Materials Science and Engineering, M.S.M.S.E.

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 as well as the specific requirements of the Statler College and the department of Mechanical and Aerospace Engineering.

Program Requirements

All M.S. degree candidates are required to 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

Code	Title	Hours
A minimum cumulative GPA of 3.0 is required in all courses		
Course Requirements		
A maximum of three 3-credit courses at the 400 level will be accepted towards the coursework requirements.		
Plan of Study		
Core Courses		
MSEN 583	Thermodynamics and Kinetics of Materials	3
MSEN 580	Crystallography and Crystals	3
MSEN 649	Microscopy of Materials	3
MSEN 686	Materials Science and Engineering Seminar	1
Complete 1 of the following options:		21
Thesis Option		
Technical Electives or Mathematics Technical Electives(15 hours)		
MAE 697	Research (6 hours)	
Final Oral or Written Examination		
Thesis		
Problem Report Option		
Technical Electives or Mathematics Technical Electives (18 hours)		
MAE 697	Research (3 hours)	
Final Oral or Written Examination		
Formal written report or professional report/paper		
Total Hours		31

Technical Electives

Code	Title	Hours
MAE 446	Mechanics of Composite Materials	3
MAE 528	Introduction to Fuel Cell Technology	3
MAE 543	Advanced Mechanics of Materials	3
MAE 593	Special Topics (Requires AEC approval)	1-6
MAE 640	Continuum Mechanics	3
MAE 641	Theory of Elasticity 1	3
MAE 643	Inelastic Behavior of Engineering Materials	3
MAE 645	Energy Methods in Applied Mechanics	3
MAE 646	Advanced Mechanics of Composite Materials	3
MAE 648 & 648L	Experimental Stress Analysis and Experimental Stress Analysis Laboratory	3
MAE 687	Materials Engineering	3
CHE 461	Polymer Science and Engineering	3
CHE 462	Polymer Processing	3

CHE 463	Polymer Composites Processing	3
CHE 466	Electronic Materials Processing	3
CHE 471	Biochemical Engineering	3
CHE 565	Corrosion Engineering	3
CHE 720	Applied Statistical and Molecular Thermodynamics	3
CHE 726	Catalysis	3
CHEM 422	Inorganic Chemistry 2	3
CHEM 422L	Inorganic Synthesis Laboratory	2
CHEM 444	Colloid and Surface Chemistry	3
CHEM 514	Mass Spectrometry Principles and Practices	3
CHEM 521	Organometallic Chemistry	3
CHEM 547	Chemical Crystallography	3
CHEM 713	Electrochemistry and Instrumentation	3
CHEM 723	Physical Methods in Inorganic Chemistry	3
EE 528	Biomedial Microdevices	3
EE 550	Advanced Semiconductor Electronics	3
EE 650	Optoelectronics	3
PHYS 471	Solid State Physics	3
PHYS 771	Advanced Solid State Physics	3
PHYS 772	Semiconductor Physics	3
PHYS 773	Collective Phenomena in Solids	3
PHYS 774	Optical Properties of Solids	3

Mathematics Technical Electives

Code	Title	Hours
CHE 531	Mathematical Methods in Chemical Engineering	3
EE 463	Digital Signal Processing Fundamentals	3
EE 465	Introduction to Digital Image Processing	3
EE 515	Linear Control Systems	3
EE 517	Optimal Control	3
IENG 518	Technology Forecasting	3
IENG 553	Applied Linear Programming	3
MAE 515	Analytical Methods in Engineering	3
MAE 623	Conduction Heat Transfer	3
MAE 633	Computational Fluid Dynamics	3
MAE 640	Continuum Mechanics	3
MAE 645	Energy Methods in Applied Mechanics	3
MATH 420	Numerical Analysis 1	3
MATH 441	Applied Linear Algebra	3
MATH 456	Complex Variables	3
MATH 521	Numerical Analysis	3
MATH 522	Numerical Solution of PDE	3
MATH 541	Modern Algebra 1	3
MATH 543	Linear Algebra	3
MATH 545	Number Theory 1	3
MATH 551	Real Variables 1	3
MATH 555	Complex Variables 1	3
MATH 560	Introduction to Dynamical Systems and Applications	3
MATH 563	Mathematical Modeling	3
MATH 564	Intermediate Differential Equations	3
MATH 566	Intermediate Partial Differential Equations	3
MATH 567	Advanced Calculus 1	3

MATH 568	Advanced Calculus	3
MATH 573	Graph Theory	3
STAT 513	Design of Experiments	3
STAT 545	Applied Regression Analysis	3
STAT 561	Theory of Probability and Statistics 1	3
STAT 562	Theory of Probability and Statistics 2	3
PHYS 461	Thermodynamics and Statistical Mechanics	3
PHYS 611	Introduction to Mathematical Physics	3

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 one and a half years is as follows.

First Year			
Fall	**Hours**	**Spring**	**Hours**
MSEN 580	3	Technical Elective 1	3
MSEN 583	3	Technical Elective 2	3
MSEN 649	3	Technical Elective 3	3
MSEN 686	1	MAE 697	3
	10		12
Second Year			
Fall	**Hours**		
Technical Elective 4	3		
Technical Elective 5	3		
MAE 697	3		
	9		

Total credit hours: 31

Major Learning Outcomes

MASTER OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING (MSMSE)

Upon graduation with a Master of Science degree in Materials Science and Engineering, students will have:

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