 773	Collective Phenomena in Solids	
PHYS 774	Optical Properties of Solids	

MAE 528	Introduction to Fuel Cell Technology	
MAE 543	Advanced Mechanics of Materials	
MAE 640	Continuum Mechanics	
MAE 643	Inelastic Behavior of Engineering Materials	
MAE 644	Fracture Mechanics	
MAE 645	Energy Methods in Applied Mechanics	
MAE 646	Advanced Mechanics of Composite Materials	
MAE 648 & 648L	Experimental Stress Analysis and Experimental Stress Analysis Laboratory	
MAE 687	Materials Engineering	
Any BIOM, BMEG, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, EXPH 583, or STAT courses 500-795, as approved by the student's AEC.		
Materials Science and Engineering Seminar		**2**
MSEN 686	Materials Science and Engineering Seminar	
Research		**24**
MAE 797	Research	
Milestones		
Plan of Study		
Qualifying Exam		
Candidacy Exam		
Publication Requirement		
Final Exam		
Dissertation		
Total Hours		56

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Students who do not hold a baccalaureate degree in materials science and engineering are required to take a set of undergraduate engineering course above and beyond the minimum coursework requirements

Curriculum Requirements (MS-PhD Pathway)

Code	Title	Hours
A minimum GPA of 3.0 is required in all courses.		
Coursework Requirements *		
MSEN 580	Crystallography and Crystals	3
MSEN 583	Thermodynamics and Kinetics of Materials	3
MSEN 649	Microscopy of Materials	3
Select courses from the following list:		9
CHE 531	Mathematical Methods in Chemical Engineering	
CHE 565	Corrosion Engineering	
CHE 615	Transport Phenomena	
CHE 625	Chemical Reaction Engineering	
CHE 720	Applied Statistical and Molecular Thermodynamics	
CHE 726	Catalysis	
CHEM 514	Mass Spectrometry Principles and Practices	
CHEM 521	Organometallic Chemistry	
CHEM 547	Chemical Crystallography	
CHEM 713	Electrochemistry and Instrumentation	
EE 528	Biomedial Microdevices	
EE 550	Advanced Semiconductor Electronics	
EE 551	Linear Integrated Circuits	
EE 650	Optoelectronics	
PHYS 771	Advanced Solid State Physics	
PHYS 772	Semiconductor Physics	

PHYS 773	Collective Phenomena in Solids	
PHYS 774	Optical Properties of Solids	
MAE 528	Introduction to Fuel Cell Technology	
MAE 543	Advanced Mechanics of Materials	
MAE 640	Continuum Mechanics	
MAE 643	Inelastic Behavior of Engineering Materials	
MAE 644	Fracture Mechanics	
MAE 645	Energy Methods in Applied Mechanics	
MAE 646	Advanced Mechanics of Composite Materials	
MAE 648 & 648L	Experimental Stress Analysis and Experimental Stress Analysis Laboratory	
MAE 687	Materials Engineering	
Any BIOM, BMEG, CE, CHE, CHEM, CPE, CS, EE, IENG, IH&S, MAE, MATH, MINE, PNGE, PHYS, SAFM, SENG, EXPH 583, or STAT courses 500-795, as approved by the student's AEC.		
Materials Science and Engineering Seminar		**2**
MSEN 686	Materials Science and Engineering Seminar	
Research		**24**
MAE 797	Research	
Milestones		
Plan of Study		
Qualifying Exam		
Candidacy Exam		
Publication Requirement		
Final Exam		
Dissertation		
Total Hours		44

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Students who do not hold a baccalaureate degree in materials science and engineering are required to take a set of undergraduate engineering course above and beyond the minimum coursework requirements

Examinations

QUALIFYING EXAM

All Ph.D. students must take and pass a written qualifying examination. 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 qualifying examination is administered by the Department of Mechanical, Materials, and Aerospace Engineering following the format specifically set forth for the MS&E Ph.D. degree 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, 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.

Major Learning Outcomes

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