

# **Department of Materials Science and Engineering**

## **Program of Electronic and Photonic Materials and Devices for International Students (2022)**

### **I. Introduction**

The major of Electronic and Photonic Materials and Devices is based on the principles of materials science and engineering, chemistry and physics, and integrates with electronics, photons, integrated circuits, information, and other disciplines. It focuses on various materials related to electronic science and engineering, information science and engineering, including semiconductor materials, photons and electromagnetic materials, functional and sensing materials, quantum information materials, and other core and key materials required for information processing and transmission. And materials' structure characterization/evaluation, performance test, process technology, manufacturing equipment, and device application. Cultivate new engineering talents with basic knowledge and application ability in the fields of materials and electronics, photonics, information, etc.

Academic subject area: Materials; Program code: 080418T

### **II. Objectives and Learning Outcomes**

The major of Electronic and Photonic Materials and Devices will cultivate high-quality science and technology talents with firm theoretical knowledge of Electronic and Photonic Materials and Devices, 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 research in the fields of materials and electronics, photonics, and information, for designing and developing new materials and devices, for 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 the fields of materials, electronics, photonics and

information, 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. The academic credit system of SUSTech allows flexible study years, but not less than 3 years or more than 6 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: 159 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
		Chinese Studies	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
	Mathematics and Natural Sciences Module	Mathematics	12
Physics		10	
Chemistry		3	
Biology		3	
Introduction to Majors Module	Introduction to Majors	2	
Major Courses	Major Required Courses	Major Foundational Courses	24
		Major Core Courses	20
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	16
	Major Elective Courses	Major Elective Courses	20
Total			159
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 & Chinese Studies & Writing) , Humanities and Social Sciences Module, and Introduction to Majors Module.			

#### 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	Department of Mathematics
	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	Department of Physics
	PHY106	College Physics II	4	1 Spring	College Physics I	
	PHY104B	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	Department of Chemistry
Biology	BIO103/ BIO102B	Principles of Biology/ Introduction to Life Science	3	1-2 Spring & Fall	None	Department of Biology
Computer Programming	CS111/ CS112/ CS113	Introduction to C Programming/ Introduction to Python Programming/ Introduction to Matlab Programming	3	1-2 Spring & Fall	None	Department of Computer Science and Engineering
<b>Notes:</b>						
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.						

## V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare the 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
	<b>Notes:</b> 1. At least 5 of the above courses will be completed in the first year, and the results should be qualified. 2. 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 the 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	Principles of Biology/ Introduction to Life Science	None
	CS111/CS112/CS113	Introduction to C Programming/ Introduction to Python Programming/ Introduction to Matlab Programming	None
	<b>Notes:</b> 1. All of the above courses should be completed in the second year, and the results should be qualified. 2. 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.		
<b>Note:</b> 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 Electronic and Photonic Materials and Devices

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	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 MA113 PHY106	MSE
	MSE203	Crystallography	2		2 Fall	MA127 MA113 PHY106	MSE
	MSE207	Engineering Mathematical Physics	3		2 Fall	MA127 MA113	MSE
	MSE344	Applied Quantum Mechanics	3		2 Spring	PHY106	MSE
	MSE213	Mechanics of Materials B	3		2 Spring	MSE001 MSE002	MSE
	MSE335	Applied Solid State Physics	3		3 Fall	MSE207 MSE344	MSE
	MSE301	Materials Chemistry	3		3 Fall	MSE001 MSE002	MSE
	<b>Total</b>			<b>24</b>	<b>1</b>		
<b>Notes:</b> Please choose MSE001 and MSE002 in the same semester.							
Major Core Courses	MSE306	Materials Characterization Techniques	3		2 Spring	MSE001 MSE002	MSE
	MSE209	Heat and Mass Transfer	3		2 Spring	MA127	MSE
	MSE311	Thermodynamics of Materials	3		3 Fall	MA127 MA113 MSE001	MSE
	MSE323	Comprehensive Experiments of Electronic and Photonic Materials and Devices I	4	4	3 Fall	MSE001 MSE002	MSE
	MSE337	Crystal Growth	3		3 Spring	MSE001	MSE
	MSE333	Comprehensive Experiments of Electronic and Photonic Materials and Devices II	4	4	3 Spring	MSE323	MSE
<b>Total</b>			<b>20</b>	<b>8</b>			
Practice-based Courses	MSE470-17	Industrial Practice	4	4	3 Summer	None	MSE
	MSE492	Thesis (Graduation Project)*	12	12	4 Spring	None	MSE
	<b>Total</b>			<b>16</b>	<b>16</b>		
<b>Notes:</b> Students who have completed Comprehensive Design I&II (COE493 & COE494) are not required to take the MSE492 Thesis (Graduation Project).							
<b>Total</b>			<b>60</b>	<b>25</b>			

**Table 2: Major Elective Courses**

**Program of Electronic and Photonic Materials and Devices**

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Restricted Electives Courses	MSE407	Advanced Thin Film Technology	3		3 Fall	MSE001	MSE
	MSE356	Electronic Information Materials and Devices	3		3 Fall	MSE001	MSE
	MSE339	Optical Materials and Devices	3		3 Spring	PHY106	MSE
	MSE310	Semiconducting Materials, Devices and Technology	3		3 Spring	MSE001	MSE
	MSE349	Integrated Circuit Processing Technology	3		3 Spring	MSE001	MSE
	MSE404	Electronic Component Reliability and Failure Analysis	3		4 Fall	MSE306	MSE
	MSE409	Packaging Materials and Technology	3		4 Fall	MSE001	MSE
	<b>Total</b>			<b>21</b>			
<b>Notes: At least 12 credits are required for Restricted Electives Courses.</b>							
Unrestricted Electives Courses	MSE103	Magic Materials	1	1	1 Spring & Fall	None	MSE
	MSE214	Experiments for Fundamentals of Circuits and Electronics	1	1	2 Fall	MA127 MA113 PHY106	MSE
	MSE202	Physical Chemistry*	3		2 Spring	MA127 CH103/CH105	MSE
	MSE204	Physical Chemistry Experiments*	1	1	2 Spring	MA127 CH103/CH105	MSE
	MSE210	General Organic Chemistry*	3		2 Spring	CH103/CH105	MSE
	MSE212	Basic Experiments for Organic Chemistry*	1	1	2 Spring	CH103/CH105	MSE
	MSE313	Polymer Materials	3		2 Spring	MSE001 MSE002	MSE
	MSE319	Physical Metallurgy A	3		3 Fall	MSE001	MSE
	MSE317	Ceramic Materials	3		3 Fall	MSE001	MSE
	MSE322	Composite Materials	3		3 Fall	MSE213	MSE
	MSE350	Surface and Interface of Materials	3		3 Fall	MSE001	MSE
	MSE352	The Fundamental of Plasma Technology	3		3 Fall	PHY106	MSE
	MSE353	Organic Electronic Materials and Devices	3		3 Fall	MSE210 MSE306	MSE
	MSE413	3D Printing and Lase-based Additive Manufacturing	3		3 Fall	None	MSE
	EE306	Introduction to MEMS	3		3 Spring	PHY106	EE
	MSE320	Introduction to Photovoltaics and Photo-thermal	3		3 Spring	MSE205(or EE201-17)	MSE
	MSE351	Principle of Sensors	3		3 Spring	PHY106	MSE
	MSE354	Introduction to Electron Photon Source	3		3 Spring	None	MSE
	MSE355	Information Storage Materials and Devices	3		3 Spring	MSE337	MSE
	MSE5019	Photonic Materials and Matematerials	3		3 Spring	PHY106	MSE
	MSE5028	Photon Science and Its Application to Materials Research and Interdisciplinary Frontiers	3		3 Spring	PHY106	MSE
	MSE5035	Quantum Materials and Quantum Sensing	3		3 Spring	MSE203	MSE
MSE402	Lithographic Materials and Processing	3		4 Fall	None	MSE	

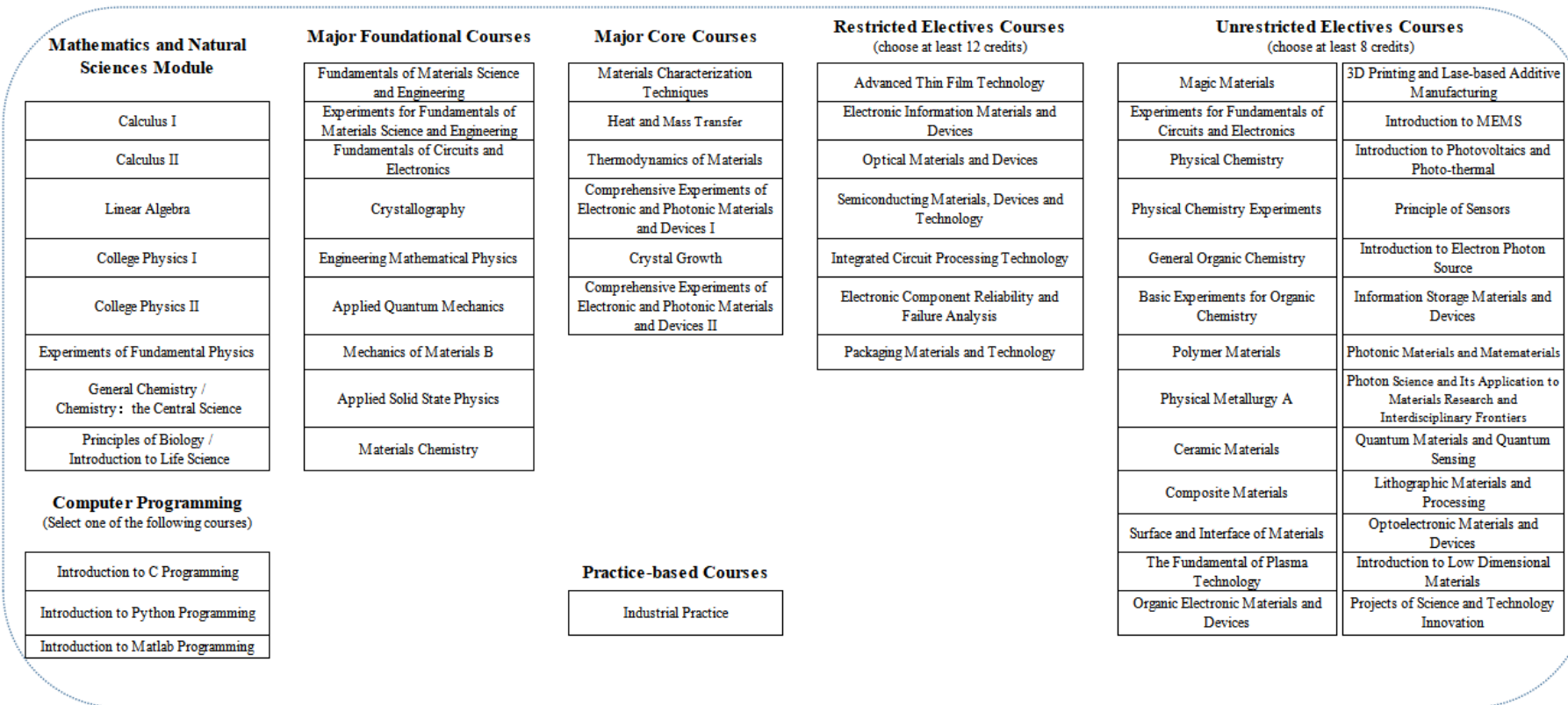
MSE408	Optoelectronic Materials and Devices	3		4 Fall	None	MSE
MSE406	Introduction to Low Dimensional Materials	3		4 Spring	MSE001	MSE
MSE480	Projects of Science and Technology Innovation	2	2	3-4 Spring & Fall	None	MSE
<b>Total</b>		<b>69</b>	<b>6</b>			
<p><b>Notes:</b></p> <p><b>1. At least 8 credits are required for Unrestricted Electives Courses.</b></p> <p>2. MSE202 &amp; MSE204 , MSE210 &amp; MSE212 are co-required courses, please take them in the same semester. Both courses co-required must be completed, and their credits can count as Unrestricted Electives Courses.</p>						

**Table 3: Overview of Practice-based Learning****Program of Electronic and Photonic Materials and Devices**

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
MSE103	Magic Materials	1	1	1 Spring & Fall	None	MSE
MSE002	Experiments for Fundamentals of Materials Science and Engineering	1	1	2 Fall	PHY106 CH103/CH105	MSE
MSE214	Experiments for Fundamentals of Circuits and Electronics	1	1	2 Fall	MA127 MA113 PHY106	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
MSE323	Comprehensive Experiments of Electronic and Photonic Materials and Devices I	4	4	3 Fall	MSE001 MSE002	MSE
MSE333	Comprehensive Experiments of Electronic and Photonic Materials and Devices II	4	4	3 Spring	MSE323	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
<b>Total</b>		<b>31</b>	<b>31</b>			



## Electronic and Photonic Materials and Devices



**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 & Chinese Studies & Writing) , Humanities and Social Sciences Module, and Introduction to Majors Module.



**Thesis (Graduation Project)**