MASTER OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING

Materials Science and Engineering (MSE) research is aimed at educating and training the next generation of out-of-the box thinkers to solve the biggest global challenges.

By fostering a multidisciplinary approach, MSE degree programs strive to endow students with the tools to strategically question current design paradigms and drive innovative materials and manufacturing solutions across a diverse range of sectors. Motivated by modern materials challenges in energy, computing, transportation, impact protection, robotics, and global health care, MSE programs' comprehensive, experiential training is designed to arm graduates with a modernized skill set tailored to confront those challenges head-on.

MSE degree programs are designed to engage students with:

- Active hands-on training in the latest materials characterization and computational methods, materials-focused intellectual property protection and technology transfer, and professional soft skill development.
- Enhanced educational opportunities promoted through industry partnerships, facilitating internships, and class time spent in active commercial manufacturing labs.
- A diverse core of faculty mentors driving advances in controlling structure at the nanoscale, predictive property modeling, high-performance metal, polymer and ceramic composites, photovoltaics, and additive manufacturing.

The overall objective of the **Materials Science and Engineering MS-Thesis, Plan A (coursework + thesis) and the MS-Coursework, Plan B (coursework + seminar/paper)** degrees is to develop students to be science and engineering professionals who use their multidisciplinary problem-solving skills to address global challenges in the field of materials science and engineering.

Students interested in graduate work should refer to the Graduate and Professional Bulletin (http://catalog.colostate.edu/general-catalog/graduate-bulletin/).

Learning Objectives

Similar to the CSU's Land Grant mission of extension, education, and research, the specific learning objectives for the MSE programs are centered on the following three themes:

1. Scholarly engagement and research
2. Educational engagement
3. Innovation

Scholarly engagement and research

Students will:

1. Graduate with an understanding of cross-disciplinary materials research in physics, engineering, and chemistry.

Educational engagement

Students will:

1. Synthesize and connect knowledge from the different disciplines of materials research to complete course work and research for their degree.
2. Communicate their science to a wide range of audiences.
3. Understand the life-cycle of materials – from design to manufacture.
4. Engage in team science where they will work with different faculty and different disciplines to answer important and innovative research questions.

Innovation

Students will:

1. Gain experience working in an interdisciplinary research setting to enable them to solve complex real-world problems.
2. Graduate with knowledge and skills necessary to assume careers in a wide variety of organizations and industries related to materials.
3. Understand how their skills are important in solving global-problems.

Diversity

Students will:

1. Gain an appreciation of different disciplines, as well as different approaches to problem solving so they can actively participate in global learning environments.

Plan A
Effective Fall 2024

Code	Title	Credits
Core Courses		
MSE 501	Materials Technology Transfer	1
MSE 502A	Materials Science and Engineering Methods: Materials Structure and Scattering	1
MSE 502B	Materials Science and Engineering Methods: Computational Materials Methods	1
MSE 503	Mechanical Behavior of Materials	3
MSE 504	Thermodynamics of Materials	3
MSE 699	Thesis [1]	3
Select two credits from the following:		2
MSE 793A	Professional Development Seminar: MSE, Diversity, Equity, and Inclusion	
MSE 793B	Professional Development Seminar: Materials and Society	
MSE 793C	Professional Development Seminar: Materials Science Engineering Careers	
Select at least one course from the following:		1
MSE 502C	Materials Science and Engineering Methods: Materials Microscopy	
MSE 502D	Materials Science and Engineering Methods: Materials Spectroscopy	
MSE 502E	Materials Science and Engineering Methods: Bulk Properties and Performance	

MSE 502F	Materials Science and Engineering Methods: Experimental Methods for Materials Research	
Select one course from the following:		3
CHEM 511	Solid State Chemistry	
CHEM 517	Chemistry of Electronic Materials	
ECE 574	Optical Properties in Solids	
PH 531	Introductory Condensed Matter Physics	
Specialty Course(s)		**3**
Select at least 3 credits from the following: [2]		
BIOM 570/ MECH 570	Bioengineering	
BIOM 592	Seminar	
CBE 501	Chemical Engineering Thermodynamics	
CBE 514	Polymer Science and Engineering	
CHEM 515	Polymer Chemistry	
CHEM 550A	Materials Chemistry: Hard Materials	
CHEM 550B	Materials Chemistry: Soft Materials	
CHEM 550C	Materials Chemistry: Nanomaterials	
CHEM 567	Crystallographic Computation	
CHEM 569	Chemical Crystallography	
CHEM 577	Surface Chemistry	
CIVE 560	Advanced Mechanics of Materials	
CIVE 565	Finite Element Method	
CIVE 662	Foundations of Solid Mechanics	
CIVE 664	Mechanics of Fatigue and Fracture	
ECE 505	Nanostructures Fundamentals and Applications	
ECE 569/ MECH 569	Micro-Electro-Mechanical Devices	
ECE 673	Thin Film Growth	
GRAD 544	Ethical Conduct of Research	
MATH 535	Foundations of Applied Mathematics	
MATH 550/ ENGR 550	Numerical Methods in Science and Engineering	
MATH 560	Linear Algebra	
MATH 561	Numerical Analysis I	
MATH 750	Numerical Methods and Models I	
MECH 525/ BIOM 525	Cell and Tissue Engineering	
MECH 530	Advanced Composite Materials	
MECH 531/ BIOM 531	Materials Engineering	
MECH 532/ BIOM 532	Materials Issues in Mechanical Design	
MECH 573/ BIOM 573	Structure and Function of Biomaterials	
MECH 628	Applied Fracture Mechanics	
MSE 505	Kinetics of Materials	
PH 631	Modern Topics in Condensed Matter Physics	
PH 731	Condensed Matter Theory	
Research and Teaching		
The M.S. Plan A requires a minimum of 30 credit hours, some of which may be fulfilled with the following		
MSE 651	Special Topics in Materials Science	
MSE 695	Independent Study	
MSE 784	Supervised College Teaching	
Program Total Credits		**30**

A minimum of 30 credits are required to complete this program.

1 Complete a minimum of 3 credits of MSE 699.
2 CHEM 511, CHEM 517, ECE 574, and PH 531 can be used as specialty courses, if not used to fulfill core requirements.

Plan B Effective Fall 2024

Code	Title	Credits
Core Courses		
MSE 501	Materials Technology Transfer	1
MSE 502A	Materials Science and Engineering Methods: Materials Structure and Scattering	1
MSE 502B	Materials Science and Engineering Methods: Computational Materials Methods	1
MSE 503	Mechanical Behavior of Materials	3
MSE 504	Thermodynamics of Materials	3
MSE 695	Independent Study [1]	3
Select two credits from the following:		2
MSE 793A	Professional Development Seminar: MSE, Diversity, Equity, and Inclusion	
MSE 793B	Professional Development Seminar: Materials and Society	
MSE 793C	Professional Development Seminar: Materials Science Engineering Careers	
Select at least one course from the following:		1
MSE 502C	Materials Science and Engineering Methods: Materials Microscopy	
MSE 502D	Materials Science and Engineering Methods: Materials Spectroscopy	
MSE 502E	Materials Science and Engineering Methods: Bulk Properties and Performance	
MSE 502F	Materials Science and Engineering Methods: Experimental Methods for Materials Research	
Select one course from the following:		3
CHEM 511	Solid State Chemistry	
CHEM 517	Chemistry of Electronic Materials	
ECE 574	Optical Properties in Solids	
PH 531	Introductory Condensed Matter Physics	
Specialty Courses		**6**
Select at least 6 credits from the following: [2]		
BIOM 570/ MECH 570	Bioengineering	
BIOM 592	Seminar	

CBE 501	Chemical Engineering Thermodynamics
CBE 514	Polymer Science and Engineering
CHEM 515	Polymer Chemistry
CHEM 550A	Materials Chemistry: Hard Materials
CHEM 550B	Materials Chemistry: Soft Materials
CHEM 550C	Materials Chemistry: Nanomaterials
CHEM 567	Crystallographic Computation
CHEM 569	Chemical Crystallography
CHEM 577	Surface Chemistry
CIVE 560	Advanced Mechanics of Materials
CIVE 565	Finite Element Method
CIVE 662	Foundations of Solid Mechanics
CIVE 664	Mechanics of Fatigue and Fracture
ECE 505	Nanostructures Fundamentals and Applications
ECE 569/ MECH 569	Micro-Electro-Mechanical Devices
ECE 673	Thin Film Growth
GRAD 544	Ethical Conduct of Research
MATH 535	Foundations of Applied Mathematics
MATH 550/ ENGR 550	Numerical Methods in Science and Engineering
MATH 560	Linear Algebra
MATH 561	Numerical Analysis I
MATH 750	Numerical Methods and Models I
MECH 525/ BIOM 525	Cell and Tissue Engineering
MECH 530	Advanced Composite Materials
MECH 531/ BIOM 531	Materials Engineering
MECH 532/ BIOM 532	Materials Issues in Mechanical Design
MECH 573/ BIOM 573	Structure and Function of Biomaterials
MECH 628	Applied Fracture Mechanics
MSE 505	Kinetics of Materials
PH 631	Modern Topics in Condensed Matter Physics
PH 731	Condensed Matter Theory
Research and Teaching	
The M.S. Plan B requires a minimum of 30 credit hours, some of which may be fulfilled with the following	
MSE 651	Special Topics in Materials Science
MSE 784	Supervised College Teaching
Program Total Credits	**30**

A minimum of 30 credits are required to complete this program.

1 A project/report will be required for satisfactory completion of MSE 695; complete a minimum of 3 credits.

2 CHEM 511, CHEM 517, ECE 574, and PH 531 can be used as specialty courses, if not used to fulfill core requirements.

Requirements for All Graduate Degrees

For more information, please visit Requirements for All Graduate Degrees (http://catalog.colostate.edu/general-catalog/graduate-bulletin/graduate-study/procedures-requirements-all-degrees/) in the Graduate and Professional Bulletin (http://catalog.colostate.edu/general-catalog/graduate-bulletin/).

Summary of Procedures for the Master's and Doctoral Degrees

NOTE: Each semester the Graduate School publishes a schedule of deadlines. Deadlines are available on the Graduate School website (https://graduateschool.colostate.edu/deadline-dates/). Students should consult this schedule whenever they approach important steps in their careers.

Forms (https://graduateschool.colostate.edu/forms/) are available online.

Step	Due Date
1. Application for admission (online)	Six months before first registration
2. Diagnostic examination when required	Before first registration
3. Appointment of advisor	Before first registration
4. Selection of graduate committee	Before the time of fourth regular semester registration
5. Filing of program of study (GS Form 6)	Before the time of fourth regular semester registration
6. Preliminary examination (Ph.D. and PD)	Two terms prior to final examination
7. Report of preliminary examination (GS Form 16) - (Ph.D. and PD)	Within two working days after results are known
8. Changes in committee (GS Form 9A)	When change is made
9. Application for Graduation (GS Form 25)	Refer to published deadlines from the Graduate School Website
9a. Reapplication for Graduation (online)	Failure to graduate requires Reapplication for Graduation (online) for the next time term for which you are applying
10. Submit thesis or dissertation to committee	At least two weeks prior to the examination or at the discretion of the graduate committee
11. Final examination	Refer to published deadlines from the Graduate School Website
12. Report of final examination (GS Form 24)	Within two working days after results are known; refer to published deadlines from the Graduate School website
13. Submit a signed Thesis/ Dissertation Submission Form (GS Form 30) to the Graduate School and Submit the Survey of Earned Doctorates (Ph.D. only) prior to submitting the electronic thesis/ dissertation	Refer to published deadlines from the Graduate School website.
14. Submit the thesis/dissertation electronically	Refer to published deadlines from the Graduate School website

15. Graduation	Ceremony information is available from the Graduate School website