

Department of Materials Science and Engineering

Program of Materials Science and Engineering for International Students (2024)

I. Introduction

The major of Materials Science and Engineering is a discipline, which systematically studies fundamental theories and experiment skills of materials science and engineering as well as applies these knowledge/abilities for materials' syntheses, preparation, structure characterization/evaluation, and performance controlling in various broad fields based on the principles of materials science, chemistry, and physics. Materials Science and Engineering is an integrated discipline for application science closely related to engineering technology.

Materials are the bases for human survival and development. In the 1970s, people viewed information, materials, and energy as the mainstay of social civilization. In the 1980s, with the rise of high technologies, materials science, information technology, and biotechnology were listed as important symbols of the new technology revolution. Nowadays, materials have become important parts of the national economy, national defense, and people's livelihood.

Academic subject areas: Materials

Program code: 080401

II. Objectives and Learning Outcomes

Materials Science and Engineering (MSE) will cultivate high-quality science and technology talents with firm theoretical knowledge of Materials Science and Engineering, abilities of mastering frontier materials' R&D and characterization techniques, and capabilities of utilizing English and computer technology very well for high-tech R&D in interdisciplinary fields. These trained students possess the capability not only for researching in their disciplines and related fields, designing and developing new materials, teaching and managing, but also for practice innovation, cooperation, and leadership. These graduates can not only engage in conventional material industrial production, new materials creation, and development of new processes and technologies, but also continue their postgraduate studies in Materials Science and Engineering

and serve in the research, development, and management in top-ranked corporations, scientific research institutes, colleges, and government.

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years.

2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor’s degree in engineering.

3. The minimum credit requirement for graduation: 161 credits. The specific requirements are as follows.

Module		Category	Minimum Credit Requirement
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
		Chinese Studies	2
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
Geoscience + Life Science		3	
GE to Majors Bridging Module	Introduction to Majors	2	
Major Courses	Major Required Courses	Major Foundational Courses	33
		Major Core Courses	17
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	16
	Major Elective Courses	Major Elective Courses	16
Total			161
<p>Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module (Foreign Languages & Writing) , Humanities and Social Sciences Module, and GE to Majors Bridging Module.</p>			

IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA117	Calculus I	4	1 Fall	None	MATH
	MA127	Calculus II	4	1 Spring	Calculus I	
	MA113	Linear Algebra	4	1 Spring & Fall	None	
Physics	PHY105	College Physics I	4	1 Fall	None	PHY
	PHY106	College Physics II	4	1 Spring	College Physics I	
	PHY104 B	Experiments of Fundamental Physics	2	1-2 Spring & Fall	None	
Chemistry	CH103/ CH105	General Chemistry/ Chemistry: the Central Science	4/3	1-2 Spring & Fall	None	CHEM
Geoscience + Life science	BIO103/ BIO102 B/ EOE100	Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences	3	1-2 Spring & Fall	None	DBIO, ESS, OCE, ESE
Computer Programming	CS109/ CS110/ CS111/ CS112/ CS113	Introduction to Computer Programming / Introduction to Java Programming / Introduction to C Programming / Introduction to Python Programming / Introduction to Matlab Programming	3	1-2 Spring & Fall	None	CSE

V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of the first academic year	MA117	Calculus I	None
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	College Physics I
	PHY104B	Experiments of Fundamental Physics	None
	CH103/CH105	General Chemistry/ Chemistry: the Central Science	None
	Notes: At least 5 of the above courses will be completed in the first year, and the results should be qualified. For Mathematics, students who have completed MA101a & MA102a are not required to take MA117 & MA127. For Physics, students who have completed PHY101 & PHY102 are not required to take PHY105 & PHY106.		
Declare major at the end of the second academic year	MA117	Calculus I	None
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	College Physics I
	PHY104B	Experiments of Fundamental Physics	None
	CH103/CH105	General Chemistry/ Chemistry: the Central Science	None
	BIO103/BIO102B/EOE100	Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences	None
	CS109/CS110/CS111/CS112/CS113	Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C Programming/ Introduction to Python Programming/ Introduction to Matlab Programming	None
Notes: All of the above courses should be completed in the second year, and the results should be qualified. For Mathematics, students who have completed MA101a & MA102a are not required to take MA117 & MA127. For Physics, students who have completed PHY101 & PHY102 are not required to take PHY105 & PHY106.			
Note:			
<ol style="list-style-type: none"> 1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year. 2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year. 3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance). 4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance). 			

VI: Major Course Arrangement

Table 1: Major Required Courses

Program of Materials Science and Engineering

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	ME102	CAD Engineering Drawing	3	1.5	1 Spring	None	MEE
	MSE001	Fundamentals of Materials Science and Engineering*	3		2 Fall	PHY106 CH103/CH105	MSE
	MSE002	Experiments for Fundamentals of Materials Science and Engineering*	1	1	2 Fall	PHY106 CH103/CH105	MSE
	MSE205	Fundamentals of Circuits and Electronics	3		2 Fall	MA127 PHY106	MSE
	MSE203	Crystallography	2		2 Fall	None	MSE
	MSE213	Mechanics of Materials B	3		2 Spring	None	MSE
	MSE202	Physical Chemistry*	3		2 Spring	MA127 CH103/ CH105	MSE
	MSE204	Physical Chemistry Experiments*	1	1	2 Spring	MA127 CH103/ CH105	MSE
	MSE301	Materials Chemistry	3		3 Fall	MSE001 MSE002	MSE
	MSE307	Comprehensive Experiments of Materials I	4	4	3 Fall	MSE001 MSE002	MSE
	MSE328	Physics of Materials	3		3 Spring	MA127 MSE001	MSE
	MSE304	Comprehensive Experiments of Materials II	4	4	3 Spring	MSE307	MSE
	Total			33	11.5		
Note: *Please choose MSE001 and MSE002 at the same semester; Please choose MSE202 and MSE204 at the same semester.							
Major Core Courses	MSE306	Materials Characterization Techniques	3		2 Spring	MSE001	MSE
	MSE313	Polymer Materials	3		2 Spring	MSE001	MSE
	MSE319	Physical Metallurgy A	3		3 Fall	MSE001 MSE002	MSE
	MSE317	Ceramic Materials	3		3 Fall	MSE001	MSE
	MSE345	Experiments for Advanced Materials Science and Engineering I	1	1	3 Fall	MSE002	MSE
	MSE311	Thermodynamics of Materials	3		3 Spring	MSE001	MSE
	MSE346	Experiments for Advanced Materials Science and Engineering II	1	1	3 Spring	MSE345	MSE
	Total			17	2		
Practice-based Courses	MSE470-17	Industrial Practice	4	4	3 Summer	None	MSE
	MSE492	Thesis (Graduation Project)*	12	12	4 Spring	None	MSE
	Total			16	16		
Note: *Students who have completed Comprehensive Design I&II (COE493 & COE494) are not required to							

	take the MSE492 Thesis (Graduation Project).			
Total		66	29.5	

Table 2: Major Elective Courses

Program of Materials Science and Engineering

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.	
Restricted Electives Courses	Materials Chemistry Track							
	MSE210	General Organic Chemistry*	3		2 Spring	CH103/CH105	MSE	
	MSE212	Basic Experiments for Organic Chemistry*	1	1	2 Spring	CH103/CH105	MSE	
	MSE332	Fundamentals of Electrochemistry	3		3 Fall	None	MSE	
	MSE325	Functional Polymers	3		3 Fall	None	MSE	
	MSE338	Biomaterials*	2		3 Spring	MSE001	MSE	
	MSE340	Experiments for Biomaterials*	2	2	3 Spring	MSE002	MSE	
	Total			14	3			
	Materials Physics Track							
	MSE344	Applied Quantum Mechanics	3		2 Spring	PHY106	MSE	
	MSE335	Applied Solid State Physics	3		3 Fall	MSE344	MSE	
	MSE310	Semiconducting Materials, Devices and Technology	3		3 Spring	MSE001	MSE	
	MSE5021	Computational Materials Science	3		3 Spring	None	MSE	
	MSE338	Biomaterials*	2		3 Spring	MSE001	MSE	
	MSE340	Experiments for Biomaterials*	2	2	3 Spring	MSE002	MSE	
	Total			16	2			
Note:								
1. The Restricted Electives Courses are divided into Materials Physics Track and Materials Chemistry Track. Under the guidance of the research tutor, the students should choose at least 8 credits in one direction.								
2. MSE210 & MSE212 , MSE338 & MSE340 are co-required courses, please take them in the same semester. Both courses co-required must be completed, and their credits can count as Restricted Electives Courses.								
Unrestricted Electives Courses	MSE103	Magic Materials	1	1	1 Fall	None	MSE	
	MA212	Probability and Statistics	3		2 Fall	MA127	MATH	
	MSE207	Engineering Mathematical Physics	3		2 Fall	MA127 MA113	MSE	
	MSE209	Heat and Mass Transfer	3		2 Spring	MA127 PHY106	MSE	
	MSE356	Electronic Information Materials and Devices	3		3 Fall	MSE001	MSE	
	MSE413	3D Printing and Laser-based Additive Manufacturing	3		3 Fall	None	MSE	
	MSE407	Advanced Thin Film Technology	3		3 Fall	None	MSE	
	MSE322	Composite Materials	3		3 Spring	None	MSE	
	MSE337	Crystal Growth	3		3 Spring	MSE001	MSE	
	MSE339	Optical Materials and Devices	3		3 Spring	PHY106	MSE	
	MSE349	Integrated Circuit Processing	3		3 Spring	MSE001	MSE	

		Technology					
MSE320	Introduction to Photovoltaics and Photo-thermal	3		3 Spring	None	MSE	
MSE410	Experiments of Circuit Design	2	2	4 Fall	MSE205	MSE	
MSE404	Electronic Component Reliability and Failure Analysis	3		4 Fall	MSE306	MSE	
MSE480	Projects of Science and Technology Innovation	2	2	3-4 Spring & Fall	None	MSE	
Total		41	5				
Notes: At least 8 credits are required for Unrestricted Electives Courses.							

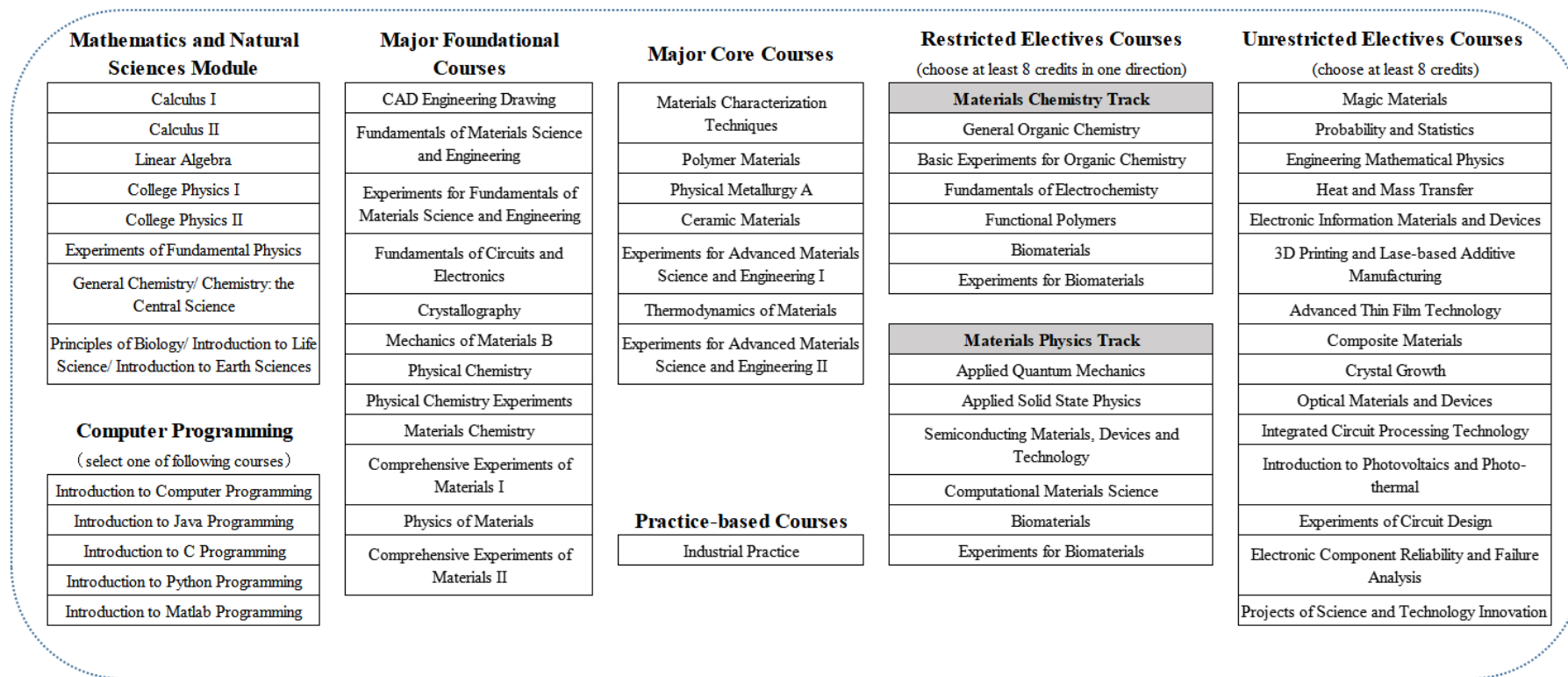
Table 3: Overview of Practice-based Learning

Program of Materials Science and Engineering

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.	
MSE103	Magic Materials	1	1	1 Fall	None	MSE	
ME102	CAD Engineering Drawing	3	1.5	1 Spring	None	MEE	
MSE002	Experiments for Fundamentals of Materials Science and Engineering	1	1	2 Fall	PHY106 CH103/CH105	MSE	
MSE204	Physical Chemistry Experiments	1	1	2 Spring	MA127 CH103/CH105	MSE	
MSE212	Basic Experiments for Organic Chemistry	1	1	2 Spring	CH103/CH105	MSE	
MSE307	Comprehensive Experiments of Materials I	4	4	3 Fall	MSE001 MSE002	MSE	
MSE345	Experiments for Advanced Materials Science and Engineering I	1	1	3 Fall	MSE002	MSE	
MSE304	Comprehensive Experiments of Materials II	4	4	3 Spring	MSE307	MSE	
MSE346	Experiments for Advanced Materials Science and Engineering II	1	1	3 Spring	MSE345	MSE	
MSE340	Experiments for Biomaterials	2	2	3 Spring	MSE002	MSE	
MSE410	Experiments of Circuit Design	2	2	4 Fall	MSE205	MSE	
MSE480	Projects of Science and Technology Innovation	2	2	3-4 Spring & Fall	None	MSE	
MSE470-17	Industrial Practice	4	4	3 Summer	None	MSE	
MSE492	Thesis (Graduation Project)	12	12	4 Spring	None	MSE	
Total		39	37.5				

Curriculum Structure of Materials Science and Engineering

Materials Science and Engineering



Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module (Foreign Languages & Writing), Humanities and Social Sciences Module, and GE to Majors Bridging Module.



Thesis (Graduation Project)