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	
	Chinese Language and Culture Module	Chinese Language and Culture	16	
	Arts and Physical Education	Physical Education	4	
	Module	Arts	2	
		Computer Programming	3	
	Competence Development Module	Writing	2	
		Foreign Languages	14	
		Humanities		
General Education Courses	Humanities and Social Sciences Module	Social Sciences	6	
	Serences module	Chinese Studies	2	
		Mathematics	12	
	Mathematics and Natural Sciences Module	Physics	10	
		Chemistry	3	
		Geoscience + Life Science	3	
	GE to Majors Bridging Module	Introduction to Majors	2	
		Major Foundational Courses	33	
	Major Required Courses	Major Core Courses	17	
Major Courses	Major Required Courses	Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	16	
	Major Elective Courses Major Elective Courses		16	
	Total		161	
Arts and Physical I		t for more details on Chinese Language and evelopment Module (Foreign Languages Majors Bridging Module.		

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
	MA117	Calculus I	4	1 Fall	None	
Mathematics	MA127	Calculus II	4	1 Spring	Calculus I	MATH
	MA113	Linear Algebra	4	1 Spring & Fall	None	
	PHY105	College Physics I	4	1 Fall	None	
Physics	PHY106	College Physics II	4	1 Spring	College Physics I	РНҮ
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 + BIO103/ Life science B/ FOE100		Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences	3	1-2 Spring & Fall	None	DBIO, ESS, OCE, ESE
Computer Programming	Introduction to Computer Programming / CS109/ Introduction to Java CS110/ Programming / CS111/ Introduction to C		3	1-2 Spring & Fall	None	CSE

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

Programming

V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite		
	MA117	Calculus I	None		
	MA127	Calculus II	Calculus I		
	MA113	MA113 Linear Algebra			
	PHY105 College Physics I		None		
Declare major at the end of the first	PHY106	College Physics II	College Physics I		
academic year	PHY104B	Experiments of Fundamental Physics	None		
	CH103/CH105	General Chemistry/ Chemistry: the Central Science	None		
	should be qualified. are not required to	the above courses will be completed in the first y For Mathematics, students who have completed M take MA117 & MA127. For Physics, students w are not required to take PHY105 & PHY106.	IA101a & MA102a		
	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		
Declare major at	PHY104B	Experiments of Fundamental Physics	None		
the end of the second academic	CH103/CH105	General Chemistry/ Chemistry: the Central Science	None		
year	BIO103/BIO102B/ EOE100	Principles of Biology/ Introduction to Life Science/ Introduction to Earth Sciences	None		
	CS109/CS110/CS1 11/CS112/CS113	Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C Programming/ Introduction to Python Programming/ Introduction to Matlab Programming	None		
Note:	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:

- 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

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
	ME102	CAD Engineering Drawing	3	1.5	1 Spring	None	MEE
	MSE001	Fundamentals of Materials Science and Engineering*	3		2 Fall	PHY106 CH103/CH10 5	MSE
	MSE002	Experiments for Fundamentals of Materials Science and Engineering*	1	1	2 Fall	PHY106 CH103/CH10 5	MSE
	MSE205	Fundamentals of Circuits and Electronics	3		2 Fall	MA127 PHY106	MSE
7	MSE203	Crystallography	2		2 Fall	None	MSE
Maj	MSE213	Mechanics of Materials B	3		2 Spring	None	MSE
Major Foundational Courses	MSE202	Physical Chemistry*	3		2 Spring	MA127 CH103/ CH105	MSE
ational C	MSE204	MSE204 Physical Chemistry Experiments*		1	2 Spring	MA127 CH103/ CH105	MSE
-	MSE301	,			3 Fall	MSE001 MSE002	MSE
	MSE307	1SE307 Comprehensive Experiments of Materials I		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			
	Please ch	oose MSE001 and MSE002 at oose MSE202 and MSE204 at Materials Characterization	the same s				
	MSE306	Techniques	3		2 Spring	MSE001	MSE
	MSE313	Polymer Materials	3		2 Spring	MSE001	MSE
Maj	MSE319	Physical Metallurgy A	3		3 Fall	MSE001 MSE002	MSE
or (MSE317	Ceramic Materials	3		3 Fall	MSE001	MSE
or Core Courses	MSE345	Experiments for Advanced Materials Science and Engineering I	1	1	3 Fall	MSE002	MSE
ırse	MSE311	Thermodynamics of Materials	3		3 Spring	MSE001	MSE
ø	MSE346	MSE346 Experiments for Advanced MSE346 Materials Science and Engineering II		1	3 Spring	MSE345	MSE
		Total	17	2			
Pra	MSE470-1 7	Industrial Practice	4	4	3 Summer	None	MSE
ctic Cou	MSE492	Thesis (Graduation Project)*	12	12	4 Spring	None	MSE
Practice-based Courses		Total	16	16			
ised	Note: *Students v	who have completed Comprehe	ensive Des	ign I&II (COE4	93 & COE	(494) are not re	quired t

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

Table 2: Major Elective Courses

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Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
		Mate	rials Chen	nistry Track			
	MSE210	General Organic Chemistry*	3		2 Spring	CH103/CH10 5	MSE
	MSE212	Basic Experiments for Organic Chemistry*	1	1	2 Spring	CH103/CH10 5	MSE
	MSE332	Fundamentals of Electrochemisty	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
Re	Total		14	3			
stri		Mat	terials Phy	sics Track		I I	
cted	MSE344	Applied Quantum Mechanics	3		2 Spring	PHY106	MSE
Ele	MSE335			3 Fall	MSE344	MSE	
Restricted Electives Courses	MSE310	Semiconducting Materials, Devices and Technology	3		3 Spring	MSE001	MSE
Cours	MSE5021	Computational Materials Science	3		3 Spring	None	MSE
es	MSE338	Biomaterials*	2		3 Spring	MSE001	MSE
	MSE340	Experiments for Biomaterials*	2	2	3 Spring	MSE002	MSE
		Total	16	2			
		icted Electives Courses are div r the guidance of the research					
	semester. Bo	& MSE212 , MSE338 & MSE th courses co-required must be	E340 are c	o-required cours	ses, pleas	e take them in	the same
	semester. Bo Courses.	th courses co-required must be	E340 are c completed,	o-required cours , and their credit	ses, pleas	e take them in nt as Restricted	the same Electives
	semester. Bo Courses. MSE103	th courses co-required must be Magic Materials	E340 are c completed, 1	o-required cours	ses, pleaso is can cou 1 Fall	e take them in nt as Restricted None	the same Electives MSE
	semester. Bo Courses.	th courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical	E340 are c completed,	o-required cours , and their credit	ses, pleas	e take them in nt as Restricted None MA127 MA127	the same Electives
Unrestr	semester. Bo Courses. MSE103 MA212	th courses co-required must be Magic Materials Probability and Statistics	2340 are c completed, 1 3	o-required cours , and their credit	ses, please s can cou 1 Fall 2 Fall	e take them in nt as Restricted None MA127 MA127 MA113 MA127	the same Electives MSE MATH
Unrestricted E	semester. Bo Courses. MSE103 MA212 MSE207	th courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics	C340 are c completed, 1 3 3	o-required cours , and their credit	ses, please s can cou 1 Fall 2 Fall 2 Fall	e take them in nt as Restricted None MA127 MA127 MA113	the same Electives MSE MATH MSE
Unrestricted Elective	semester. Bo Courses. MSE103 MA212 MSE207 MSE209	h courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics Heat and Mass Transfer Electronic Information Materials and Devices 3D Printing and Lase-based Additive Manufacturing	340 are c completed, 1 3 3 3	o-required cours , and their credit	ses, please ts can cou 1 Fall 2 Fall 2 Fall 2 Spring	e take them in nt as Restricted None MA127 MA127 MA113 MA127 PHY106	the same Electives MSE MATH MSE MSE
Unrestricted Electives Cou	semester. Bo Courses. MSE103 MA212 MSE207 MSE209 MSE356	h courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics Heat and Mass Transfer Electronic Information Materials and Devices 3D Printing and Lase-based Additive Manufacturing Advanced Thin Film Technology	E340 are c completed, 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3	o-required cours , and their credit	1 Fall 2 Fall 2 Fall 2 Spring 3 Fall 3 Fall 3 Fall	e take them in nt as Restricted None MA127 MA127 MA113 MA127 PHY106 MSE001 None None	the same Electives MSE MATH MSE MSE MSE
Unrestricted Electives Courses	semester. Bo Courses. MSE103 MA212 MSE207 MSE209 MSE356 MSE413	th courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics Heat and Mass Transfer Electronic Information Materials and Devices 3D Printing and Lase-based Additive Manufacturing Advanced Thin Film Technology Composite Materials	E340 are c completed, 1 3 3 3 3 3 3 3 3 3 3	o-required cours , and their credit	1 Fall 2 Fall 2 Fall 2 Spring 3 Fall 3 Fall	e take them in nt as Restricted MA127 MA127 MA127 MA127 PHY106 MSE001 None	the same Electives MSE MATH MSE MSE MSE MSE
Unrestricted Electives Courses	semester. Bo Courses. MSE103 MA212 MSE207 MSE209 MSE356 MSE413 MSE407	h courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics Heat and Mass Transfer Electronic Information Materials and Devices 3D Printing and Lase-based Additive Manufacturing Advanced Thin Film Technology	E340 are c completed, 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3	o-required cours , and their credit	1 Fall 2 Fall 2 Fall 2 Spring 3 Fall 3 Fall 3 Fall	e take them in nt as Restricted None MA127 MA127 MA113 MA127 PHY106 MSE001 None None	the same Electives MSE MATH MSE MSE MSE MSE
Unrestricted Electives Courses	semester. Bo Courses. MSE103 MA212 MSE207 MSE209 MSE356 MSE413 MSE407 MSE322	th courses co-required must be Magic Materials Probability and Statistics Engineering Mathematical Physics Heat and Mass Transfer Electronic Information Materials and Devices 3D Printing and Lase-based Additive Manufacturing Advanced Thin Film Technology Composite Materials	E340 are c completed, 1 3	o-required cours , and their credit	ses, please s can cou 1 Fall 2 Fall 2 Fall 2 Spring 3 Fall 3 Fall 3 Fall 3 Spring	e take them in nt as Restricted MA127 MA127 MA127 MA127 PHY106 MSE001 None None None	the same Electives MSE MATH MSE MSE MSE MSE 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

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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

and the second se					
Mathematics and Natural	Major Foundational	Major Core Courses	Restricted Electives Courses	Unrestricted Electives Courses	
Sciences Module	Courses		(choose at least 8 credits in one direction)	(choose at least 8 credits)	
Calculus I	CAD Engineering Drawing	Materials Characterization	Materials Chemistry Track	Magic Materials	
Calculus II	Fundamentals of Materials Science	Techniques	General Organic Chemistry	Probability and Statistics	
Linear Algebra	and Engineering	Polymer Materials	Basic Experiments for Organic Chemistry	Engineering Mathematical Physics	
College Physics I	Experiments for Fundamentals of	Physical Metallurgy A	Fundamentals of Electrochemisty	Heat and Mass Transfer	
College Physics II	Materials Science and Engineering	Ceramic Materials	Functional Polymers	Electronic Information Materials and Devices	
Experiments of Fundamental Physics	Fundamentals of Circuits and	Experiments for Advanced Materials	Biomaterials	3D Printing and Lase-based Additive	
General Chemistry/ Chemistry: the	Electronics	Science and Engineering I	Experiments for Biomaterials	Manufacturing	
Central Science	Crystallography	Thermodynamics of Materials		Advanced Thin Film Technology	
Principles of Biology/ Introduction to Life	Mechanics of Materials B	Experiments for Advanced Materials	Materials Physics Track	Composite Materials	
Science/ Introduction to Earth Sciences	Physical Chemistry	Science and Engineering II	Applied Quantum Mechanics	Crystal Growth	
	Physical Chemistry Experiments		Applied Solid State Physics	Optical Materials and Devices	
Computer Programming	Materials Chemistry		Semiconducting Materials, Devices and	Integrated Circuit Processing Technology	
(select one of following courses)	Comprehensive Experiments of		Technology	Introduction to Photovoltaics and Photo-	
Introduction to Computer Programming	Materials I		Computational Materials Science	thermal	
Introduction to Java Programming	Physics of Materials	Practice-based Courses	Biomaterials	Experiments of Circuit Design	
Introduction to C Programming	Comprehensive Experiments of	Industrial Practice	Experiments for Biomaterials	Electronic Component Reliability and Failure	
Introduction to Python Programming	Materials II			Analysis	
Introduction to Matlab Programming				Projects of Science and Technology Innovation	

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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)