

# 材料成型及控制工程专业 2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in Materials Forming and Control Engineering (2017)

专业名称	材料成型及控制工程	主干学科	机械工程、材料科学与工程
Major	Materials Forming and Control Engineering	Major Disciplines	Mechanical Engineering, Materials Science and Engineering
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering

### 最低毕业学分规定

#### Graduation Credit Criteria

课程性质 Course Nature	课程分类 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践教学环节 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses		29	69.5	\	24.5	\	170
选修课 Elective Courses		9	22	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

本专业培养适应快速发展的国民经济和现代化建设需要，具有良好的社会责任感、职业道德、人文素养和良好的科学工程素质，具备系统的材料科学、机械工程和自动控制等基础知识和应用能力，既能够从事材料成型工程领域的科学研究、教学培训、新产品新工艺新技术开发、生产组织及工程服务等方面的工作，也能够承担经营管理、生产技术管理等工作，具有实践能力和创新意识的高级人才。

本专业期待毕业生几年之后能达成下列目标：

- (1) 具有良好的社会责任感、人文社科素养和职业道德；
- (2) 能够进行材料成型领域的科研与教学、产品研发、技术改造、生产经营和生产技术管理；
- (3) 在材料成型领域的研究与开发、生产工艺设计及控制等领域具有就业竞争力；
- (4) 能够通过终身学习促进专业发展，并在团队中具有协调和领导能力；
- (5) 有创新精神和能力，并有能力服务社会。

This program aims at training students who meet the requirements of the rapid growth of national economy and modernization as well as have a strong sense of social responsibility, professional ethics, humanistic quality and scientific engineering quality. With comprehensive knowledge and skills of materials science, mechanical engineering and automatic control, students can be competent to engage not only in the aspects of academic research, teaching, production organization, engineering services and development of new product, novel process and technology but also in the management works of operation and production

technique, showing excellent practical ability and innovate consciousness.

Students of this programs are expected to achieve the following objectives after graduation:

1. Have a strong sense of social responsibility, professional ethic and good quality of humanities and social sciences.
2. Be competent to engage in research, teaching, product development, technical reform, production management and production technology management related to materials forming and control engineering.
3. Be competitive in the field of materials forming and control engineering on the aspects of research, development, industrial design and control.
4. Promote professional development through life-long study with capacity in communication, negotiation, organization and executive.
5. Possess innovative spirit and ability and to serve our society.

## (二) 毕业要求

- (1) **工程知识:** 具有从事材料成型及控制工程领域相关工作所需要的数学, 自然科学, 工程基础和专业知识, 能够将其用于解决相关领域的复杂工程问题;
  - (2) **问题分析:** 能够应用数学、自然科学、工程科学和专业知识的基本原理, 并通过文献研究, 识别、表达、分析材料成型及控制相关领域的复杂工程问题, 以获得有效结论;
  - (3) **设计/开发解决方案:** 能够设计针对材料成型及控制相关领域复杂工程问题的解决方案, 能进行材料成型工艺设计, 成型过程控制设计, 成型装备或焊接结构设计等, 并能够在设计、开发环节中体现创新意识, 考虑社会、健康、安全、法律、文化以及环境等因素;
  - (4) **研究:** 能够综合运用材料成型及控制工程专业基础理论和技术手段对专业相关领域复杂工程问题进行研究, 包括设计实验、分析与解释数据, 并通过结果讨论得到合理有效的结论;
  - (5) **使用现代工具:** 能够针对材料成型及控制相关领域复杂工程问题, 选用现代工程开发工具和信息技术工具, 对材料成型工艺、成型装备或焊接结构进行设计, 对成型过程进行模拟和预测等, 并能够理解其局限性;
  - (6) **工程与社会:** 能够合理分析、评价材料成型及控制相关领域工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响, 并理解应承担的责任;
  - (7) **环境和可持续发展:** 树立可持续发展的工程思想, 能够理解和评价针对材料成型及控制相关领域复杂工程问题的工程实践对环境、社会可持续发展的影响;
  - (8) **职业规范:** 具有人文社会科学素养、社会责任感和道德情操, 能够在工程实践中理解并遵守工程职业道德和规范, 履行责任;
  - (9) **个人和团队:** 具有一定的组织管理能力、表达能力、人际交往能力和团队合作能力, 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色;
  - (10) **沟通:** 能够就材料成型及控制相关领域复杂工程问题与业界同行及社会公众进行有效沟通和交流, 包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野, 能够在跨文化背景下进行沟通和交流;
  - (11) **项目管理:** 理解并掌握工程管理原理与经济决策方法, 并能在多学科环境中应用;
  - (12) **终生学习:** 具有自主学习和终身学习的意识, 有不断学习和适应发展的能力。
1. **Engineering knowledge:** Acquire mathematics, natural science, engineering principles and professional knowledge required for the work in the field of materials forming and control engineering, and be able to use them to solve complex engineering issues.
  2. **Problem analysis:** Apply the fundamental principle of applied mathematics, natural science, engineering science and professional knowledge to identify, express and analyze the complex

- engineering issues related to materials forming and control engineering through literature review, and to finally reach effective conclusions.
3. **Design/development solution:** Be capable to provide solutions to complex engineering problems in the field of materials forming and control engineering, design materials forming processes, forming process controlling, forming equipment, or welding constructions, as well as to reflect innovation consciousness in the design and development processes, taking factors including society, health, safety, laws, culture, and environment into considerations.
  4. **Research:** Be able to comprehensively apply fundamental theories and technical skills of materials forming and control engineering to investigate complex engineering problems in professional-related area, including experimental designs, analysis and interpretation of data, and acquiring reasonable and effective conclusion via discussing results.
  5. **Usage of modern tools:** Be able to select and use modern engineering development and information technology tools to solve complex engineering problems in the field of materials forming and control technology, design materials processing technology, processing equipment, or welding constructions, model and predict forming processes, and understand the limitations of the tools.
  6. **Engineering and society:** Be able to analyze and estimate the influences of engineering practice and complex engineering problem solutions properly in the field of materials forming and control engineering on society, health, safety, laws, culture and environment, and understand the responsibilities that should be taken for.
  7. **Environment and sustainable development:** Establish engineering thoughts of sustainable development, understand and estimate the influences of engineering practice of complex engineering problems in the field of materials forming and control engineering on sustainable development of environment and society.
  8. **Professional standards:** Have quality of humanities and social sciences, social responsibilities, and moral sentiments to understand and comply with engineering professional ethics and norms, and to fulfill the responsibilities.
  9. **Individual and team:** Acquire capabilities of organization management, expression, human communication and team work, and be able to play a role as an individual, team member or manager in a team with a multi-discipline background.
  10. **Communication:** Be able to negotiate and exchange with industry peers and the public on complex engineering problems in the field of materials forming and control engineering, including writing, designing and presenting reports clearly, and have certain international perspectives to communicate under the cross-cultural background.
  11. **Project management:** Understand and grasp engineering management principles and economic decision making methods, and be able to apply them in multi-discipline situations.
  12. **Life-long learning:** Acquire consciousness of self-learning and life-long learning, and capabilities of continuous learning and adaptive development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√			
毕业要求 2		√	√		
毕业要求 3		√	√		√

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 4		√	√		√
毕业要求 5				√	
毕业要求 6		√			√
毕业要求 7	√				
毕业要求 8	√				
毕业要求 9		√		√	
毕业要求 10			√	√	√
毕业要求 11		√	√		
毕业要求 12				√	

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

材料力学、机械设计基础、电工与电子技术基础、金属学及热处理、材料成型原理、材料成型控制工程基础、CAD/CAM 基础、测试技术基础

Materials Mechanics, Foundation of Mechanical Design, Electrical Engineering, Metallography and Heat Treatment, Principle of Material Forming, Fundamentals of Material Forming Control and Engineering, Fundamentals of CAD/CAM, Fundamentals of Testing Techniques

#### (二) 专业特色课程:

现代材料成形技术、高分子材料成形基础、材料成型数值模拟、材料焊接方法、焊接电源技术、焊接结构、材料成型自主设计实验

Forming Technology of Modern Materials, Fundamentals of Polymer Material Molding, Numerical Simulation of Material Forming, Method of Material Welding, Technology of Welding Power, Welding Structure, Independent Design Experiment of Material Forming

附：毕业要求实现矩阵：

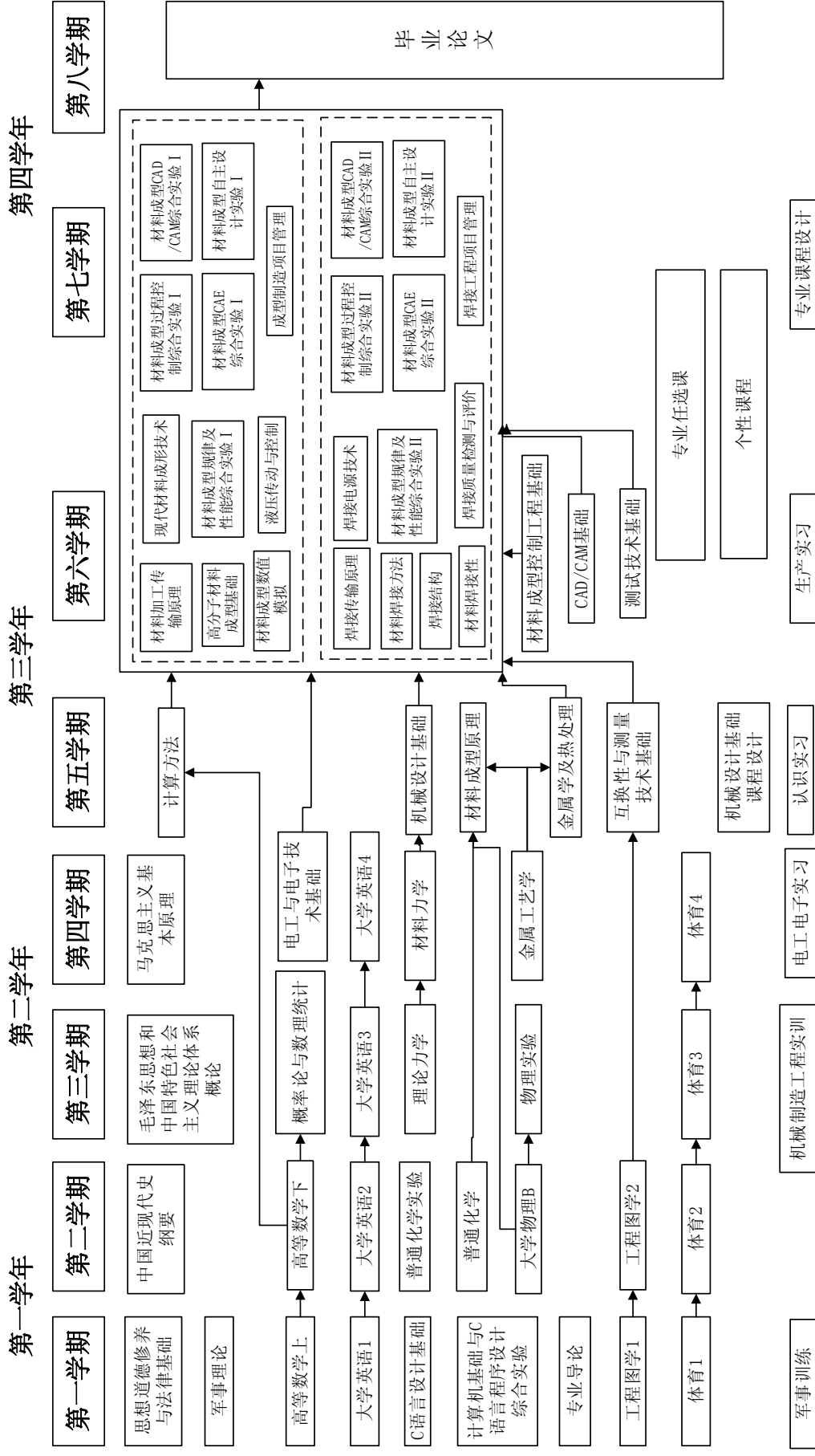
专业核心课程	专业特色课程	课程名称	材料成型及控制工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		思想道德修养与法律基础						√	√	√				
		中国近现代史纲要								√				
		毛泽东思想和中国特色社会主义理论体系概论								√				
		马克思主义基本原理								√				
		军事理论								√				
		体育									√			
		大学英语					√					√		√
		C 语言设计基础					√							



专业 核心 课程	专业 特色 课程	课程名称	材料成型及控制工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		材料成型 CAD/CAM 综合实验			√		√							
		材料成型 CAE 综合实验			√		√							
	√	材料成型自主设计实验			√	√						√		
<b>塑性成型方向</b>														
		材料加工传输原理	√			√								
	√	现代材料成形技术	√			√								
	√	高分子材料成形基础	√			√								
	√	材料成型数值模拟			√		√							
		液压传动与控制		√	√									
		成型制造项目管理							√				√	
<b>焊接方向</b>														
		焊接传输原理	√			√								
	√	焊接电源技术	√		√									
	√	材料焊接方法	√			√								
	√	焊接结构		√	√									
		材料焊接性		√		√								
		焊接质量检测与评价		√		√								
		焊接工程项目管理							√				√	
<b>公共选修部分和实践环节</b>														
		专业选修课						√						
		军事训练									√			
		机械制造工程实训						√						
		电工电子实习		√										
		机械设计基础课程设计		√		√								
		认识实习						√		√				
		生产实习						√					√	
		专业课程设计			√		√	√						
		毕业论文				√						√		√

### 三、课程教学进程图

#### III Teaching Process Map



#### 四、 理论教学建议进程表

#### IV Theory Course Schedule

课程编号 Course Number	课 程 名 称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识教育必修课程									
General Education Required Courses									
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					2	
4220003110	毛泽东思想和中国特色社会主义理论体 系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					1	
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				1	
小 计 Subtotal		29	640	32	0	48	64		



课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses			要求至少取得 9 个学分，且必须选修艺术体育类课程中的艺术类相关课程并取得至少 2 个学分，在创新创业类和经济管理类中分别至少选修一门课程。 Students are required to obtain at least 9 credits, which must contain art courses of 2 credits from the category of Art and Physical Education Courses, at least one course from the category of Innovation and Entrepreneurship Courses and the category of Economy and Management Courses respectively.						
人文社科类 Arts and Social Science Courses									
经济管理类 Economy and Management Courses									
科学技术类 Science and Technology Courses									
艺术体育类 Art and Physical Education Courses									
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4070234110	专业导论 Introduction to Materials Physics	1	16					1	
4080371170	工程图学 A 上 Engineering Graphics I	3	56				8	1	
4080372170	工程图学 A 下 Engineering Graphics II	2.5	56				16	2	工程图学上
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学上
4050229110	线性代数 Linear Algebra	2.5	40					2	
4200371170	普通化学 C General Chemistry	2	32					2	
4200372170	普通化学实验 C General Chemistry Lab	0.5	16	16				2	
4050463130	大学物理 B Physics B	5	80					2	
4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理
4050058110	概率论与数理统计 B Probability and Mathematical Statistics	3	48					3	高等数学下
4050106110	计算方法 B Computing Method	2	32					3	高等数学下
4050549140	理论力学 C Theoretical Mechanics	4	64					3	
4050015110	材料力学 A Materials Mechanics	5	80	8				4	理论力学

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4080367170	金属工艺学 B Metallurgical Technology	2	32	2				4	
4100011110	电工与电子技术基础 B Electrical Engineering	5.5	88	20				4	
4080054110	互换性与测量技术 B Interchangeability and Measurement	2	32	4				5	工程图学
4080061110	机械设计基础 Foundation of Mechanical Design	3.5	56	6				5	材料力学
4070349120	金属学及热处理 B Metallography and Heat Treatment	3.5	56	4				5	金属工艺学
4070528130	材料成型原理 C Principle of Material Forming	4.5	72					5	金属学及热 处理
4070011110	材料成型控制工程基础 Fundamentals of Material Forming Control and Engineering	2.5	40	4				6	
4070172110	CAD/CAM 基础 A Fundamentals of CAD/CAM	2.5	40		8			6	
4070039110	测试技术基础 Fundamentals of Testing Techniques	2	32					6	
小 计 Subtotal		69.5	1160	96	8		24		
(四) 专业教育选修课程 Specialized Elective Courses									
塑性成型方向 (限选课) Plastic Molding (Specialized Direction)									
4070615170	材料加工传输原理 Principle of Transport Phenomena in Materials Processing	2	32					6	材料成型原 理
4070147110	现代材料成形技术 Forming Technology of Modern Materials	3.5	56					6	材料成型原 理
4070616170	高分子材料成形基础 C Fundamentals of Polymer Material Molding	2	32					6	材料成型原 理
4070617170	材料成型数值模拟 C Numerical Simulation of Material Forming	2	32					6	材料成型原 理
4070618170	液压传动与控制 D Transmission and Control of Hydraulic Power	1.5	24					6	机械设计基 础
4070619170	材料成型规律及性能综合实验 A Comprehensive Experiments of Material Forming Law and Performance	1.5	48	48				6	

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070621170	材料成型过程控制综合实验 A Comprehensive Experiments of Material Forming Process Control	1.5	48	48				7	
4070623170	材料成型 CAD/CAM 综合实验 A CAD/CAM Comprehensive Experiments of Material Forming	1.5	48	48				7	
4070625170	材料成型 CAE 综合实验 A CAE Comprehensive Experiments of Material Forming	1.5	48	48				7	
4070627170	材料成型自主设计实验 A Independent Design Experiment of Material Forming	1.5	48	48				7	
4070629170	成型制造项目管理 Project Management of Molding Manufacturing	0.5	8					7	
小 计 Subtotal		19	424	240					
焊接方向（限选课） Welding（Specialized Direction）									
4070630170	焊接传输原理 Principle of Transport Phenomena in Welding	1.5	24					6	材料成型原理
4070082110	焊接电源技术 Technology of Welding Power	2	32					6	电工与电子技术基础
4070019110	材料焊接方法 A Method of Material Welding	2	32					6	材料成型原理
4070296120	焊接结构 C Welding Structure	2	32					6	材料成型原理
4070277120	材料焊接性 B Material Weldability	2	32					6	材料成型原理
4070631170	焊接质量检测与评价 C Welding Quality Inspection and Evaluation	1.5	24					6	材料成型原理
4070620170	材料成型规律及性能综合实验 B Comprehensive Experiments of Material Forming Law and Performance	1.5	48	48				6	
4070622170	材料成型过程控制综合实验 B Comprehensive Experiments of Material Forming Process Control	1.5	48	48				7	
4070624170	材料成型 CAD/CAM 综合实验 B CAD/CAM Comprehensive Experiments of Material Forming	1.5	48	48				7	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070626170	材料成型 CAE 综合实验 B CAE Comprehensive Experiments of Material Forming	1.5	48	48				7	
4070628170	材料成型自主设计实验 B Independent Design Experiment of Material Forming	1.5	48	48				7	
4070632170	焊接工程项目管理 Project Management of Welding	0.5	8					7	
小 计 Subtotal		19	424	240					
塑性成型方向（任选课） Plastic Molding (Elective Courses)									
4070633170	现代模具设计方法 B Method of Modern Mold Design	1.5	24					6	
4070636170	模具制造学 C Mold Manufacture	1.5	24					6	
4070634170	材料成型设备 Material Forming Equipment	1.5	24					7	
4070635170	特种成型技术 Special Forming Technology	1.5	24					7	
小 计 Subtotal		6	96						
焊接方向（任选课） Welding (Elective Courses)									
4070637170	焊接工装设计 C Welding Fixture Design	1.5	24					6	
4070639170	钎焊 Brazing	1.5	24					6	
4070638170	压力焊 Pressure Welding	1.5	24					7	
4070640170	微连接原理与方法 B Principle and Method of Micro Joining	1.5	24					7	
小 计 Subtotal		6	96						
修读说明：要求至少选修 22 学分。必须选修一个方向，方向限选课 19 学分，任选课至少 3 学分。 NOTE: Minimum subtotal credits are 22. Students should take one specialized direction of 19 credits, and at least 3 credits for Elective Courses.									
(五) 个性课程 Personalized Elective Courses									
塑性成型方向 Plastic Molding									
4070641170	增材制造技术 Incremental Manufacturing Technology	1.5	24					5	
4070643170	高分子材料流变学 Rheology of Polymer Materials	1.5	24					5	

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur		
4070642170	轻合金成形技术 Light Alloy Forming Technology	1.5	24					6	
4070644170	现代车身成形技术 Modern Forming Technology of Auto Body	1.5	24					7	
小 计 Subtotal		6	96						
焊接方向 Welding									
4070645170	焊接数值模拟 C Numerical Simulation of Welding	1.5	24					5	
4070646170	材料力学性能 B Material Mechanical Performance	1.5	24					5	
4070648170	材料分析测试方法 Material Analysis and Test Method	1.5	24					6	
4070647170	高能束焊 C High-energy Beam Welding	1.5	24					7	
小 计 Subtotal		6	96	0	0	0	0		
<p>修读说明：学生从以上个性课程中至少选修 3 学分，和从学校发布的其它个性课程目录中选修的学分一起，要求至少选修 6 学分。</p> <p>NOTE: Students can select courses from above (at least 3 credits) and the other personalized courses in catalog, and are required to obtain at least 6 credits.</p>									

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080150110	机械制造工程实训 B Training on Mechanical Manufacturing Engineering	4	4	3
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice for Foundation of Mechanical Design	2	2	5
4070220110	认识实习 Practice for Engineering Cognition	1	1	5
4070223110	生产实习 Practice for Producing	3	3	6
4070649170	专业课程设计 Curriculum Design	3	3	7
4070650170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		24.5	34	

## 六、其它要求

### VI Recommendations on Course Studies

1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。

2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人： 赵春霞

专业培养方案责任人： 廖红卫

# 材料科学与工程专业 2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in Materials Science and Engineering (2017)

专业名称	材料科学与工程	主干学科	材料科学与工程
Major	Materials Science and Engineering	Major Disciplines	Materials Science and Engineering
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程性质 Course Nature	课程分类 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践教学环节 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses		29	76.5	\	21.5	\	170
选修课 Elective Courses		9	18	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

本专业培养具有良好社会责任感和职业道德,具有较好自然科学基础和人文社会科学基础,扎实的材料科学与工程领域的基础知识,综合素质好,具有创新精神,能在材料制备、加工成型,材料结构及性能调控,材料应用等领域从事科学研究与教学、新材料研制、技术开发和改造、工艺和设备设计、生产技术管理与经营管理等方面工作,适应社会主义市场经济发展的高层次、高素质、德智体全面发展的科学研究与工程技术人才。

本专业期待毕业生五年后能达成下列目标:

- (1) 身心健康,具备良好的敬业精神、社会责任感和工程职业道德,关注当代全球问题和社会可持续发展问题,具有质量意识、环境意识和安全意识。
- (2) 具有材料及制品的设计、制备、测试、分析和应用能力,能运用自然科学、材料科学与工程等基础理论解决工程实践中的实际问题。
- (3) 知晓材料科学与工程的发展前沿及趋势,具有新材料研制、工艺开发与改造、技术系统集成、生产过程管理的能力,促进专业可持续发展。
- (4) 具有创新精神,具有终身学习的能力,能不断提升职业竞争力。
- (5) 具有良好的交流沟通能力、良好的团队意识和合作精神,能在团队中发挥协调和领导能力。

**Educational Objectives:**

Aiming at high-level scientific researchers and engineers with good social responsibility, humanities and social sciences literacy and professional ethics, this plan will enable students to

have broad education necessary of natural science and humanities and social sciences and systematically grasp specialized knowledge as well as the practical application methods of materials science and engineering related to the fields of material preparation, processing and molding, material structure and performance control. With initiative spirit and international view, students can be fit into jobs in the fields of scientific research and teaching, research and development of new materials, technological development and reconstruction, process and equipment design, production technology management.

Graduates in this major are expected to achieve the following objectives in a few years:

1. Having good professionalism, social responsibility and engineering ethics, and paying close attention to the contemporary global problems and social sustainable development, with quality awareness, environmental awareness and safety awareness.
2. Having the ability to design, prepare, test, analyze and apply materials and products, and applying the basic theories of natural science, material science and engineering to solve the basic problems in engineering practice.
3. Knowing the frontier and trend of the development of materials science and engineering, with the capability of developing new materials, developing and reforming technology, integrating technology system and managing production process, and promoting the sustainable development of the specialty.
4. With innovative spirit and lifelong learning ability, can continuously enhance employment competitiveness.
5. Having good communication skills, good team work spirit and coordination and leadership skills in the team.

## (二) 毕业要求

- (1) 工程知识：具有从事材料科学与工程专业相关工作所需要的数学、自然科学、工程基础和专业知识，能够将其用于解决材料科学与工程相关研发、设计、生产和应用过程中的复杂工程问题；
- (2) 问题分析：能够应用数学、自然科学、工程科学和材料科学的基本原理，识别、表达，并通过文献研究、分析材料科学与工程相关领域的复杂工程问题，以获得有效结论；
- (3) 设计/开发解决方案：能够设计针对材料科学与工程专业领域复杂工程问题的解决方案，设计满足特定需求的材料、生产装备及工艺流程，并能够在设计、开发环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素；
- (4) 研究：能够基于材料科学与工程基础理论并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论；
- (5) 使用现代工具：能够针对材料科学与工程领域复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性；
- (6) 工程与社会：能够基于专业基础理论和工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任；
- (7) 环境和可持续发展：能够理解和评价针对复杂工程问题的工程实践对环境、社会可持续发展的影响；
- (8) 职业规范：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任；
- (9) 个人和团队：具有一定的组织管理能力、表达能力、人际交往能力和团队合作能力，



能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色；

(10) 沟通：能够就材料科学与工程相关领域复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流；

(11) 项目管理：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用；

(12) 终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

### **Graduation requirements**

1. Engineering knowledge: Having basic and professional knowledge of mathematics, science and engineering, and an ability to apply the knowledge to solve complex engineering issues in the fields of materials science and engineering;
2. Problem analysis: Grasping the basic principles and methods of mathematics, science and professional foundations; an ability to identify, interpret and analyze complex engineering issues in the related fields of materials science and engineering, to obtain reasonable conclusion through literature search to analyze and demonstrate influencing factors;
3. Design / development solutions: An ability to provide solutions for complex engineering problems in the field of materials science and engineering, and design materials types, device parameters and process flow to meet desired needs within realistic constrains such as society, health, safety, law, culture, and the environment.
4. Research: Grasping the basic theory of materials science and engineering; an ability to use scientific methods to study complex engineering problems, including scheme design and experiment, data analysis and interpretation, results and discussion to get valid conclusion synthetically;
5. Using modern tools: An ability to select and use the technologies, resources, modern engineering tools, and information technology tools, describe and characterize, predict and simulate engineering practice, and understand the applicability and limitations of the conclusions;
6. Engineering and society: Grasping professional basic theory and its relevant engineering knowledge, which can be used to analyze and evaluate impacts of solutions to professional practices and complex engineering issues on society, health, safety, law and culture;
7. Environment and sustainable development: Understanding of standards, policies, laws, and regulations related to the major; An ability to correctly recognize and evaluate the impact of engineering practices including complex engineering issues on environment, society and sustainable development;
8. Professional norms: Having humanities and social sciences literacy and social responsibility; an understanding of professional and ethical norms;
9. Individuals and team: An ability of personal expression and communication, teamwork and organization management, and an ability to undertake the roles of individuals, team members and leaders in a multidisciplinary team;
10. Communication: An ability to give solutions to complex engineering issues related to materials science and engineering, and to communicate effectively with industry peers and the public in the cross-cultural background, including proposal design and report writing, presentation, and problem discussion;
11. Project management: Understanding and grasping the principles of engineering management and methods of economic decision, which can be applied to the practice such as engineering

problems;

12. Life-long learning: ability of self-study and to engage in innovation and life-long learning, and enable to keep learning and adapt to social development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√	√	√	
毕业要求 2		√	√	√	
毕业要求 3	√	√	√	√	
毕业要求 4		√	√	√	
毕业要求 5		√	√	√	
毕业要求 6	√	√	√	√	
毕业要求 7	√	√	√		
毕业要求 8	√				
毕业要求 9					√
毕业要求 10					√
毕业要求 11			√		
毕业要求 12				√	

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

专业核心课程：材料概论、材料科学基础、材料工程基础、材料研究与测试方法、物理化学。

Core Courses: Introduction to Materials, Fundamentals of Materials Science, Fundamentals of Materials Engineering, Methods of Materials Research and Testing, Physical Chemistry.

#### (二) 专业特色课程:

专业特色课程：材料概论、材料科学基础、材料工程基础、材料研究与测试方法、固体物理/金属材料学/无机非金属工学。

Characteristic Courses: Introduction to Materials, Fundamentals of Materials Science, Fundamentals of Materials Engineering, Methods of Materials Research and Testing, Solid Physics / Metal Materials Science / Inorganic Non-metallic Material Engineering.

附：毕业要求实现矩阵:

专业 核心 课程	专业 特色 课程	课程名称	材料科学与工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		思想道德修养与法律基础						√		√				
		中国近现代史纲要								√				
		毛泽东思想和中国特色社会主义理论体系概论								√				
		马克思主义基本原理												√
		军事理论								√				
		体育									√			

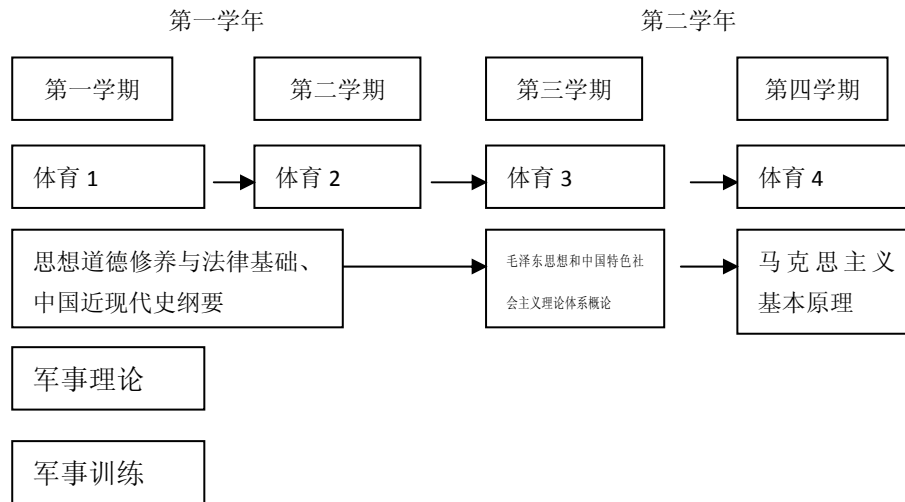
专业 核心 课程	专业 特色 课程	课程名称	材料科学与工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		大学英语					√					√		√
		Python/C 程序设计基础					√							
		计算机基础与Python/C程序设计综合实验					√							
		通识选修类课程								√	√		√	
		高等数学	√				√							
		线性代数		√										
		概率论与数理统计		√			√							
		大学物理	√											
		物理实验				√								
		无机化学	√											
		无机化学实验				√								
		有机化学	√											
		有机化学实验				√								
√		物理化学	√	√										
		物理化学实验				√								
		工程图学			√									
		工程力学	√	√										
		电工与电子技术基础	√										√	
		机械设计基础	√										√	
√	√	材料概论										√		
√	√	材料科学基础	√	√		√								√
√	√	材料工程基础	√	√	√				√					
√	√	材料研究与测试方法				√	√							√
		材料研究与测试方法实验				√	√							
		安全工程						√						
		项目管理											√	
		材料与环境							√					
		计算机在材料科学中的应用				√	√							
材料科学方向专业必修+限选														
		材料化学		√	√				√					
		结构与缺陷		√	√									
		分析化学					√							
√		固体物理	√		√	√								
		材料物理		√	√				√					
		材料工艺与设备		√	√			√						
		分析化学实验					√							
		材料科学基础实验		√		√								
		材料制备与物性分析		√		√	√			√	√			

专业 核心 课程	专业 特色 课程	课程名称	材料科学与工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
材料工程 1 方向专业必修+限选														
		金属学原理		√										
	√	金属材料学		√	√									
		金属材料性能	√		√	√								
		金属凝固理论与技术		√	√		√		√					
		金属固态相变原理及应用		√	√		√		√					
		热加工设备原理与设计		√	√			√						
		金相分析技术实验		√			√							
		材料科学基础实验		√		√								
		材料结构控制与性能测试				√	√			√	√			
材料工程 2 方向专业必修+限选														
		材料物理性能	√		√	√								
		粉体科学工程基础		√	√									
		分析化学					√							
	√	无机非金属材料工学		√	√				√					
		无机非金属材料工厂设计概 念			√				√					
		热工设备		√	√			√						
		分析化学实验					√							
		材料工程基础实验		√			√							
		材料科学基础实验		√		√								
		材料制备与性能实验				√				√	√			
集中性实践教学														
		军事训练								√				
		机械制造工程实训						√						
		电工电子实习						√						
		机械设计基础课程设计			√									
		认识实习						√						
		专业实习						√	√					
		工程设计训练			√			√		√	√			
		毕业论文		√		√					√			√

### 三、课程教学进程图

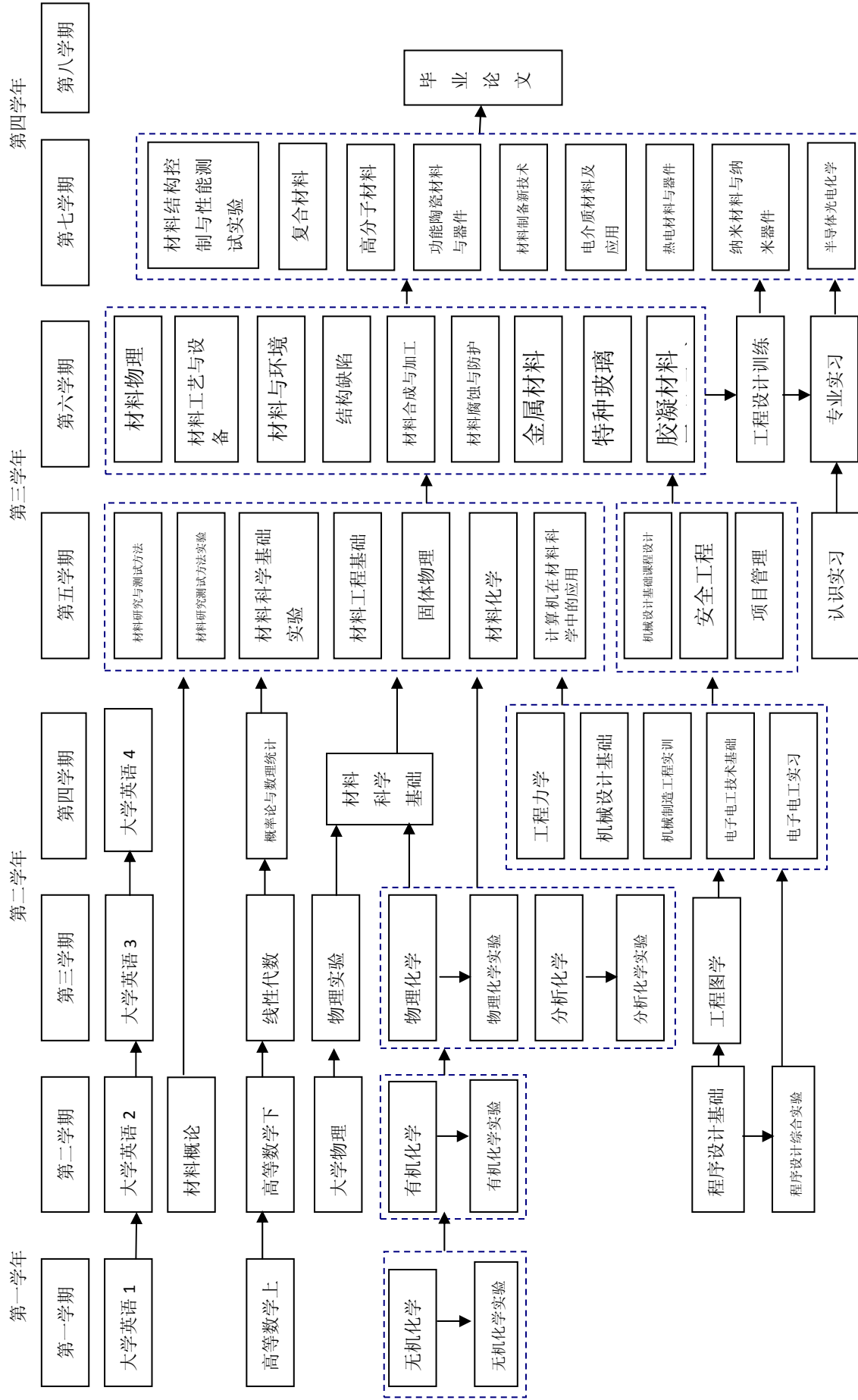
#### III Teaching Process Map

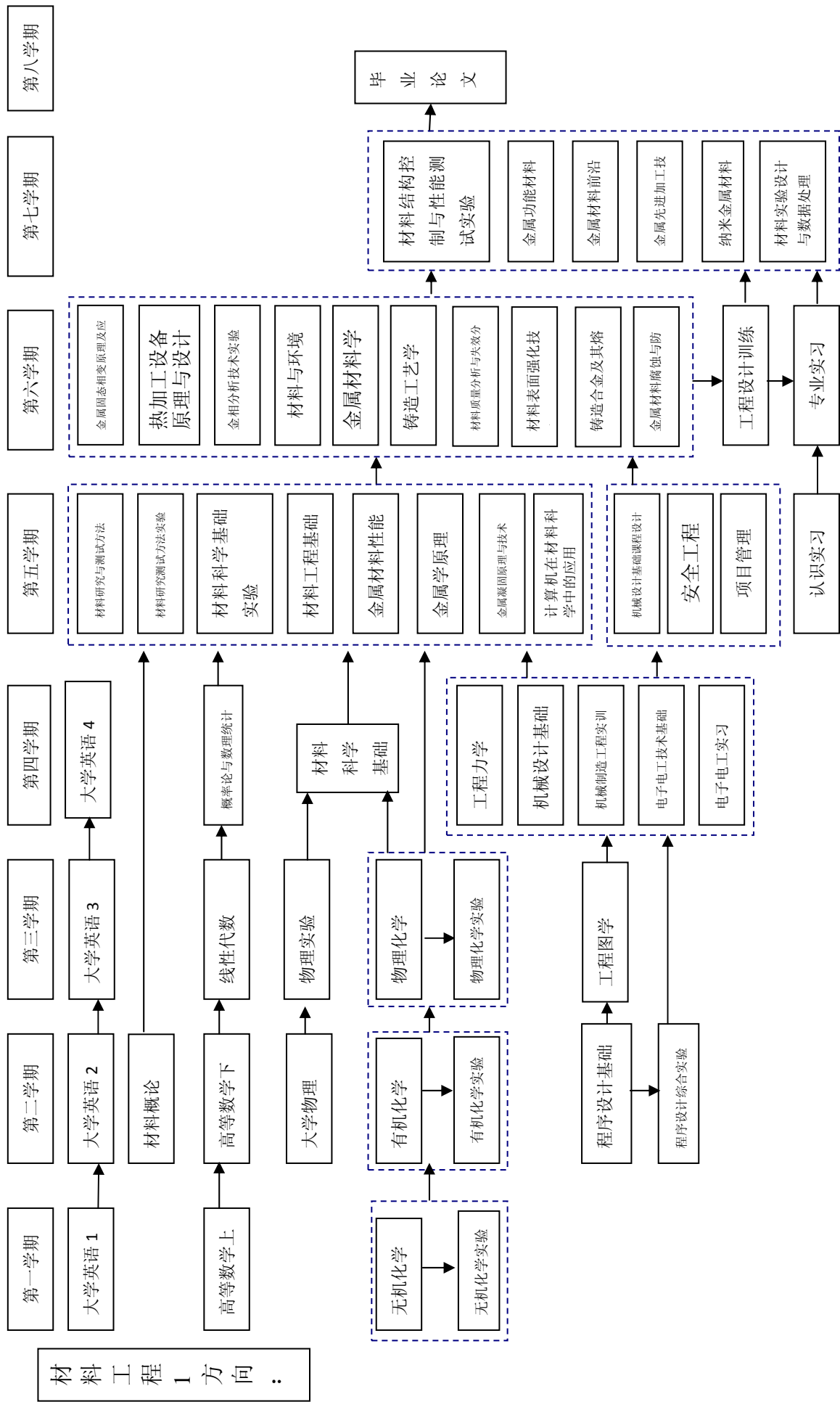
(一) 部分通识课程教学进程图 (各专业方向相同):

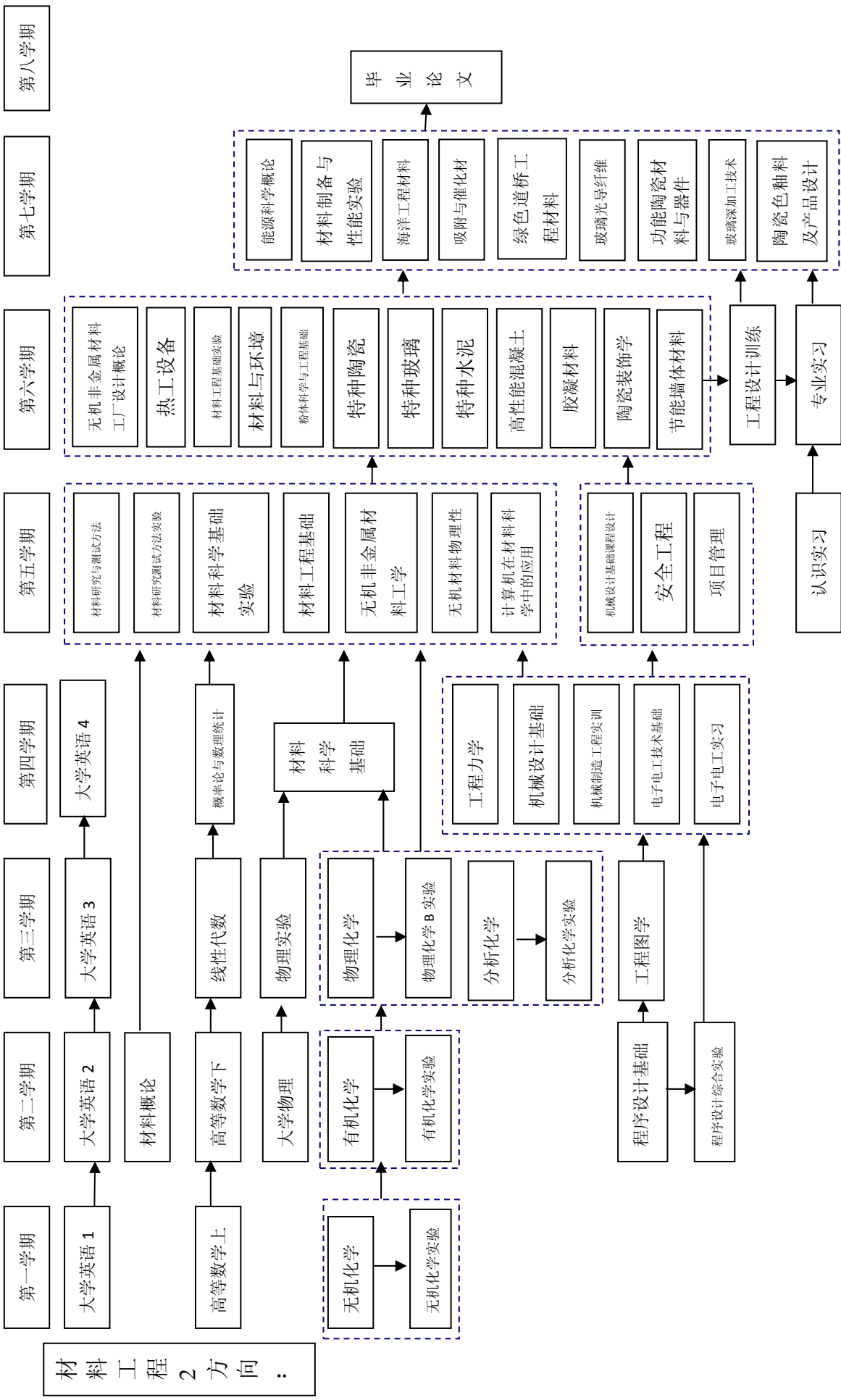


(二) 各专业方向课程教学进程图:

材料科学方向：









#### 四、理论教学建议进程表

#### IV Theory Course Schedule

课程编号 Course Number	课程名称 Course Title	学分 CrS	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识教育必修课程 General Education Required Courses									
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English 1	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programming	2	32					2	
4120340170	计算机基础与 Python 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2	
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2	
小 计 Subtotal		29	640	32	0	48	64		

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 1.5 个学分						要求至少取得 9 个学分	
人文社科类 Arts and Social Science Courses		要求至少选修 1 门							
经济管理类 Economy and Management Courses		要求至少取得 1.5 个学分							
科学技术类 Science and Technology Courses									
艺术体育类 Art and Physical Education Courses		要求至少取得艺术类相关课程 2 学分							
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4200357170	无机化学 B Inorganic Chemistry	3	48				1		
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32			1	无机化学	
4050063110	高等数学 A 上 Advanced Mathematics I	5	80				1		
4050064110	高等数学 A 下 Advanced Mathematics II	5	80				2	高等数学上	
4070016110	材料概论 Introduction to Materials	2	32				2		
4200274120	有机化学 C Organic Chemistry	3	48				2		
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32			2	有机化学	
4050463130	大学物理 B Physics	5	80				2		
4050224110	物理实验 B Physics Lab.	1	32	32			3	大学物理	
4050229110	线性代数 Linear Algebra	2.5	40				3	高等数学下	
4200366170	物理化学 D Physical Chemistry	3.5	56				3		
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32			3	物理化学	
4080374170	工程图学 C Engineering Graphics	3	56			8	3		
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40				4	高等数学下	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4050071110	工程力学 A Engineering Mechanics	4	64	4				4	
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4080457170	机械设计基础 B Fundamentals of Mechanical Design	2.5	40					4	
4070554170	材料科学基础 B Fundamentals of Materials Science	4	64					4	
4070017110	材料工程基础 Fundamentals of Materials Engineering	4	64					5	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing	2.5	40					5	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method	1	32	32				5	
小 计 Subtotal		59.5	1040	164	0	0	8		
模块一（材料科学方向）									
4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry Experiment	1	32	32				3	
4070080110	固体物理 D Solid Physics	2.5	40					5	
4070033110	材料物理 B Materials Physics	3.5	56					6	
4070161110	材料工艺与设备 A Materials Technology & Equipment	2.5	40					6	
4070280120	材料科学基础实验 A Fundamental Experiments on Materials Science	1	32	32				5	材料科学基 础
4070282120	材料制备与物性分析 A Analysis of Materials Preparing & Physical Properties	5	160	160				7	
小 计 Subtotal		17	384	224	0	0	0		
模块二（材料工程 1 方向）									
4070540140	金属材料性能 Metal Materials Performance	2	32					5	
4070101110	金属凝固理论与技术 Theoretical Basis of Metal Solidification	2.5	40					5	金属学原理

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070304120	材料科学基础实验 B Fundamental Experiments on Materials Science	1	32	32				5	材料科学基础
4070320130	金属固态相变原理及应用 Principles and Application of Metal Solid Transformation	2.5	40					6	金属学原理
4070487110	热加工设备原理与设计 Principles and Design of Thermal Equipments	3	48					6	
4070268120	金相分析技术实验 B Experiments on Metallographical Analysis	2	64	64				6	
4070556170	材料结构控制与性能测试 B Materials Structure Controlling and Property	4	128	128				7	
小 计 Subtotal		17	384	224	0	0	0		
模块三（材料工程 2 方向）									
4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry Experiment	1	32	32				3	
4070557170	无机非金属材料工学 C Inorganic Non-metallic Material Engineering	4	64					5	
4070280120	材料科学基础实验 A Experiments on Material Science Foundation and Testing	1	32	32				5	材料科学基础
4070143110	无机非金属材料工厂设计概论 Design of Inorganic Non-metallic Materials Plant	2.5	40		12			6	
4070120110	热工设备 Thermal Engineering Equipment	2	32					6	
4070276120	材料工程基础实验 A Fundamental Experiments on Materials	2	64	64				6	材料工程基础
4070284120	材料制备与性能实验 Experiments on Materials Fabrication and Properties	3	96	96				7	
小 计 Subtotal		17	384	224	12	0	0		
(四) 专业教育限选课程 Specialized Elective Courses									
模块一（材料科学方向）									
4070002110	安全工程 Safety Engineering	1	16					5	

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070151110	项目管理 B Project Management	1	16					5	
4070559170	计算机在材料科学中的应用 B Computer Applied in Materials Science	2	32		16			5	
4070560170	材料化学 C Materials Chemistry	2	32					5	
4070558170	材料与环境 B Materials and Environment	1	16					6	
4070097110	结构缺陷 Structural Imperfection	2	32					6	
小 计 Subtotal		9	144	0	16	0	0		
模块二（材料工程 1 方向）									
4070002110	安全工程 Safety Engineering	1	16					5	
4070151110	项目管理 B Project Management	1	16					5	
4070559170	计算机在材料科学中的应用 B Computer Applied in Materials Science	2	32		16			5	
4070614170	金属学原理 B Principles of Metallographic	1.5	24					5	
4070558170	材料与环境 B Materials and Environment	1	16					6	
4070525120	金属材料学 A Metal Materials Science	2.5	40					6	金属凝固理论与技术
小 计 Subtotal		9	144	0	16	0	0		
模块三（材料工程 2 方向）									
4070002110	安全工程 Safety Engineering	1	16					5	
4070151110	项目管理 B Project Management	1	16					5	
4070559170	计算机在材料科学中的应用 B Computer Applied in Materials Science	2	32		16			5	
4070034110	材料物理性能 Material Physical Performance	2	32					5	
4070558170	材料与环境 B Materials and Environment	1	16					6	
4070047110	粉体科学与工程基础 Fundamentals of Powder Science and Engineering	2	32					6	
小 计 Subtotal		9	144	0	16	0	0		

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(四) 专业教育选修课程 Specialized Elective Courses									
4070672170	功能材料 A Functional Materials	1.5	24					4	
4070391130	聚合物形态与结构 B Polymer Morphology and Structures	2	32					4	
模块一（材料科学方向）									
4070021110	材料合成与加工 Materials Synthesizing and Processing	2	32					6	
4070014110	材料腐蚀与防护 Materials Corrosion and Protection	2	32					6	
4070098110	金属材料 Metallic Materials	2	32					6	
4070135110	特种玻璃 A Special Glass	1.5	24					6	
4070094110	胶凝材料 Gelling Materials	2	32					6	
4070048110	复合材料 Composite Materials	2	32					7	
4070058110	高分子材料 Polymer Materials	2	32					7	
4070077110	功能陶瓷材料与器件 Functional Ceramics Materials and Device	2	32					7	
4070561170	材料制备新技术 New Material Preparation Technology	2	32					7	
4070117110	电介质材料及应用 Dielectric Materials and Applications	2	32					7	
4070331130	热电材料与器件 Thermoelectric Materials and Devices	2	32					7	
4070532130	纳米材料与纳米器件 Nanomaterials and Nanodevices	2	32					7	
4070318130	半导体光电化学 Semiconductor Photoelectrochemistry	1	16					7	
小 计 Subtotal		24.5	392	0	0	0	0		
模块二（材料工程 1 方向）									
4070368120	铸造工艺学 B Foundry Engineering	2	32					6	
4070038110	材料质量分析与失效分析 Materials Quality and Failure Analysis	2	32					6	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070562170	材料表面强化技术 Materials Surface Hardening	2	32					6	
4070552140	铸造合金及其熔炼 Casting Alloy and Melting	2	32					6	
4070527140	金属材料腐蚀与防护 Metal materials Corrosion and Protection	2	32					6	
4070157110	金属功能材料 A Metal Functional Materials	2	32					7	
4070348130	金属材料前沿 Metal Material Frontier	2	32					7	
4070563170	金属先进加工技术 New Metal Preparation Technology	2	32					7	
4070564170	纳米金属材料 Nano Metal materials	1	16					7	
4070565170	材料实验设计与数据处理 Experimental Design and Data Analysis for Materials	2	32					7	
小 计 Subtotal		19	304	0	0	0	0		
模块三（材料工程 2 方向）									
4070135110	特种玻璃 A Special Glass	1.5	24					6	
4070136110	特种陶瓷 A Special Ceramics	1.5	24					6	
4070137110	特种水泥 A Special Cement	1.5	24					6	
4070070110	高性能混凝土 High-Performance Concrete	1.5	24					6	
4070094110	胶凝材料 Cementitious Materials	2	32					6	
4070566170	陶瓷装饰学 B Ceramics Decoration Art	1	16					6	
4070567170	节能墙体材料 Energy Efficency Materials for Walls	1	16					6	
4070571170	陶瓷色釉料及产品设计 B Ceramic Glaze and Product-Shape Design	1	16					6	
4070568170	海洋工程材料 Marine Engineering Materials	1	16					7	
4070569170	吸附与催化材料 Adsorption and Catalytic Materials	1	16					7	

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggeste d Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070606170	绿色道桥工程材料 Green Materials for Highway and Bridge Engineering	1	16					7	
4070570170	玻璃光导纤维 B Optical Glass Fiber	1	16					7	
4070077110	功能陶瓷材料与器件 Functional Ceramics Materials and Apparatus	2	32					7	
4070604170	玻璃深加工技术 B Glass Further Processing	1	16					7	
4070602170	能源科学概论 B Introduction to Energy Resource	1	16					7	
小 计 Subtotal		19	304	0	0	0	0		
修读说明：要求至少选修 18 学分，其中限选课 9 学分，选修课 9 学分。2+2 国际项目学生必须选修《功能材料》和《聚合物形态与结构》两门课程并取得学分。 NOTE: Minimum subtotal credits:18.									
(五) 个性课程 Personalized Elective Courses									
4070116110	纳米材料与纳米技术 A Nanomaterials and Nanotechnology	2	32					6	
4070071110	新能源材料与技术 A Materials and Technology of New Energy	2	32					6	
4070081110	光电子材料及应用 Photoelectron Materials and its Applications	1	16					6	
4070009110	薄膜材料与技术 Thin-film Materials and Technology	1	16					6	
4070349130	材料科学研究思维与方法 Thinking and Method of Materials Science Research	1	16					6	
4070152110	新型建筑材料 A New Materials for Buildings	2	32					7	
4070572170	微晶玻璃制备与应用 Preparation and Application of Glass-Crystal	1	16					7	
小 计 Subtotal		10	160	0	0	0	0		
修读说明：学生从以上个性课程选修 4 学分，在学校发布的其它个性课程目录中选课至少 2 学分。 NOTE: Students can select courses from above and the other personalized courses in catalog, and are required to obtain at least 6 credits.									



## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crts	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	5
4070216110	认识实习 Practice of Engineering Cognition	1	1	5
4070226110	专业实习 Practice of Specialty	3	3	6
4070547140	工程设计训练 Training on Engineering Design	3	3	6
4070573170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		21.5	31	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人：赵春霞  
专业培养方案责任人：黄学辉

# 材料物理专业 2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in Materials Physics (2017)

专业名称	材料物理	主干学科	材料科学与工程, 物理、化学
Major	Materials Physics	Major Disciplines	Materials science and engineering, Physics, Chemistry
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 years

### 最低毕业学分规定

#### Graduation Credit Criteria

课程类别 Course Classification 课程性质 Course Nature	通识课程 Public Basic Courses	专业课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	29	76	\	21.5		170
选修课 Elective Courses	9	18.5	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

本专业培养具有良好的思想素质、人文社科素养和职业道德, 具有创新意识和国际视野, 能够在信息功能材料与技术、光电材料与技术和纳米材料与技术等领域从事新材料设计和研制、材料性能改进与应用、器件设计与研制、生产与运营管理等工作, 适应独立和团队工作的高层次科学研究与工程技术人才。

本专业期待毕业生五年左右具有的职业能力和取得的职业成就如下:

- (1) 具有良好的社会责任感、人文社科素养和职业道德;
- (2) 能够进行新材料设计和研制、材料性能改进与应用、器件设计与研制、生产与运营管理;
- (3) 了解功能材料的发展现状和发展趋势, 掌握材料在研发生产过程中对环境、社会可持续发展等的影响; 在信息功能材料与技术、光电材料与技术和纳米材料与技术等领域具有就业竞争力;
- (4) 能够通过终身学习促进专业发展, 并在团队中具有协调和领导能力;
- (5) 有创新精神和能力, 并有能力服务社会。

- (1) With good qualities of ideological quality, the responsibility in culture, humanities and social science as well as professional ethics.
- (2) Enable to be engaged in the design and development of new material, the performance improvement and application of material, device design and development, the production and operation management.

- (3) Understand the current situation and development trend of the novel functional materials. Master the influence of new materials on environmental and social sustainable development during the process of the research and production; Possess the engaging employability in the fields of information functional materials and technology, optoelectronic materials and technology, nanomaterials and nanotechnology, etc.
- (4) Enable to promote the professional development through lifelong learning and to have the skills of the coordination and leadership in a team.
- (5) Possess the innovative spirit and ability, and enable to serve the community.

## (二) 毕业要求

- (1) **工程知识**: 具有数学、自然科学、工程基础和材料专业知识, 能够将其用于解决新型功能材料研发与生产、技术改造和服役过程等中的复杂工程问题。
- (2) **问题分析**: 能够应用数学、自然科学和工程科学的基本原理和跨学科知识, 通过文献研究和知识整合, 识别、表达、分析并研究新型功能材料在工程实践中的基本科学问题与复杂工程问题, 以获得有效结论。
- (3) **设计/开发解决方案**: 能够设计针对材料领域复杂工程问题的解决方案, 开发满足信息功能材料、光电材料、光纤传感材料和纳米材料等领域特定需求的材料、生产技术和工艺流程, 在设计环节中体现创新意识, 同时考虑社会、健康、安全、法律、文化以及环境等因素。
- (4) **研究**: 研究: 掌握材料物理、材料科学与工程的基本理论和研究方法, 具有研究和开发新材料、新工艺、新器件的初步能力, 包括设计新材料、提出解决方案、实施实验计划、采集数据、分析与解释数据、并通过信息综合得出合理有效结论和撰写论文或技术报告。
- (5) **使用现代工具**: 使用现代工具: 能够开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具, 包括对复杂工程问题进行预测与模拟, 并理解所得结论的适用性和局限性。
- (6) **工程与社会**: 能够运用工程理论及相关背景知识评价专业实践和复杂工程问题的解决方案对社会、健康、安全、法律以及文化的影响, 并理解应承担的责任。
- (7) **环境和可持续发展**: 了解和环境与可持续发展相关的规范、政策、法律和法规, 能够理解和评价工程实践及所包含的复杂工程问题对环境、社会和可持续发展的影响。
- (8) **职业规范**: 具有人文社会科学素养和社会责任感, 能够在新型功能材料工程实践中理解并遵守职业道德和规范, 履行责任。
- (9) **个人和团队**: 具有表达与交往能力、团队协作和组织管理能力, 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。
- (10) **沟通**: 具备国际视野, 针对材料物理相关领域的基本科学问题和复杂工程问题, 能够在跨文化背景下与业界同行及社会公众进行有效沟通和交流, 包括设计方案和撰写报告、陈述发言与问题讨论。
- (11) **项目管理**: 理解并掌握工程管理原理与经济决策方法, 具有在 multidisciplinary 环境中应用的能力。
- (12) **终身学习**: 具有自主学习的能力, 创新和终身学习的意识, 具有不断学习和适应科技进步与社会发展的能力。

## (II) Graduation requirements

- (1) **Engineering knowledge:** Possess the needed abilities to be engaged in the new materials related areas, such as mathematics, natural science, engineering basic knowledge and professional knowledge. Master the main method of the material preparation and the related principle in the engineering technology. Enable to analyze the complex engineering problems during the process of the research and development, design, production and practical application of new materials;
- (2) **Problem analysis:** By applying the basic theories in mathematics, natural science and engineering science, enable to recognize and express the relationship and the main influence factor on the material composition, structure, production process and property through the analysis of the related literature. Enable to analyze the relevant scientific issues of the material preparation by applying the modern testing technology and analysis method, enable to analyze the existed problem and the rationality of the solution;
- (3) **Design/development solutions:** Enable to propose the solution method for the complex engineering problems and scientific issues in the fields of the information functional materials and technology, optoelectronic materials and technology, optical fiber sensing materials and technology, nanomaterials and nanotechnology, etc. Design the equipment and the technique for the material preparation and production with the novelty and creative. By considering the social, health and safety, legal, cultural and environmental factors, optimize the design and development solutions;
- (4) **Research:** Enable to do the research on the complex questions of the materials development in a scientific method by using the related basic theory in mathematics, physics and material sciences. Enable to have the analysis and evolution on the crystal structure, energy structure, the relationship between the structure and performance on the basis of the professional knowledge, and carry out the experiment of the material preparation by a scientific method and proper synthesis route. Enable to choose the suitable measurement to give the reasonable analysis and evaluation on the experimental results, and then form an effective and reasonable conclusion combining with theory designing.
- (5) **Using of modern tools:** Enable to choose and use of the appropriate technology, resource, the tools of the modern engineering tools and information technology to carry out the complex engineering problems, including the expression and characterization, prediction and simulation, and enable to understand the applicability and limitations of the conclusion .
- (6) **Engineering and society:** Enable to use the engineering theory and relevant background knowledge to evaluate the influence of the solutions of the professional practices and complex engineering issues on the society, health, safety, law and culture. Enable to understand the responsibilities to be undertaken.
- (7) **Environment and sustainable development:** Understand the relevant rules, policies, laws and regulations related to the discipline, enable to correctly understand and evaluate the impact of engineering practices and complex engineering issues on environment, society and sustainable development.
- (8) **Occupation specification:** Possess the humane, social, scientific and social responsibility, enable to understand and obey the professional ethics and specification.
- (9) **Individual and team working:** Possess the good skills of the presentation and communication as well as team work and organizational management, enable to act as individual, team members or the role of responsible person in a multidisciplinary team;
- (10) **Communication:** Possess the international vision, enable to effectively communicate with industry peers and the public in the cross cultural background complex engineering problems for the new type of functional material in the related fields, including the plan design and report writing, the statement and discussion.

- (11) **Project management:** Understand the principles of engineering management and economic decision making, and possess the ability to be applied in engineering management practice.
- (12) **Lifelong learning:** Possess the ability to autonomously learn, the awareness of the innovation and lifelong learning, and the ability for the continuous and autonomous learning and adapting to the development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√	√		
毕业要求 2		√	√		
毕业要求 3		√			√
毕业要求 4		√	√		
毕业要求 5			√	√	
毕业要求 6	√				√
毕业要求 7	√		√		
毕业要求 8	√				
毕业要求 9				√	
毕业要求 10				√	√
毕业要求 11				√	
毕业要求 12			√		√

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

大学物理、理论物理、材料科学基础、固体物理、材料物理、材料研究与测试方法、材料设计理论与计算方法、功能材料制备及物理性能创新实验

College Physics, Physical Chemistry, Theoretical Physics, Fundamentals of Materials Science and Engineering, Solid State Physics, Materials Physics, Methods of Materials Research and Testing, Theory and Calculation Method for the Material Designing, Innovation Experiment on Materials Synthesizing and Processing

#### (二) 专业特色课程:

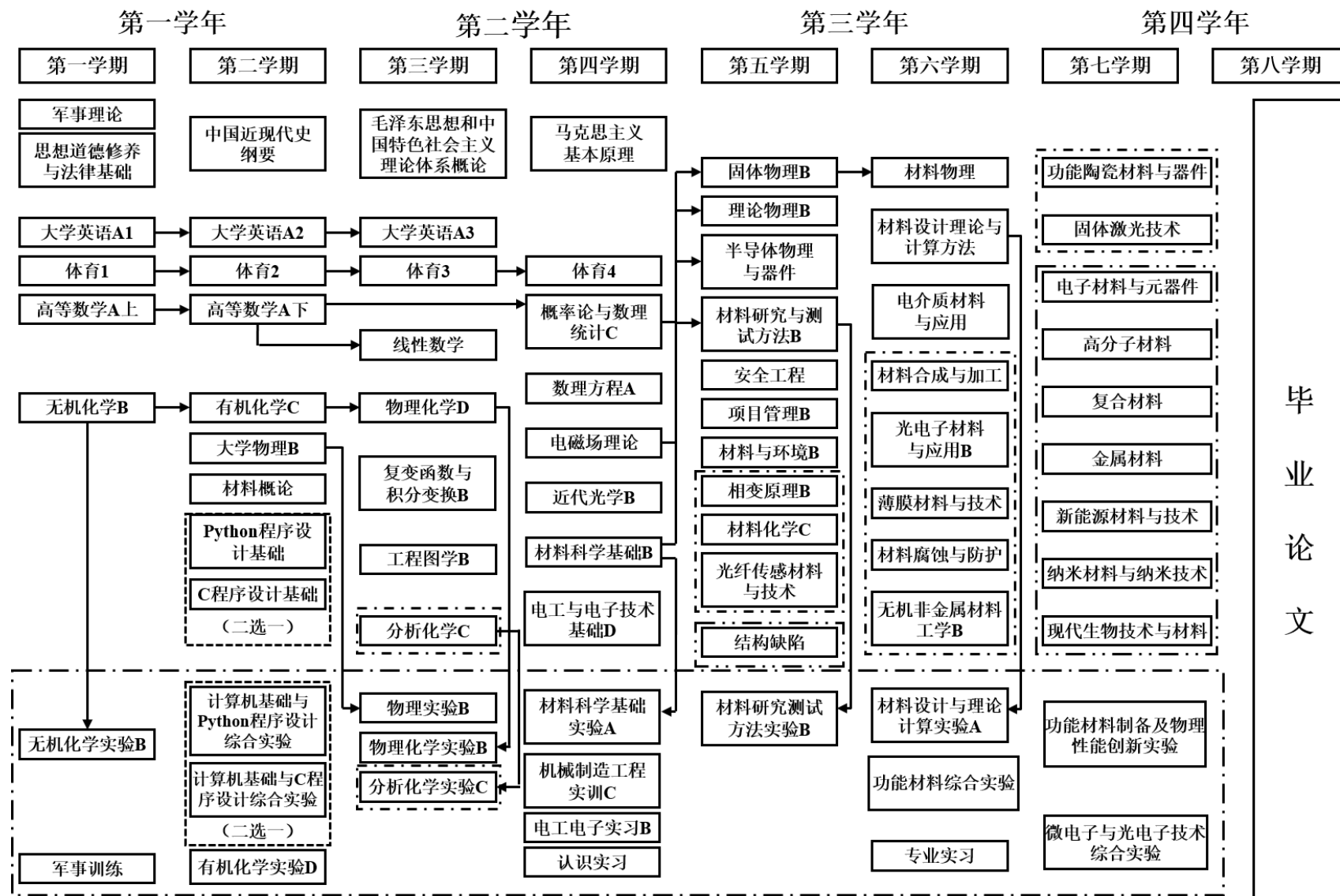
近代光学、电磁场理论、半导体物理与器件、电介质材料及应用、功能材料综合实验、微电子与光电子技术综合实验

Modern Optics, Electromagnetic Fields Theory, Semiconductor physics and devices, Dielectric Material and Application, Comprehensive Experiment of Functional Materials, Comprehensive Experiment of Microelectronic and Optoelectronic Technology



专业 核心 课程	专业 特色 课程	课程名称	材料物理专业毕业要求											
			(1) 工程 知识	2 问 题分 析	(3) 设计 /开 发解 决方 案	(4) 研 究	(5) 使 用 现 代 工 具	(6) 工 程 与 社 会	(7) 环 境 和 可 持 续 发 展	(8) 职 业 规 范	(9) 个 人 和 团 队	(10) 沟 通	(11) 项 目 管 理	(12) 终 身 学 习
		材料科学基础实验		L	L									
√		理论物理		M										
√		固体物理		H										
	√	半导体物理与器件	H	M										
√		材料研究与测试方法				L	H							
		材料研究与测试方法实验				M	L	L						
√		材料物理		L		H								
√		材料设计理论与计算方法	L		H									
		材料设计与理论计算实验			L		M							
√		功能材料综合实验								H				
	√	功能材料制备及物理性能 创新实验			H	M								
		机械制造工程实训			M			L						
		电工与电子技术基础						H						
		电工电子实习							L					
√		认识实习						L	H			L		
√		专业实习						H	L	M	L			
	√	微电子与光电子技术综合 实验				M		L						
√		毕业论文			M	H	M				M			
		工程图学	H		M		L							
√		安全工程							H					
		材料与环境							M					
√		项目管理										H		
		专业选修课群										L	L	
		电介质材料与应用									M			
		光纤传感材料与应用							M					

### 三、课程教学进程图 III Teaching Process Map





#### 四、 理论教学建议进程表

#### IV Theory Course Schedule

(一) 通识教育必修课程									
General Education Required Courses									
课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					2	
4220003110	毛泽东思想和中国特色社会 主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32			16		1	
4210004170	体育 1 Physical Education I	1	32					1	
4210004170	体育 2 Physical Education II	1	32					2	
4210004170	体育 3 Physical Education III	1	32					3	
4210004170	体育 4 Physical Education IV	1	32					4	
4030003180	大学英语 A1 College English A 1	3	60				16	1	
4030003180	大学英语 A2 College English A II	2	44				16	2	大学英语 A1
4030003180	大学英语 A3 College English A III	2	44				16	3	大学英语 A2
4030003180	大学英语 4 College English IV	2	44				16	3	大学英语 A3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Python Language Programming	2	32					2	
4120340170	计算机基础与 Python 程序设 计综合实验 Foundations of Computer and Python Language Programming Experiments	1	32	32				2	
4120335170	C 程序设计基础 C Language Programming	2	32					2	
4120336170	计算机基础与 C 程序设计综合 实验 Foundations of Computer and C Language Programming Experiments	1	32	32				2	
<b>小 计 Subtotal</b>		<b>29</b>	<b>640</b>	<b>32</b>	<b>0</b>	<b>48</b>	<b>64</b>		

(二) 通识教育选修课程 General Education Elective Courses									
以下课程要求至少选修 9 学分。									
创新创业类 Innovation and Entrepreneurship Courses	要求至少取得 1.5 个学分			要求至少取得 9 个学分					
人文社科类 Arts and Social Science Courses	至少选修 1 门								
经济管理类 Economy and Management Courses	要求至少取得 1.5 个学分								
科学技术类 Science and Technology Courses	至少选修 1 门								
艺术体育类 Art and Physical Education Courses	要求至少取得艺术类相关课程 2 学分								
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4200357170	无机化学 B Inorganic Chemistry	3	48					1	
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32				1	无机化学 B
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学 A 上
4070016110	材料概论 Introduction to Materials	2	32					2	
4200274120	有机化学 C Organic Chemistry	3	48					2	
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32				2	有机化学 C
4050463130	大学物理 B College Physics	5	80					2	
4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理 B
4050229110	线性代数 Linear Algebra	2.5	40					3	高等数学 A 下
4200366170	物理化学 D Physical Chemistry	3.5	56					3	
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32				3	物理化学 D
4050052110	复变函数与积分变换 B Complex Function and Integral Transform	3	48					3	
4050599170	近代光学 B Modern Optics	3.0	48	8				4	
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40					4	高等数学 A 下
4070043110	电磁场理论 Electromagnetic Fields Theory	2	32					4	
4070554170	材料科学基础 B Fundamentals of Materials Science	4	64					4	

4070280120	材料科学基础实验 A Experiments on Fundamentals of Materials Science	1	32	32				4	材料科学基础 B
4070113110	理论物理 B Theoretical Physics	4	64					5	
4070079110	固体物理 B Solid Physics	3.5	56					5	
4070587170	半导体物理与器件 Semiconductor Physics and Devices	3	48					5	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing	2.5	40					5	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method	1	32	32				5	材料研究与测试 方法 B
4070580170	材料物理 Materials Physics	3	48					6	固体物理 B
4070588170	材料设计理论与计算方法 Theory and Calculation Method for the Material Designing	2	32					6	
4070589170	材料设计与理论计算实验 A Experiment A on Theory and Calculation Method for the Material Designing	2	64	64				6	材料设计理论与 计算方法
4070590170	功能材料综合实验 Comprehensive Experiment of Functional Materials	3.5	112	112				6	
<b>小 计 Subtotal</b>		<b>76</b>	<b>1400</b>	<b>376</b>					
(四) 专业教育选修课程 Specialized Elective Courses									
以下课程要求至少选修 10.5 学分。									
4080366170	工程图学 B Engineering Graphics	3	48					3	
4050171110	数理方程 A Mathematical Physics Equation	2.5	40					4	
4070002110	安全工程 Safety Engineering	1	16					5	
4070558170	材料与环境 B Materials & Environmental	1	16					5	
4070151110	项目管理 B Project management	1	16					5	
4070117110	电介质材料及应用 Dielectric Materials and Applications	2	32					6	
<b>小 计 Subtotal</b>		<b>10.5</b>	<b>168</b>						
以下课程要求至少选修 8 学分。									
4070097110	结构缺陷 Structure Imperfection	2	32					5	
4070592170	相变原理 B Phase Transformation	1	16					5	
4070560170	材料化学 C Materials Chemistry	2	32					5	
4070531150	光纤传感材料与技术 Materials and Applications of Optical Fiber Sensor	1	16					5	

4070021110	材料合成与加工 Materials Synthesizing and Processing	2	32					6	
4070545140	光电子材料及应用 B Photoelectron Materials and its Applications	2	32					6	
4070009110	薄膜材料与技术 Thin-film Materials and Technology	1	16					6	
4070077110	功能陶瓷材料与器件 Functional Ceramic Material and Devices	2	32					7	
4070078110	固体激光技术 Solid Laser Technique	2	32					7	
<b>小 计 Subtotal</b>		<b>15</b>	<b>240</b>						

修读说明：要求至少选修 18.5 学分。

NOTE: Minimum subtotal credits: 18.5

(五) 个性课程

Personalized Elective Courses

4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200368170	分析化学实验 C Analytical Chemist Experiment	1	32	32				3	
4070014110	材料腐蚀与防护 Materials Corrosion and Protection	2	32					6	
4070145110	无机非金属材料工学 B Inorganic Non-metallic Materials Engineering	2	32					6	
4070116110	纳米材料与纳米技术 Nanomaterials and Nanotechnology	2	32					7	
4070593170	电子材料与元器件 Electronically materials and component	2	32					7	
4070058110	高分子材料 Polymer Materials	2	32					7	
4070048110	复合材料 Composite Materials	2	32					7	
4070098110	金属材料 Metallic Materials	2	32					7	
4070071110	新能源材料与技术 Materials and Technology of New Energy	2	32					7	
4070333130	现代生物技术与材料 Modern Biological Technology and Materials	2	32					7	
<b>小 计 Subtotal</b>		<b>20.5</b>	<b>344</b>	<b>32</b>	<b>0</b>	<b>0</b>	<b>0</b>		

修读说明：个性课程至少选修 6 学分，从以上个性课程至少选修 4 学分，在学校发布的其它个性课程目录中选课至少 2 学分。

NOTE: Students can select courses from above to obtain at least 4 credits and from the other personalized courses in catalog to obtain at least 2 credits.

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 CrS	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080151110	机械制造工程实训 C Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4070217110	认识实习 Practice of Engineering Cognition	1	1	4 (暑期)
4070229110	专业实习 Practice of Specialty	3	3	6 (暑期)
4070591170	功能材料制备及物理性能创新实验 Innovation Experiment on Materials Synthesizing and Processing	3	3	7
4110308170	微电子与光电子技术综合实验 Comprehensive Experiment of Microelectronic and optoelectronic Technology	2	2	7
4070594170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		21.5	31	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1. Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2. The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人：赵春霞  
专业培养方案责任人：周静

# 材料化学专业 2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in Materials Chemistry (2017)

专业名称	材料化学	主干学科	材料科学，化学
Major	Materials Chemistry	Major Disciplines	Materials science, Chemistry
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程类别 Course Classification 课程性质 Course Nature	通识课程 Public Basic Courses	专业课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	29	78	\	19.5	\	170
选修课 Elective Courses	9	18.5	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

培养具有良好的社会责任感、人文社科素养和职业道德，具有扎实的化学、数理和其它自然科学知识，系统掌握现代材料领域的材料科学、材料化学、工程应用的多学科多领域知识，具有创新意识和国际视野，能够在材料的合成与制备、加工与成型、结构与性能分析、材料设计与计算、材料环境行为效应、产业化应用等领域，从事工艺设计、技术开发与改造、材料服役行为分析与材料改性、新材料新器件研发与生产、应用系统集成及经营管理等工作的高层次科学研究与工程技术人才。

本专业期待毕业生 5 年左右能达成下列目标：

- (1) 身心健康，具备良好的敬业精神、社会责任感和职业道德，关注社会问题，具有质量意识、环境意识和安全意识；
- (2) 能够进行材料的制备与加工、工艺设计、技术开发与改造、材料服役行为分析与材料改性、新材料新器件研发与生产、应用系统集成及经营管理；
- (3) 在新材料的合成与制备、加工与成型、结构与性能分析、材料设计与计算、材料环境行为效应、产业化应用等领域具有就业竞争力；
- (4) 具有良好的表达能力、交流沟通能力以及良好的团队意识和合作精神，在团队中具有协调和领导能力，能够通过终身学习促进专业发展；
- (5) 具有创新精神、创新意识和国际视野，并有能力服务社会。

Aiming at preparing students for high-level scientific researchers and engineers with good social

responsibility, humanities and social sciences literacy and professional ethics, this plan will enable students to have solid foundation in basic theories of chemistry, mathematics and natural science and systematically grasp multidisciplinary and multi-fields knowledge of materials science, materials chemistry and engineering application in the fields of modern materials. With initiative spirit and international view, students can be fit into jobs in the fields of materials synthesis and preparation, processing and forming, structure and property analysis, materials design and calculation, materials environmental behavior effect and industrialization application. They can do the work of process planning, technology renovation and product development, materials performance behavior analysis and materials modification, new materials and new device research and development as well as production and application system integration and operation management.

Graduates in this major are expected to achieve the following objectives in 5 years:

1. With physical and mental health, and having good professional dedication, social responsibility and professional ethics and having concerns on social problems with quality awareness, environmental awareness and safety awareness;
2. Enable to do the work of materials preparation and processing, process planning, technology development and reform, materials performance behavior analysis and materials modification, new materials and new device research and development as well as production and application system integration and operation management;
3. Having employment competitiveness in the fields of materials synthesis and preparation, processing and forming, structure and property analysis, materials design and calculation, materials environmental behavior effect and industrialization application;
4. Having good presentation and communication skills as well as good team work spirit, with coordination and leadership skills in the team, and ability to promote professional development through lifelong learning;
5. Having innovative spirit, creative consciousness and international view and ability to serve the society.

## (二) 毕业要求

- (1) 工程知识：具有数学、自然科学、工程基础和材料专业知识，能够将其应用于解决新材料新器件研发与生产、技术改造和服役过程中的复杂工程问题的能力。
- (2) 问题分析：能够应用数学、自然科学和工程科学的基本原理，结合文献研究，识别、表达并分析材料化学及相关领域的基本科学问题和复杂工程问题，以获得有效结论。
- (3) 设计/开发解决方案：针对新材料领域复杂工程问题，能够制定解决方案，开发满足需求的材料、技术和工艺，在设计中体现创新意识，同时考虑社会、健康、安全、法律、文化以及环境等因素。
- (4) 研究：掌握材料化学、材料科学与工程的基本理论和研究方法，具有研究和开发新材料、新工艺、新器件的初步能力，包括提出解决方案、实施实验计划、采集数据、分析实验结果、得出

合理有效结论和撰写论文或技术报告。

- (5) 使用现代工具：能够开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，对复杂工程问题进行预测与模拟，并理解所得结论的适用性和局限性。
- (6) 工程与社会：能够运用工程理论及相关背景知识评价专业实践和复杂工程问题的解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。
- (7) 环境和可持续发展：了解与本专业相关的规范、政策、法律和法规，能够理解和评价工程实践及所包含的复杂工程问题对环境、社会和可持续发展的影响。
- (8) 职业规范：具有人文社会科学素养和社会责任感，能够在材料类工程实践中理解并遵守职业道德和规范，履行责任。
- (9) 个人和团队：具有表达与交往能力、团队协作和组织管理能力，能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。
- (10) 沟通：具备国际视野，针对材料化学相关领域的基本科学问题和复杂工程问题，能够在跨文化背景下与业界同行及社会公众进行有效沟通和交流，包括设计方案和撰写报告、陈述发言与问题讨论。
- (11) 项目管理：理解并掌握工程管理原理与经济决策方法，具有在多学科背景下项目管理实践中应用的能力。
- (12) 终身学习：具有自主学习的能力、创新和终身学习的意识，具有不断学习和适应社会发展的能力。

## II. Graduation requirements

1. Engineering knowledge: Having basic and professional knowledge of chemistry, mathematics, natural science and engineering. Obtaining the abilities which can be used to solve complex engineering problems in the process of new energy materials and devices research and development as well as in the production, technical transformation and service.
2. Problem analysis: Be able to use basic principles of mathematics, natural science and engineering science, combine with literature research, to identify, express and analyze basic scientific problems and complex engineering problems in material chemistry and related fields, and obtain effective conclusions.
3. Design / development solutions: Be able to develop solutions for complex engineering problems in the field of new materials; developing materials, technologies and processes to meet the needs and being innovative in materials design, as well as taking into account the social, health, safety, legal, cultural and environmental factors.
4. Research: Grasping the basic theories and research methods of material chemistry, material science and engineering, have the preliminary ability to research and develop new materials, processes and devices, including proposing solutions, implementing experimental plans, collecting data, analyzing experimental results, drawing reasonable and effective conclusions and writing papers or technical reports.
5. Using modern tools: Be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools to predict and simulate complex engineering



- problems, as well as understanding the applicability and limitations of the conclusions;
6. Engineering and society: Be able to use engineering theory and relevant background knowledge to evaluate the impacts of professional practices and solutions to complex engineering problems on social, health, safety, legal and cultural, and to understand the responsibilities;
  7. Environment and sustainable development: Understand the regulations, policies, laws and regulations related to this major, be able to understand and evaluate engineering practices and the environmental, social and sustainable impacts of complex engineering issues;
  8. Professional norms: having the humanities social science quality and responsibility, be able to understand and abide by the professional ethics and norms in the material engineering practice, fulfill the responsibility;
  9. Individuals and team: With the ability of expression and communication, teamwork and organizational management, be able to assume the role of individual, team member and person in charge in a multi-major team;
  10. Communication: having an international perspective, be able to effectively communicate with industry peers and the public who are under a cross-cultural background, focus on basic scientific and complex engineering issues related to materials chemistry, including designing plans and writing reports, presentations and problem discussions;
  11. Project management: Understanding and grasping the principles of engineering management and methods of economic decision, which can be applied to the practice of project management;
  12. Lifelong learning: Having the ability of self-study, innovation and lifelong learning, and enable to keep learning and adapt to social development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√	√		
毕业要求 2		√	√		
毕业要求 3		√	√		√
毕业要求 4		√	√		
毕业要求 5		√	√		
毕业要求 6		√	√		
毕业要求 7	√				
毕业要求 8	√				
毕业要求 9				√	
毕业要求 10				√	
毕业要求 11		√	√		
毕业要求 12					√

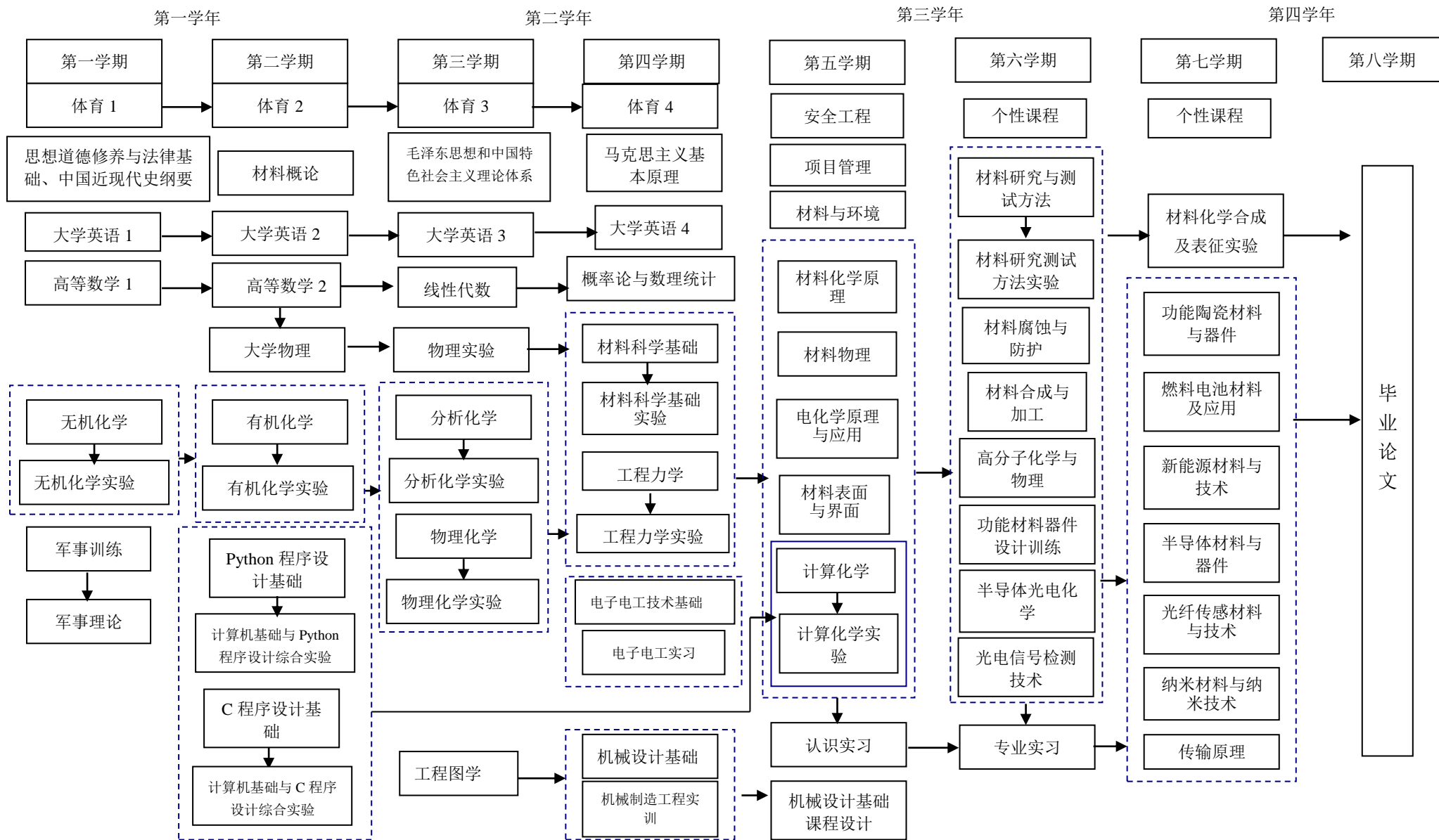


专业 核心 课程	专业 特色 课程	课程名称	材料化学专业毕业要求												
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
		高等数学	H												
		线性代数	L	M											
		概率论与数理统计		H			L								
		大学物理	H												
		物理实验				L									
		工程图学	L		L										
		电工与电子技术基础						H							
		机械设计基础			H										
		工程力学	M				L								
√		无机化学	H												
√		无机化学实验							L						
√		有机化学		L											
√		有机化学实验								L					
√		分析化学				L									
√		分析化学实验									L				
√		物理化学		M		L									
√		物理化学实验		L		L									
√		材料概论						L			M				
		材料与环境						M							
√		材料科学基础	L	H		L									
		材料科学基础实验		L	L										
√		材料物理		L		M									
√	√	计算化学	L				L								
		计算化学实验	L				L								
		安全工程							H						
		项目管理											H		
	√	材料腐蚀与防护						H							
	√	材料表面与界面									M				
√	√	材料化学原理	M	M		L									
√		材料研究与测试方法				L	H								
		材料研究与测试方法实验				H	L	L							
√	√	材料合成与加工		L		L		M							
√	√	材料化学合成及表征实验				H					H				

专业 核心 课程	专业 特色 课程	课程名称	材料化学专业毕业要求												
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
√	√	电化学原理与应用		M											
	√	高分子化学与物理		L											
		心理健康教育													L
		军事训练			L						L				
		机械制造工程实训						M							
		电工电子实习								M					
		机械设计基础课程设计			M			L							
		认识实习						L		H				L	
		专业实习						H	L	M	M				
	√	功能材料器件设计训练			M						M				
		毕业论文			M	H	M						H		
		形势与政策													L

### 三、课程教学进程图

### III Teaching Process Map



#### 四、 理论教学建议进程表

#### IV Theory Course Schedule

(一) 通识教育必修课程 General Education Required Courses									
课程编号 Course Number	课程名称 Course Title	学分 CrS	学时分配 Including					建议 修读 学期 Sugge sted Term	先修课程 Prerequisite Course
			总学 时 Tot hrs	实验 Exp	上机 Ope-ra tion	实践 Prac-ti ce	课外 Extra- cur		
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色 社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English 1	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programming	2	32					2	

4120340170	计算机基础与 Python 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2	
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2	
小 计 Subtotal		29	640	32	0	48	64		
(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 1.5 个学分						要求至少取得 9 个学分	
人文社科类 Arts and Social Science Courses		至少选修 1 门							
经济管理类 Economy and Management Courses		要求至少取得 1.5 个学分							
科学技术类 Science and Technology Courses		至少选修 1 门							
艺术体育类 Art and Physical Education Courses		要求至少取得艺术类相关课程 2 学分							
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4200357170	无机化学 B Inorganic Chemistry	3	48					1	
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32				1	无机化学 —
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学上
4070016110	材料概论 Introduction to Materials	2	32					2	
4200274120	有机化学 C Organic Chemistry	3	48					2	
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32				2	有机化学
4050463130	大学物理 B Physics	5	80					2	

4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理
4050229110	线性代数 Linear Algebra	2.5	40					3	
4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry Experiment	1	32	32				3	分析化学
4200366170	物理化学 D Physical Chemistry	3.5	56					3	
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32				3	物理化学
4080374170	工程图学 C Engineering Graphics	3	56				8	3	
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40					4	线性代数
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4080457170	机械设计基础 B Fundamentals of Mechanical Design	2.5	40					4	
4050071110	工程力学 A Engineering Mechanics	4	64	4				4	
4070554170	材料科学基础 B Fundamentals of Materials Science	4	64					4	
4070280120	材料科学基础实验 A Experiments on Fundamentals of Materials Science	1	32	32				4	材料科学基 础
4070577170	材料化学原理 Principle of Materials Chemistry	5	80					5	
4200216120	计算化学 B Calculation Chemistry	2	32					5	
4070579170	计算化学实验 Calculation Chemistry Experiment	1	32		32			5	计算化学
4070580170	材料物理 Materials Physics	3	48					5	
4070138110	电化学原理与应用 Electrochemical Fundamentals and Applications	2	32					5	



4070035110	材料研究与测试方法 A Methods of Materials Research and Testing	3.5	56					6	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method	1	32	32				6	材料研究与测试方法
4070581170	材料化学合成及表征实验 D Experiments on Materials Chemistry and Characterization	5	160	160				7	
小 计 Subtotal		78	1464	388	32	0	8		
(四) 专业教育选修课程 Specialized Elective Courses									
专业限定选修课 (至少修习 10.5 学分)									
4070002110	安全工程 Safety Engineering	1	16					5	
4070151110	项目管理 B Project Management	1	16					5	
4070582170	材料表面与界面 B Materials Surface and Interface	1.5	24					5	
4070014110	材料腐蚀与防护 Materials Corrosion and Protection	2	32					6	电化学原理与应用
4070021110	材料合成与加工 Materials Synthesizing and Processing	2	32					6	
4070583170	高分子化学与物理 B Physics and Chemistry of Polymer	3	48	8				6	
小 计 Subtotal		10.5	168	8	0	0	0		
专业选修课 (至少修习 8 学分)									
4070672170	功能材料 A Functional Materials	1.5	24					4	
4070391130	聚合物形态与结构 B Polymer Morphology and Structures	2	32					4	
4070558170	材料与环境 B Materials and Environment	1	16					5	
4070318130	半导体光电化学 Semiconductor Photoelectrochemistry	1	16					6	
4070313130	光电信号检测技术 Detection Technology of Photo-Electric Signals	2	32					6	

4070139110	燃料电池材料及应用 Fuel Cell Materials & Their Applications	2	32					7	
4070584170	传输原理 Principles of Transfer Process	2	32					7	
4070077110	功能陶瓷材料与器件 Functional Ceramic Materials and Devices	2	32					7	
4260116140	纳米材料与纳米技术 Nanomaterials and Nanotechnology	2	32					7	
4070046110	半导体材料与器件 Semiconductor Materials and Devices	2	32					7	
4070531150	光纤传感材料与技术 Materials and Applications of Optical Fiber Sensor	1	16					7	
小 计 Subtotal		15	240	0	0	0	0		
修读说明：要求至少选修 18.5 学分。2+2 国际项目学生必须选修《功能材料》和《聚合物形态与结构》两门课程并取得学分。									
NOTE: Minimum subtotal credits: 18.5.									
(五) 个性课程									
Personalized Elective Courses									
4070081110	光电子材料及应用 Photoelectron Materials and its Applications	1	16					6	
4070009110	薄膜材料与技术 Thin-film Materials and Technology	1	16					6	
4070145110	无机非金属材料工学 B Inorganic Non-metallic Materials Engineering	2	32					6	
4070098110	金属材料 Metallic Materials	2	32					7	
4070006110	玻璃光导纤维 Optical Glass Fiber	2	32					7	
4070149110	现代功能材料 A Modern Functional Materials	2	32					7	
4070071110	新能源材料与技术 A Materials and Technology of New Energy	2	32					7	
4070048110	复合材料 Composite Materials	2	32					7	
小 计 Subtotal		14	224	0	0	0	0		

修读说明: 要求至少选修 6 学分。学生从以上个性课程至少选修 4 学分, 从学校发布的其它个性课程目录至少选修 2 学分。

NOTE: Minimum subtotal credits: 6. Students can select courses from above are required to obtain at least 4 credits. Students can select courses from the other personalized courses in catalog, are required to obtain at least 2 credits.

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	5
4070218110	认识实习 Practice of Engineering Cognition	1	1	5
4070230110	专业实习 Practice of Specialty	3	3	6 (暑期)
4070585170	功能材料器件设计训练 Training on Devices Design for Functional Materials	1	1	6
4070586170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		19.5	29	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程, 分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程, 要求与本专业培养方案内设置的课程内容不重复。

1. Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.
2. The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人: 赵春霞  
专业培养方案责任人: 顾少轩

# 无机非金属材料工程专业 2017 版本本科培养方案

## Undergraduate Program for Specialty in Inorganic Non-metallic Material Engineering (2017)

专业名称	无机非金属材料工程	主干学科	材料学、化学、物理
Major	Inorganic Non-metallic Material Engineering	Major Disciplines	Materials, Chemistry, Physics
计划学制	四年	授予学位	工学学士
Duration	4 years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程性质 Course Nature	课程分类 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践教学环节 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses		29	72	\	25.5	\	170
选修课 Elective Courses		9	18.5	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Graduation Requirements

##### (一) 培养目标

##### Educational Objectives

培养有良好社会责任感和职业道德，专业知识扎实，综合素质全面，通晓无机非金属材料工程理论、技术与研究方法，能够在材料制备、加工成型、材料分析、材料应用等领域从事科学研究、技术开发、新材料研制、工艺和设备设计、技术改造、生产经营管理等工作，适应国家新经济发展和行业需求，具有适应能力强、创新意识强、实干精神强以及国际竞争力的工程技术卓越人才。

本专业毕业生通过 5 年的工作实践，逐步实现以下培养目标：

1. 具有良好的人文素养和社会责任感，遵守职业道德及规范；
2. 具有进行无机非金属材料产品制造与技术研发、工艺与装备设计、生产组织与技术管理的能力；
3. 具备项目管理能力，能够在—个技术研发团队中作为骨干或者领导发挥有效作用；
4. 在无机非金属材料制造、研发、设计、分析与应用等领域具有竞争优势；
5. 具有通过终身学习拓展和增强自己的知识和能力；
6. 具备可持续发展理念和国际化视野，有意愿创新或创业，并有能力服务社会。

Cultivate outstanding personnel of strong social responsibility, professional knowledge and ethics, comprehensive quality, adapting competence, innovative consciousness, action orientation and international competition who better understand the theories, technologies, and research methods of inorganic nonmetallic materials engineering, and can work at scientific research, technology development, new material development, process and equipment design, technological

remolding, production, operation and management in material preparation, machine-shaping, material analysis and material application, meeting the requirements of state's new economy and industry development.

The Graduates of this major, with 5 years actual working practice, are supposed to have the following competences, gradually.

1. Having excellent humanity cultivation and social responsibility, abiding by professional moralities and rules.
2. Having a competence to conduct product-manufacturing processes and its related R&D, technical process and equipment designing, production process organizing and technical management of inorganic non-metallic materials.
3. Having a competence to conduct project management, being in a position to function effectively as a core member or a leader in a technical R&D team.
4. Having stronger competitive advantages in manufacturing, R&D, designing, analyzing and application of inorganic non-metallic materials.
5. Having an ability to engage in life-long learning to enhance their own knowledge and abilities.
6. Having sustainable development ideas and international vision, a strong desire to conduct innovation activities or to engage in self-making business, and to serve the society.

## (二) 毕业要求

### Graduation Requirements

1. 工程知识：具有从事无机非金属材料工程专业相关工作所需要的数学、自然科学、工程基础和专业知识，能够将其用于解决无机非金属材料研发、设计、生产和应用过程中的复杂工程问题。
2. 问题分析：能够用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析无机非金属材料相关领域的复杂工程问题，以获得有效结论。
3. 设计/开发解决方案：针对无机非金属材料工程专业领域复杂工程问题，能够提出解决方案，设计满足特定需求的材料类型、生产装备及工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。
4. 研究：能够基于材料科学与工程基本理论并采用科学方法对复杂工程问题进行研究，包括设计与进行实验、分析与解释数据、并通过信息综合得到合理有效的结论。
5. 使用现代工具：能够针对本专业领域复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。
6. 工程与社会：能够基于专业基础理论和工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。
7. 环境和可持续发展：能够理解和评价针对复杂工程问题的工程实践对环境、社会可持续发展的影响。
8. 职业规范：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。
9. 个人和团队：具有一定的组织管理能力、表达能力、人际交往能力和团队合作能力，能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。
10. 沟通：能够就无机非金属材料相关领域复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的

国际视野，能够在跨文化背景下进行沟通和交流。

11. 项目管理：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。
12. 终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。
  1. Engineering Knowledge: graduated students must master the related knowledge in mathematics, natural science, fundamental engineering and specialty knowledge, and able to apply these knowledge to solving broadly-defined engineering problems of R&D, designing, production and application process in the field of inorganic non-metallic materials.
  2. Analyzing Problems: graduated students are able to use the basic principles of mathematics, natural science and engineering science to identify and formulate broadly-defined engineering technology problems in the field of inorganic non-metallic materials, and capable of analyzing these broadly-defined engineering problems through referring to appropriate technical literature and getting effective solutions.
  3. Design/Develop Solution Plan: graduated students have a capability of designing solution plan for broadly-defined engineering technology problems in the field of inorganic non-metallic materials, and to design detailed materials, production equipment and technical process to meet desired needs that reflect their innovation awareness at designing phase, with a consideration of social sustainability, health, safety, law, culture, environment, etc.
  4. Research: Graduated students are able to conduct the related researches in broadly-defined engineering technology problems in accordance with the basic theories of materials science and technology and by taking scientific methods, including designing and conducting experiments, analyzing and interpreting data so as to get reasonable and effective conclusions through integrated information.
  5. Using Modern Tools: Graduated students can develop, select and apply appropriate techniques, information sources, modern engineering tools and modern IT (information technology) tools, including the prediction and simulation of broadly-defined engineering technology problems, and understanding the limitation of these tools.
  6. Engineering and Society: Graduated students can reasonably analyze and evaluate the impact of professional engineering practice and broadly-defined engineering technology problem solving plan on social sustainability, health, safety, law and culture, in accordance with the professional basic theories and related background knowledge in engineering, and can understand and shoulder their responsibilities.
  7. Environment and sustainable development: Graduated students are able to understand and evaluate the impact of engineering practice of broadly-defined engineering technology problems on environment and social sustainable development.
  8. Professional Regulation: Graduated students must have better humanity cultivation, art and science as well as social responsibilities, who can understand and observe engineering professional morality and rules, and shoulder their responsibilities.
  9. Individual and Team: Graduated students have appropriate competences in organizing, managing, expressing, communicating and cooperating, and able to shoulder the responsibilities of an individual, team member or responsible person in a multidisciplinary team.
  10. Communication: Graduated students can effectively communicate and exchange views with professional colleagues and social public on broadly-defined engineering technology problems in the related field of inorganic non-metallic materials, including writing reports,

designing files, expressing thoughts, articulating or replying instructions, and having appropriate international vision and can communicate and exchange views in multicultural atmosphere.

11. Project Management: Graduated students can understand and master engineering management principles and economical determination methods, and apply them in multidisciplinary atmosphere.
12. Life-long Learning: Graduated students have an awareness of self-directed studying and life-long learning, and an ability of continuous studying and development.

附：培养目标实现矩阵（Appendix: The matrix to realize educational objectives）

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5	培养目标 6
毕业要求 1		√		√		
毕业要求 2		√		√		
毕业要求 3		√				√
毕业要求 4		√			√	
毕业要求 5				√	√	
毕业要求 6	√					√
毕业要求 7	√					√
毕业要求 8	√					
毕业要求 9			√			
毕业要求 10			√			√
毕业要求 11			√			
毕业要求 12				√	√	

## 二、专业核心课程与专业特色课程

### II Core and Characteristic Courses of Specialty

#### （一）专业核心课程：

##### Core Courses

无机化学、物理化学、材料科学基础、材料工程基础、材料研究与测试方法、无机非金属材料工学

Inorganic Chemistry, Physical Chemistry, Fundamentals of Materials Science, Fundamentals of Materials Engineering, Methods of Materials Research and Testing, Inorganic Non-metallic Materials Technology

#### （二）专业特色课程：

##### Characteristic Courses

材料制备与性能实验、无机非金属材料工厂设计概论、热工设备、材料设计实验、工程设计训练

Experiments on Materials Preparation and Performance Test, Introduction to Inorganic Non-metallic Materials Plant Design, Thermal Equipment, Experiments on Materials Design, Training on Engineering Design

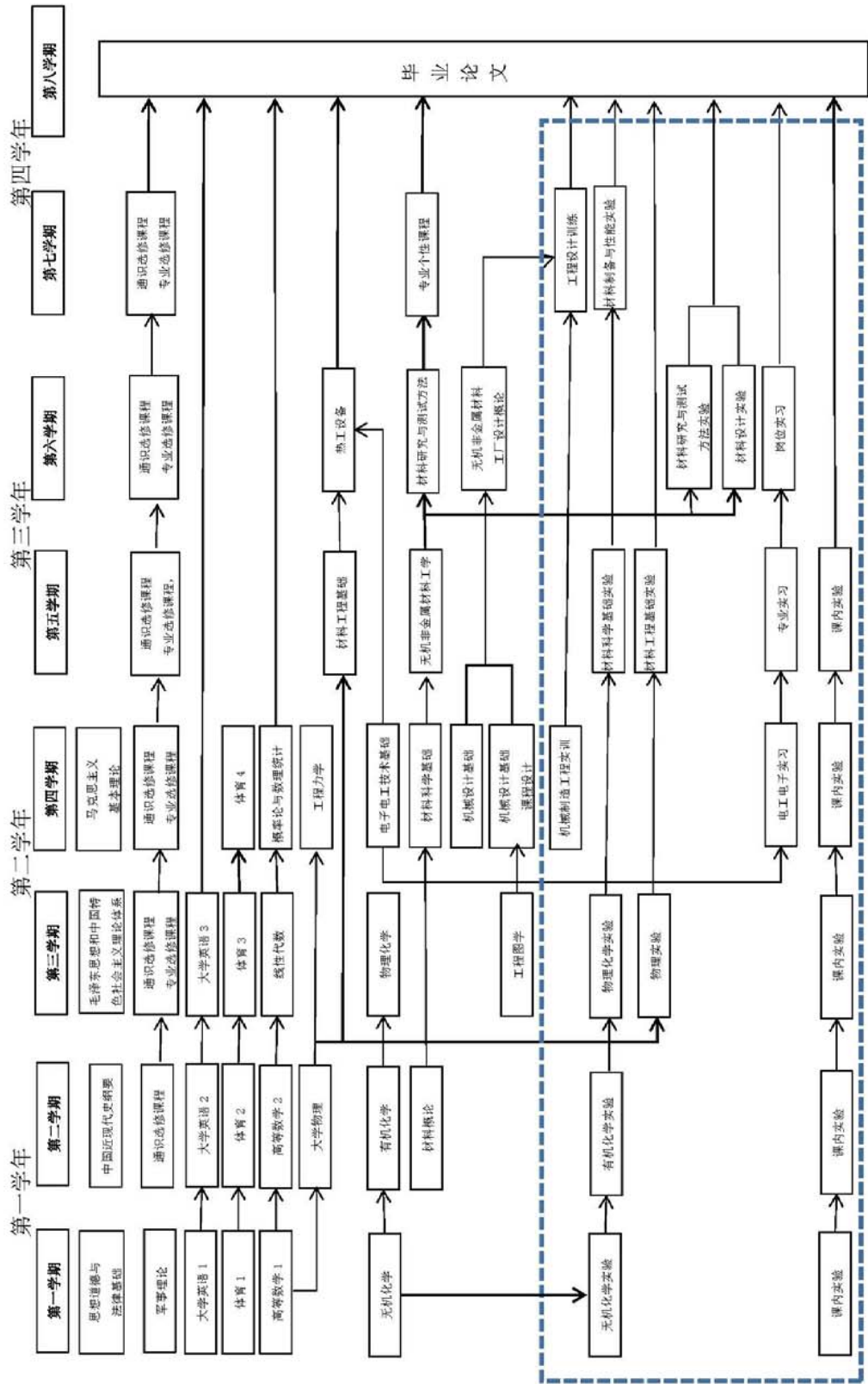




无机非金属材料工程专业毕业要求														
专业核心课程	专业特色课程	课程名称	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			工程知识	问题分析	设计/开发解决方案	研究	使用现代工具	工程与社会	环境和可持续发展	职业规范	个人和团队	沟通	项目管理	终身学习
		电工与电子技术基础	√				√							
		机械设计基础	√											
√		无机化学	√											
		无机化学实验				√				√				
√		物理化学	√											
		物理化学实验				√								
		机械制造工程实训						√						
		电工与电子实习		√										
		材料概论	√									√		
√		材料科学基础	√	√		√								√
√		材料工程基础	√	√	√				√					
		无机材料物理性能	√	√										
√		无机非金属材料工学	√	√	√									
		材料科学基础实验		√		√								
		材料工程基础实验		√			√							
	√	材料设计实验		√			√				√	√		
	√	无机非金属材料工厂设计概论			√				√	√			√	

		无机非金属材料工程专业毕业要求											
专业核心课程	专业课程名称	(1) 工程知识	(2) 问题分析	(3) 设计/开发 解决方案	(4) 研究	(5) 使用现代 工具	(6) 工程与社会	(7) 环境和可持续 发展	(8) 职业规范	(9) 个人和团队	(10) 沟通	(11) 项目管理	(12) 终身学习
√	热工设备		√	√			√						
√	材料研究与测试方法			√									√
	材料研究与测试方法实验			√									
√	材料制备与性能实验			√								√	
	项目管理									√	√		
	安全工程						√					√	
	专业实习						√			√			
	专业导论						√						√
√	工程设计训练			√			√				√		
	岗位实习						√						
	毕业论文		√		√						√		√
	专业选修课（环境类）							√					
	专业其它选修课	√	√										
	个性课程												√
	创新计划项目(课外学分)				√					√			√

三、课程教学进程图  
III Flow-Diagram of Teaching Process



#### 四、理论教学建议进程表

#### IV Theory Course Schedule

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识教育必修课程 General Education Required Courses									
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programming	2	32					2	
4120340170	计算机基础与 Python 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2	
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2	
小 计 Subtotal		29	640	32	0	48	64		

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		至少 1.5 学分							要求至少取得 9 个学分
人文社科类 Arts and Social Science Courses		至少选修 1 门							
经济管理类 Economy and Management Courses		至少 1.5 学分							
科学技术类 Science and Technology Courses		至少选修 1 门							
艺术体育类 Art and Physical Education Courses		至少取得艺术类相关课程 2 学分							
(三) 专业教育必修课程 Specialized Required Courses									
4200357170	无机化学 B Inorganic Chemistry	3	48					1	
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32				1	无机化学
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学上
4070016110	材料概论 Introduction to Materials	2	32					2	
4200274120	有机化学 C Organic Chemistry	3	48					2	
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32				2	有机化学
4050463130	大学物理 B Physics	5	80					2	
4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理
4200366170	物理化学 D Physical Chemistry	3.5	56					3	
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32				3	物理化学
4080374170	工程图学 C Engineering Graphics	3	56				8	3	
4050229110	线性代数 Linear Algebra	2.5	40					3	高等数学下
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40					4	高等数学下

课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4080457170	机械设计基础 B Base of Mechanical Design	2.5	40					4	
4070554170	材料科学基础 B Fundamentals of Materials Science	4	64					4	
4070280120	材料科学基础实验 A Experiments on Fundamentals of Materials Science	1	32	32				5	材料科学基 础
4070144110	无机非金属材料工学 A Inorganic Non-metallic Materials Technology	5	80					5	
4070017110	材料工程基础 Fundamentals of Materials Engineering	4	64					5	
4070276120	材料工程基础实验 A Experiments on Fundamentals of Material Engineering	2	64	64				6	材料工程基 础
4070534130	材料设计实验 Experiments on Materials Design	1	32	32				6	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing	2.5	40					6	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method	1	32	32				6	
4070120110	热工设备 Thermal Equipment	2	32					6	
4070673170	无机非金属材料工厂设计概论 Introduction to Design of Plant of Inorganic Non-metallic Materials	2.5	40			12		6	
4070284120	材料制备与性能实验 Experiment of Material Preparation and Performance Test	3	96	96				7	无机非金属 材料工学
小 计 Subtotal		72	1352	384	0	12	8		
(四) 专业教育限选课程 Specialized Elective Courses									
4070151110	项目管理 B Project Management	1	16					3	
4050071110	工程力学 A Engineering Mechanics	4	64	4				4	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070002110	安全工程 Safety Engineering	1	16					5	
4070142110	无机材料物理性能 Physical Properties of Inorganic Materials	2	32					5	
以下两门课程要求至少选修一门									
4070558170	材料与环境 B Materials and Environment	1	16					7	
4070600170	材料制备过程污染物控制 Pollutant Control in Material Preparation process	1	16					7	
小 计 Subtotal		10	160	4	0	0	0		
(五) 专业教育选修课程 Specialized Elective Courses									
4200303120	分析化学 C Analytical Chemistry	1.5	24					3	
4200376170	分析化学实验 C Experiment of Analytical Chemistry	1	32	32				3	分析化学
4070672170	功能材料 A Functional Materials	1.5	24					4	
4070391130	聚合物形态与结构 B Polymer Morphology and Structures	2	32					4	
4070597170	计算机在材料科学中应用 Computer Applied in Materials Science	2	32		16			5	
4070047110	粉体科学与工程基础 Fundamentals of Powder Science and Technology	2	32					5	
4070602170	能源科学概论 B Introduction to Energy Resources	1	16					6	
4070094110	胶凝材料 Cementitious Materials	2	32					6	
4070136110	特种陶瓷 A Special Ceramics	1.5	24					6	
4070137110	特种水泥 A Special Cement	1.5	24					6	
4070135110	特种玻璃 A Special Glass	1.5	24					6	
4070070110	高性能混凝土 High performance Concrete	1.5	24					6	
4070571170	陶瓷色釉料及产品设计 B Ceramic Glaze and Product-Shape Design	1	16					6	

课程编号 Course Number	课程名称 Course Title	学分 Cr.s	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070087110	混凝土施工技术 Construction Techniques of Concrete	1	16					6	
4070567170	节能墙体材料 Energy Efficiency Materials for Walls	1	16					6	
4070604170	玻璃深加工技术 B Glass Further Processing	1	16					6	
4070570170	玻璃光导纤维 B Optical Glass Fiber	1	16					7	
4070605170	生态干混砂浆 Ecological drymix mortar	1	16					7	
4070606170	绿色道桥工程材料 Green Engineering Materials for Road and Bridge	1	16					7	
4070093110	建筑工程概论 B Architecture Introduction	1	16					7	
小 计 Subtotal		27	448	32	16	0	0		

修读说明：要求至少选修 18.5 学分，其中限选课 9 学分，其它选修课 9.5 学分。2+2 国际项目学生必须选修《功能材料》和《聚合物形态与结构》两门课程并取得学分。

NOTE: Minimal subtotal credit:18.5.

(六) 个性课程

Specialized Personalized Course

以下课程最多允许选 3 学分

4070607170	材料与智能制造 Materials and Intelligent Manufacturing	1	16					5	
4070349130	材料科学研究思维与方法 Thinking and Method of Materials Science Research	1	16					5	
4070566170	陶瓷装饰学 B Ceramics Decoration Art	1	16					5	
4070608170	功能陶瓷材料与器件 B Functional Ceramics Materials and Apparatus	1	16					5	
4070609170	粉体材料 B Powder Material	1	16					5	

以下课程最多允许选 3 学分

4070610170	新型建筑材料 D New Building Material	1	16					7	
4070611170	新能源材料与技术 C New Energy Materials and Technology	1	16					7	



课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur		
4070009110	薄膜材料与技术 Thin-film Materials and Technologies	1	16					7	
4070612170	纳米材料与纳米技术 C Nanomaterials and Nanotechnology	1	16					7	
4070081110	光电子材料及应用 Photoelectronic Materials and Applications	1	16					7	
小 计 Subtotal		10	160	0	0	0	0		

修读说明：学生从以上个性课程和学校发布的其它个性课程目录中选课，要求至少选修 6 学分，其中以上个性课程至少选修 4 学分。

NOTE: Students can select courses from above and the other personalized courses in catalog, and are required to obtain at least 6 credits, 4credits in above courses.

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	4
4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4070225110	专业实习 Practice of Specialty	2	2	5
4070668170	岗位实习 Internship	6	6	6
4070547140	工程设计训练 Training on Engineering Design	3	3	7
4070669170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		25.5	35	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人： 赵春霞  
专业培养方案责任人： 赵青林

# 高分子材料与工程专业 2017 版本本科培养方案

## Undergraduate Education Plan for Major in Polymer Materials & Engineering (2017)

专业名称	高分子材料与工程	主干学科	材料科学与工程
Major	Polymer materials and Engineering	Major Disciplines	Materials science and Engineering
计划学制	4 年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程性质 Course Nature	课程类别 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses		29	78	\	18.5	\	170
选修课 Elective Courses		9	19.5	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

##### Educational Objectives

培养具有良好的思想素质、人文社科素养和职业道德，较强的工程实践能力和持续学习能力，较好的团队精神、创新意识和国际视野，系统掌握高分子材料与工程专业基础知识和实践应用方法，能在高分子材料合成与改性、成型加工、设计与应用及相关领域从事产品研发、工艺与设备设计、和生产、技术、运营管理等相关工作的高层次科学研究与工程技术人才。

本专业期待毕业生能达成下列目标：

- (1) 具有良好的修养和道德素质；
- (2) 在高分子材料方面基础扎实、知识面宽，具有解决高分子材料及其相关领域复杂工程问题的能力，能够从事高分子材料产品研发、工艺与设备设计和生产技术管理等工作；
- (3) 在高分子材料合成与改性、成型加工、设计与应用等领域具有就业竞争力。
- (4) 综合素质高，富有创新精神，能够在技术开发团队中起到骨干甚至领导作用；
- (5) 具有良好的口头和书面表达能力、交流沟通能力以及良好的团队意识和合作精神；
- (6) 具有国际化视野、可持续发展的理念和拓展自己知识的能力，能适应社会的进步，成为全面发展的高层次科学研究与工程技术人才。

The educational objective is to train students to be high-level scientific research and engineering talents with good moralities, humanistic qualities and professional ethics, strong

engineering practical abilities and sustainable learning abilities, excellent teamwork spirit, innovate consciousness and international vision, solid grounded basic theories and application abilities in polymer materials and engineering. The graduates can research and develop products, design technology and equipment and manage production in polymerization, modification of polymer materials, polymer processing and etc. fields.

Graduates of this major are supposed to achieve the following aims:

1. Having good manner and excellent moralities.
2. Having solid grounded in basic theory, wide-ranged in specialized knowledge of polymer materials and engineering. The graduates can research and develop the product of polymer materials, design the equipment and manage the production techniques.
3. Having strong employabilities in polymerization, modification of polymer materials, polymer processing and etc. fields.
4. Having initiative spirit and social responsibility. The graduates can become to assets or leaders in the technique developing teams.
5. Having the good ability of written and verbal communication skills, a good sense of cooperation and teamwork.
6. Having international vision and sustainable learning abilities. The graduates can develop their knowledge, adapt to social progress and become to excellent researchers and engineers.

## (二) 毕业要求

要求学生掌握人文社会科学理论，具有社会责任感和工程职业道德；具有较强的外语能力和计算机应用能力；掌握科学的学习方法，具有较强的学习和适应社会发展的能力；掌握高分子材料领域的基础理论和基本技能，具备分析和解决高分子材料相关领域复杂工程问题的能力。

具体毕业要求如下：

- (1) **工程知识**：能够将数学、自然科学、工程基础和专业知识用于解决高分子材料及相关领域复杂工程问题。
- (2) **问题分析**：能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析与高分子材料及相关领域的复杂工程问题，以获得有效结论。
- (3) **设计/开发解决方案**：能够设计针对高分子材料及相关领域复杂工程问题的解决方案，设计满足高分子材料与工程特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。
- (4) **研究**：能够基于科学原理并采用科学方法对高分子材料及相关领域的复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。
- (5) **使用现代工具**：能够针对高分子材料及相关领域复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对该领域复杂工程问题的预测与模拟，并能够理解其局限性。
- (6) **工程与社会**：能够基于工程相关背景知识进行合理分析，评价高分子材料与工程专业的工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。
- (7) **环境和可持续发展**：能够理解和评价针对复杂工程问题的高分子材料与工程专业的工程实践对环境、社会可持续发展的影响。
- (8) **职业规范**：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。

- (9) **个人和团队**: 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。
- (10) **沟通**: 能够就高分子材料及相关领域的复杂工程问题与业界同行及社会公众进行有效沟通和交流, 包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野, 能够在跨文化背景下进行沟通和交流。
- (11) **项目管理**: 理解并掌握工程管理原理与经济决策方法, 并能在多学科环境中应用。
- (12) **终身学习**: 具有自主学习和终身学习的意识, 有不断学习和适应发展的能力。

Students are required to have basic theory of humanities and art, social responsibility and professional behavior; great aptitude for foreign languages and computer applications; strong ability to learn and adapt to the society. The students of this major mainly study basic theory of polymer chemistry and physics, the relation of composition, structure and properties of polymer materials, and polymer molding processing technology. The graduates can solve the complicated engineering problems in the fields which are related to polymer materials and engineering.

1. **Engineering knowledge**: Knowledge of mathematics, natural science, economy and management, which are prepared for polymer material industry engineering.
2. **Analysis of problems**: Using the basic theories of applied mathematics, natural science and engineering science and literature research to solve the complicated engineering problems in the fields which are related to polymer materials and engineering.
3. **Design and develop solutions**: According to social, health, safety, law, culture, environment and the other factors, the graduates can design the solutions, engineering system and process flow in order to solve the complicated engineering problems in the fields which are related to polymer materials and engineering.
4. **Research**: Grasping the basic theory of polymer materials science and engineering; an ability to use scientific methods to study complex engineering problems, including scheme design and experiment, data analysis and interpretation, results and discussion to get valid conclusion synthetically.
5. **Using modern tools**: An ability to select and use the technologies, resources, modern engineering tools, and information technology tools, describe and characterize, predict and simulate engineering practice, and understand the applicability and limitations of the conclusions.
6. **Engineering and society**: Grasping professional basic theory and its relevant engineering knowledge, which can be used to analyze and evaluate impacts of solutions to polymer engineering practices and complex polymer engineering issues on society, health, safety, law and culture.
7. **Environment and sustainable development**: Understanding of standards, policies, laws, and regulations related to the major; An ability to correctly recognize and evaluate the impact of polymer engineering practices including polymer complex engineering issues on environment, society and sustainable development.
8. **Professional norms**: Having humanities and social sciences literacy and social responsibility; an understanding of professional and ethical norms.
9. **Individuals and team**: An ability of personal expression and communication, teamwork and organization management, and an ability to undertake the roles of individuals, team members and leaders in a multidisciplinary team.
10. **Communication**: An ability to give solutions to complex engineering issues related to polymer materials, and to communicate effectively with industry peers and the public in the

cross-cultural background, including proposal design and report writing, presentation, and problem discussion.

11. **Project management:** Understanding and grasping the principles of engineering management and methods of economic decision, which can be applied to the practice such as engineering problems.
12. **Life-long learning:** An ability of self-study and to engage in innovation and life-long learning, and enable to keep learning and adapt to social development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5	培养目标 6
毕业要求 1		√				
毕业要求 2		√				
毕业要求 3		√	√	√		
毕业要求 4		√	√			
毕业要求 5		√	√			√
毕业要求 6	√					
毕业要求 7	√					
毕业要求 8	√			√		√
毕业要求 9			√	√	√	
毕业要求 10			√		√	√
毕业要求 11		√				
毕业要求 12						√

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

有机化学、物理化学、高分子化学、高分子物理、材料化工基础、聚物流变学、聚合物加工原理与工艺、聚合物合成工艺学、材料研究与测试方法

Organic Chemistry, Physical Chemistry, Polymer Chemistry, Polymer Physics, Fundamentals of Materials Chemical Engineering, Rheology of Polymer, Principle and Technology of Polymer Processing, Technology of Polymer Synthesis, Methods of Materials Research and Testing.

#### (二) 专业特色课程:

高分子材料研究进展, 聚合物复合材料, 高分子建筑材料, 防水材料, 高聚物循环再生技术, 高分子共混物改性

Research Development of Polymer Materials, Polymer Composite Materials, Polymer Materials for Building, Waterproof Materials, Technology of Polymer Materials Recycling, Polymer Blends and Modification

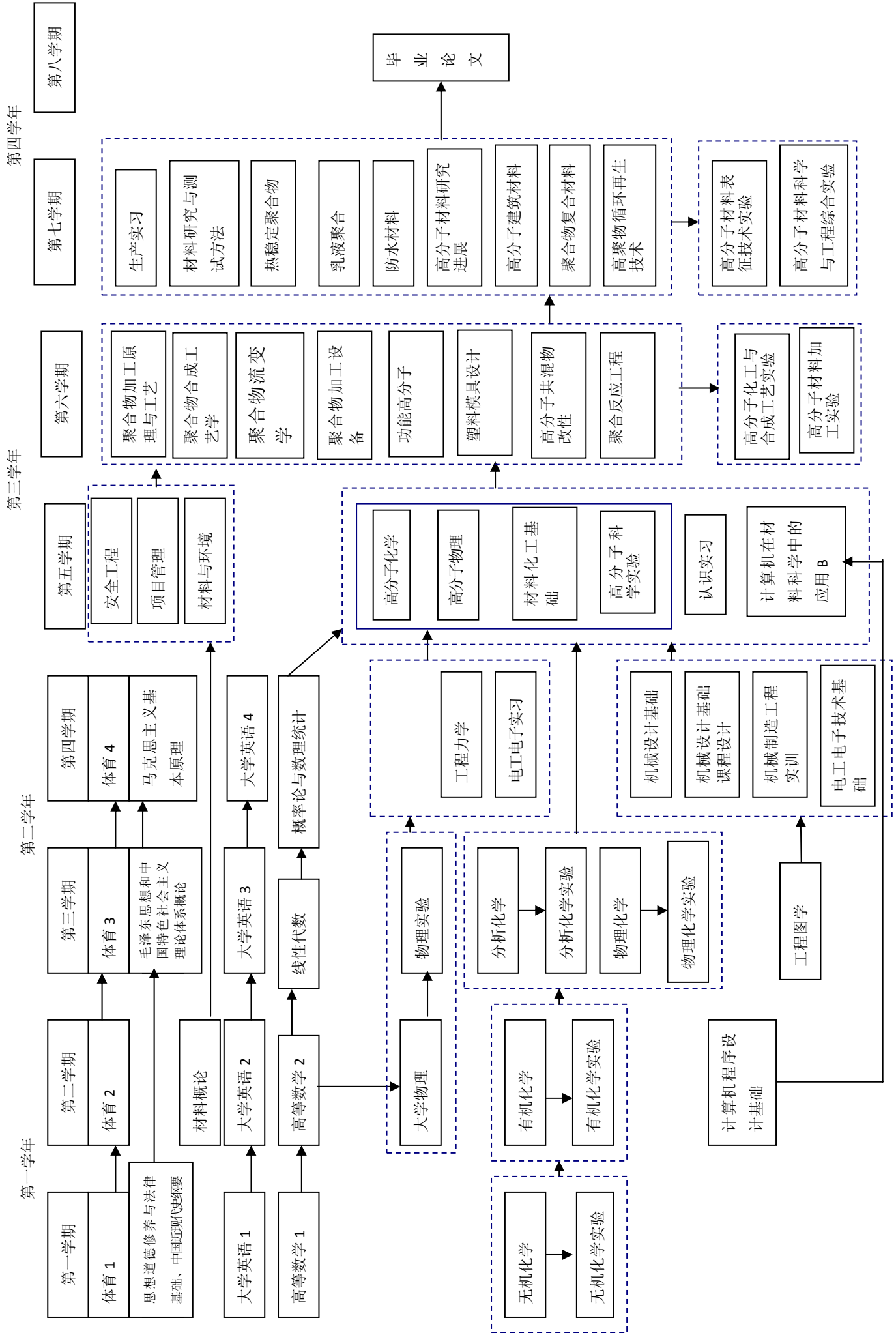


专业核 心课程	专业特 色课程	课程名称	高分子材料与工程专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		聚物流变学		√	√	√								
√		聚合物加工设备	√										√	
√		功能高分子		√			√	√						
		高分子化工与合成工艺实验			√	√								
√	√	高分子材料加工实验			√	√								
√		材料研究与测试方法	√			√	√							√
		高分子材料实验				√			√					
	√	高分子材料表征技术实验				√	√		√					
√	√	高分子材料科学与工程综合实验			√	√		√			√		√	
		安全工程						√		√				
		项目管理											√	
		材料与环境							√					
		高分子材料研究进展			√			√						
		聚合物复合材料				√								
		高分子建筑材料						√						
		防水材料					√						√	
		高聚物循环再生技术			√		√	√						
		高分子共混物改性					√					√		
		军事训练									√			√
		机械制造工程实训						√			√			
		电工电子实习						√			√			
		机械设计基础课程设计			√							√		
		认识实习						√	√			√	√	
		生产实习						√			√			√
		毕业论文				√	√					√		√

### 三、课程教学进程图

#### III Teaching Process Map





#### 四、 理论教学建议进程表

#### IV Theory Course Schedule

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识必修课程									
General Education Required Courses									
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色社会主义理论体 系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programming	2	32					2	
4120340170	计算机基础与 Python 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course	
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur			
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2		
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2		
小 计 Subtotal		29	640	32	0	48	64			
(二) 通识选修课程 General Education Elective Courses										
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 1.5 个学分							要求至少 取得 9 个学 分	
人文社科类 Arts and Social Science Courses		至少选修 1 门								
经济管理类 Economy and Management Courses		要求至少取得 1.5 个学分								
科学技术类 Science and Technology Courses		至少选修 1 门								
艺术体育类 Art and Physical Education Courses		要求至少取得艺术类相关课程 2 学分								
(三) 专业必修课程 Basic Disciplinary Required Courses										
4200357170	无机化学 B Inorganic Chemistry	3	48					1		
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32				1		
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1		
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学 A1	
4070016110	材料概论 Introduction to Materials	2	32					2		
4200274120	有机化学 C Organic Chemistry	3	48					2		
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32				2		
4050463130	大学物理 B Physics B	5	80					2		
4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理	
4050229110	线性代数 Linear Algebra	2.5	40					3	高等数学	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4200366170	物理化学 D Physical Chemistry	3.5	56					3	
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32				3	
4080374170	工程图学 C Engineering Graphics	3	56				8	3	
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40					4	线性代数
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4080457170	机械设计基础 B Fundamentals of Mechanical Design	2.5	40					4	
4050071110	工程力学 A Engineering Mechanics	4	64	4				4	
4070064110	高分子化学 A Polymer Chemistry	3.5	56					5	
4070067110	高分子物理 A Polymer Physics	3.5	56					5	
4070660170	材料化工基础 B Fundamentals of Materials Chemical Engineering	3	48					5	
4070294120	高分子科学实验 A Experiments on Polymer Science	3	96	96				5	
4070110110	聚合物加工原理与工艺 Principle and Technology of Polymer Processing	3	48					6	
4070260120	聚合物合成工艺学 A Technology of Polymer Synthesis	3.5	56			16		6	
4070289120	高分子材料加工实验 A Experiments on Polymer Materials Processing	2	64	64				6	
4070292120	高分子化工与合成工艺实验 A Experiments on Polymer Chemical Engineering g and Synthesize Technology	2	64	64				6	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing	2.5	40					7	
4070291120	高分子材料实验 A Experiments on Polymer Materials	2	64	64				7	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070288120	高分子材料表征技术实验 A Experiments on Polymer Materials Characterization	1	32	32				7	
4070290120	高分子材料科学与工程综合实验 A Comprehensive Experiments on Polymer Materials Science and Engineering	1	32	32				7 (创新创业 实践)	
小 计 Subtotal		78	1496	484	0	16	8		
(四) 专业选修课程 Specialized Elective Courses									
专业限定选修课 (至少修习 13.5 学分)									
4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry C Experiment	1	32	32				3	
4070002110	安全工程 Safety Engineering	1	16					5	
4070151110	项目管理 B Project Management	1	16					5 (创新创 业教育课 程)	
4070558170	材料与环境 B Materials & Environment	1	16					5	
4070559170	计算机在材料科学中的应用 B Computer applied in Materials Science	2	32		16			5	
4070111110	聚物流变学 A Rheology of Polymer	2	32					6	
4070076110	功能高分子 A Functional Polymer	2	32					6	
4070109110	聚合物加工设备 Equipments of Polymer Processing	2	32					6	
小 计 Subtotal		13.5	232	32	16	0	0		
专业选修课 (至少修习 6 学分)									
4070096110	结构化学 C Structural Chemistry	1.5	24					5	
4070063110	高分子共混物改性 Polymer Blends and Modification	2	32					6	
4070106110	聚合反应工程 Reactive Engineering of Polymerization	1.5	24					6	
4070129110	塑料模具设计 Mould Design of Plastics Processing	1.5	24					6	

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur		
4070123110	热稳定聚合物 Thermal Stabilized Polymer	1.5	24					7	
4070124110	乳液聚合 Emulsion Polymerization	1.5	24					7	
4070061110	高分子材料研究进展 Development of Polymer Materials	2	32					7	
4070066110	高分子建筑材料 A Polymer Materials For Building	1.5	24					7	
4070107110	聚合物复合材料 A Polymer Composite Materials	1.5	24					7	
4070044110	防水材料 A Waterproof Materials	1.5	24					7	
4070312130	高聚物循环再生技术 Technology of Polymer Materials Recycling	1.5	24					7	
小 计 Subtotal		17.5	280	0	0	0	0		
修读说明：要求至少选修 19.5 学分。 NOTE: Minimum subtotal credits:19.5.									
(五) 个性课程 Personalized Elective Courses									
4070014110	材料腐蚀与防护 Materials Corrosion and Protection	2	32					6	
4070009110	薄膜材料与技术 Thin-film Materials and Technology	1	16					6	
4070116110	纳米材料与纳米技术 A Nanomaterials and Nanotechnology	2	32					7	
4070071110	新能源材料与技术 A Materials and Technology of New Energy	2	32					7	
小 计 Subtotal		7	112	0	0	0	0		
修读说明：学生从以上个性课程和学校发布的其它个性课程目录中选课，要求至少选修 6 学分。 NOTE: Students can select courses from above and the other personalized courses in catalog, and are required to obtain at least 6 credits.									

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crts	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	4
4070219110	认识实习 Practice of Engineering Cognition	1	1	5
4070222110	生产实习 Practice of Producing	3	3	7
4070661170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		18.5	28	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人：赵春霞  
专业培养方案责任人：吴力立

# 复合材料与工程专业 2017 版本本科培养方案

## Undergraduate Education Plan for Composite Materials and Engineering (2017)

专业名称	复合材料与工程	主干学科	材料学
Major	Composite Materials and Engineering	Major Disciplines	Materials
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程类别 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
课程性质 Course Nature						
必修课 Required Courses	29	71.5	\	24.5	\	170
选修课 Elective Courses	9	20	6	\	10.0	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

本专业培养适应社会可持续发展、国际化需要，具有良好的人文素养和职业道德，具备扎实的自然科学基础和突出的工程实践能力，具有良好的团队合作与创新意识，系统掌握复合材料基础理论和专业知识，能够在复合材料设计与制备、成型加工、应用等领域胜任研究、设计、开发、制造和管理工作的高层次科学研究与工程技术人才。

本专业毕业生通过 5 年左右的工作实践，预期达到以下目标：

- (1) 具有良好的人文和社会科学素养，具有社会责任感和工程职业道德；
- (2) 具备分析、制定和解决复合材料及其相关领域复杂工程问题的能力，能够胜任复合材料技术与产品研发、工艺与设备设计、产品设计、生产与经营管理等工作；
- (3) 具备项目管理能力，能够在—个技术研发团队中作为骨干或者领导有效地发挥作用；
- (4) 能够通过终身学习，拓展和增强自己的知识和能力；
- (5) 具备可持续发展理念和国际化视野，有意愿创新或创业，并有能力服务社会。

For the major, the high-level research and engineering talents are trained with good humanistic accomplishment and professional ethics to meet the needs of social sustainable development and internationalization, who have the solid natural science, outstanding ability of engineering practice and good spirit of teamwork and innovation, systematically master the basic theory and professional knowledge of composite materials, and can engage in research, development, design of product and process, production and management in the field of composite design, preparation, forming and application.



The graduates of this major are expected to achieve the following goals after about 5 years of work practice:

(1) Having good humanistic and social science accomplishment, a sense of social responsibility, and professional ethics.

(2) Having the ability to analyze, formulate and resolve the complex engineering problems in composite materials and related fields, and being able to engage in research, development, design of product and process, management of productive technology of composite materials.

(3) Having the ability to manage the projects, and to take effective roles as a backbone or leader in a R&D team.

(4) They can expand and strengthen their knowledge and ability by lifelong learning.

(5) They have the ability to serve the society with international vision, sustainable development concept, willing of innovation entrepreneurship.

## (二) 毕业要求

(1) **工程知识:** 能够将数学、自然科学、工程基础和专业知用于解决复合材料设计、成型与应用等复杂工程问题;

(2) **问题分析:** 能够应用数学、自然科学和材料工程科学的基本原理, 识别、表达、并通过文献研究分析复合材料设计、成型与应用过程中的复杂工程问题, 以获得有效结论;

(3) **设计/开发解决方案:** 能够设计针对复合材料复杂工程问题的解决方案, 设计满足需求的材料体系、结构形式与成型工艺, 并能够在设计环节中体现创新意识, 考虑社会、健康、安全、法律、文化以及环境等因素;

(4) **研究:** 能够基于科学原理并采用科学方法对复合材料合成、结构设计、性能等复杂工程问题进行研究, 包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论;

(5) **使用现代工具:** 能够针对复合材料合成、结构设计和性能中的复杂工程问题, 开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具, 包括对复杂工程问题的预测与模拟, 并能够理解其局限性;

(6) **工程与社会:** 能够基于复合材料工程相关背景知识进行合理分析, 评价复合材料新产品、新技术、新工艺和复杂工程问题的解决方案对社会、健康、安全、法律以及文化的影响, 并理解应承担的责任;

(7) **环境和可持续发展:** 树立可持续发展的工程思想, 能够理解和评价针对复合材料复杂工程问题的工程实践对环境、社会可持续发展的影响;

(8) **职业规范:** 具有人文社会科学素养、社会责任感和良好的心理素质, 能够在复合材料工程实践中理解并遵守工程职业道德和规范, 履行责任;

(9) **个人和团队:** 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色;

(10) **沟通:** 能够就复合材料复杂工程问题与业界同行及社会公众进行有效沟通和交流, 包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令, 并具备一定的国际视野, 能够在跨文化背景下进行沟通和交流;

(11) **项目管理:** 理解并掌握复合材料工程管理原理与经济决策方法, 并能在多学科环境中应用;

(12) **终生学习:** 具有自主学习和终身学习的意识, 有不断学习和适应发展的能力。

- (1) Engineering knowledge: Having the knowledge of mathematics, natural science, engineering and professional knowledge in the field of composite materials and engineering, and it can be applied to resolve the complex engineering problems in the design, forming and application of composite materials.
- (2) Problem analysis: Having the ability to apply the basic principles of mathematics, natural science and material engineering science to identify, express and analyze the complex engineering problems in the field of design, forming and application of composite materials through literature research, and obtain the valid conclusions.
- (3) Design and develop solutions: Having the ability to design a solution for the complex engineering problems in the field of composite materials, design the material system, structural style and forming process to meet the specific requirements, and the innovative consciousness should be expressed in the design process, and it should be taken into account the factors such as society, health, safety, law, culture and environment.
- (4) Research: Having the ability to research the complex engineering problems of synthesis, structural design and property of composite materials based on scientific principles and methods, including design of experiments, analysis and explanation of experimental data, and reasonable and effective conclusions are obtained by integrated information.
- (5) Application of modern tools: Having the ability to develop, select and apply the appropriate technology, resource, engineering and information technology tools to solve the complex engineering problems, including the prediction and simulation of the complex engineering problems, and its limitations should be understood.
- (6) Engineering and society: Have the ability to conduct reasonable analysis based on relevant background knowledge of composite materials and engineering, to evaluate the impact of new products, new technologies, new processes and solutions for complex engineering problems of composite materials on society, health, safety, law and culture, and understand the responsibilities to be undertaken.
- (7) Environment and sustainable development: Establishing the engineering idea of sustainable development can understand evaluate the impact of engineering practice on the sustainable development of environment and society for complex engineering problems of composite materials.
- (8) Professional standard: Having humanities, art and social responsibility, good psychological quality, and have the ability to understand and comply with the ethics and standards in engineering practices, and fulfill responsibilities.
- (9) Individuals and team: Having the ability to take the roles of individuals, team members and leaders in a multidisciplinary team.
- (10) Communication: Having the ability to effectively communicate with industry counterparts and the public on complex engineering issues of composite materials, including reports, presentation and responses. And have the ability for communications and discussions in the cross-cultural background with international vision.
- (11) Project management: Having the ability to understand and master the engineering management principles and economic decision methods in the field of composite materials, and it can be applied in the multidisciplinary environment.
- (12) Lifelong learning: Having the awareness of self-learning and lifelong learning, and have the ability of continuous learning and adapting to development to keep abreast of the latest theories, technologies and international trends in the field of composite materials.

附 1: 培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√			
毕业要求 2		√			
毕业要求 3		√			√
毕业要求 4		√			
毕业要求 5		√			
毕业要求 6	√				√
毕业要求 7	√				√
毕业要求 8	√				√
毕业要求 9			√		
毕业要求 10			√	√	√
毕业要求 11			√		
毕业要求 12				√	√

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

高分子化学、高分子物理、材料研究与测试方法、材料复合原理、复合材料力学、复合材料聚合物基体、复合材料工艺与设备

Core Courses: Polymer Chemistry, Polymer Physics, Methods of Materials Research and Testing , Principles of Materials Compositing, Mechanics of Composite Materials, Composite Materials Polymer Matrix, Technologies and Equipments of Composite Materials.

#### (二) 专业特色课程:

复合材料制备新技术、复合材料界面、功能复合材料、复合材料模具设计、复合材料产品设计、复合材料学、复合材料结构设计

Characteristic Courses: New Technologies of Composite Materials Preparing, Interface of Composite Materials, Functional Composite Materials, Mould Design of Composite Materials, Products Design of Composite Materials, Composite Materials ,Structural Design of Composite Materials.

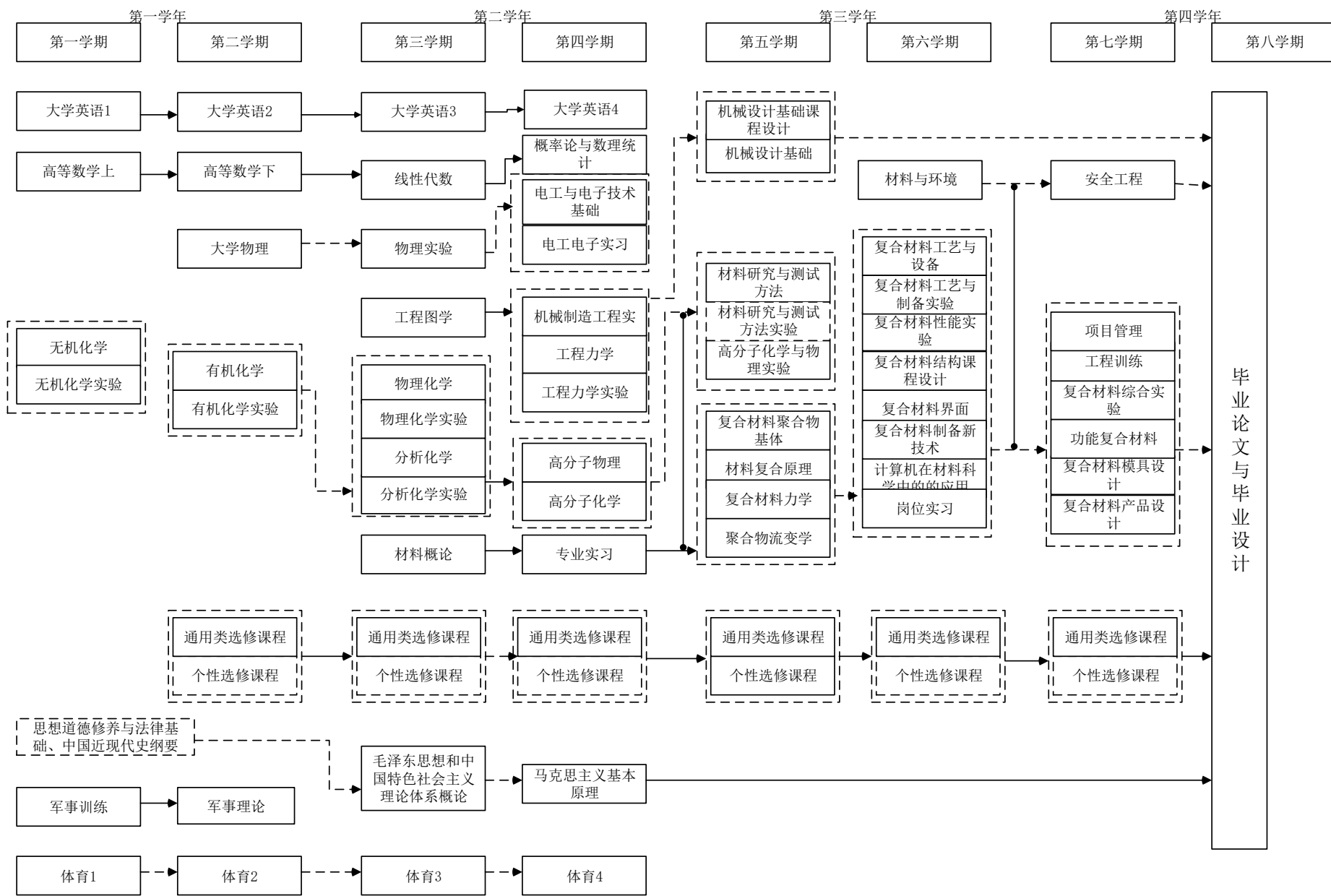




编号	课程名称	1	2	3	4	5	6	7	8	9	10	11	12
		工程知识	问题分析	设计/开发 解决方案	研究	使用现代 工具	工程与社 会	环境和可 持续发展	职业规范	个人和团 队	沟通	项目管理	终身学习
59	岗位实习			√			√		√		√		
60	毕业论文		√		√						√		√
61	专业选修课						√	√					
62	个性课程							√			√		
63	创新类活动									√		√	√

### 三、课程教学进程图

#### III Teaching Process Map



四、 理论教学建议进程表  
IV Theory Course Schedule

(一) 通识必修课程 General Education Required Courses									
课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议 修读 学期 Sugg- ested Term	先修 课程 Prereq- uisite Cours- e
			总学 时 Tot hrs.	实 验 Exp .	上机 Ope-r ation	实践 Prac-ti ce	课外 Extra-c ur		
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学 英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学 英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学 英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programming	2	32					2	
4120340170	计算机基础与 Python 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2	



4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2		
小 计 Subtotal		29	640	32	0	48	64			
(二) 通识选修课程 General Education Elective Courses										
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 1.5 个学分							要求 至少 取得9 学分	
人文社科类 Arts and Social Science Courses		至少选修 1 门								
经济管理类 Economy and Management Courses		要求至少取得 1.5 个学分								
科学技术类 Science and Technology Courses		至少选修 1 门								
艺术体育类 Art and Physical Education Courses		要求至少取得艺术类相关课程 2 学分								
(三) 专业教育必修课程 Basic Disciplinary Required Courses										
4200357170	无机化学 B Inorganic Chemistry B	3	48					1		
4200358170	无机化学实验 B Inorganic Chemistry Experiment B	1	32	32				1		
4050063110	高等数学 A 上 Advanced Mathematics A I	5	80					1	高等 数学 上	
4050064110	高等数学 A 下 Advanced Mathematics A II	5	80					2		
4200274120	有机化学 C Organic Chemistry C	3	48					2		
4200302120	有机化学实验 D Organic Chemistry Experiment D	1	32	32				2		
4070016110	材料概论 Introduction to Materials	2	32					2		
4050463130	大学物理 B Physics B	5	80					2		
4050224110	物理实验 B Physical Experiment B	1	32	32				3	大学 物理 B	
4050229110	线性代数 Linear Algebra	2.5	40					3	高等 数学 A 下	
4080374170	工程图学 C Engineering Graphics C	3	56				8	3		
4200366170	物理化学 D Physical Chemistry D	3.5	56					3		
4200367170	物理化学实验 B Physical Chemistry B Experiment	1	32	32				3		
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology D	3	48					4		
4050072110	工程力学 B Engineering Mechanics B	4	64					4		

4050073110	工程力学 B 实验 Engineering Mechanics Experiment B	0.5	16	16				4	
4070065110	高分子化学 B Polymer Chemistry B	3	48					4	有机化学
4070068110	高分子物理 B Polymer Physics B	3	48					4	物理化学
4080457170	机械设计基础 B Base of Mechanical Design B	2.5	40					5	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing B	2.5	40					5	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method B	1	32	32				5	材料研究与测试方法
4070293120	高分子化学与物理实验 A Experiments on Polymer Chemistry & Physics A	2	64	64				5	
4070015110	材料复合原理 Composite Materials Principles	2	32					5	
4070055110	复合材料力学 A Mechanics of Composite Materials A	2	32					5	工程力学
4070054110	复合材料聚合物基体 Composite Materials Polymer Matrix	2	32					5	高分子化学
4070052110	复合材料工艺与设备 A Composite Manufacture Technology and Equipment A	3	48					6	
4070285120	复合材料工艺与制备实验 A Experiments of Process and Preparation of Composite Materials A	3	96	96				6	复合材料工艺与设备
4070287120	复合材料性能实验 A Experiments of Composite Materials Properties	2	64	64				6	
小 计 Subtotal		71.5	1352	400	0	0	8		
(四) 专业教育选修课程 Specialized Elective Courses									
专业限定选修课 (至少修习 14 学分)									
4200303120	分析化学 C Analytical Chemistry C	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry Experiment C	1	32	32				3	
4050598170	概率论与数理统计 C Probability and Mathematical Statistics C	2.5	40					3	
4070053110	复合材料结构设计 Structural Design of Composite Materials	2	32					6	复合材料力学
4070559170	计算机在材料科学中的应用 B Computer Applied in Materials Science & Engineering B	2	32		16			6	
4070558170	材料与环境 B Materials & Environment B	1	16					6	

4070002110	安全工程 Safety Engineering	1	16					7	
4070595170	复合材料综合实验 Comprehensive Experiment of Composite Materials	2	64	64				7	
4070151110	项目管理 B Project Management B	1	16					7	
小 计 Subtotal		14	272	96	16	0	0		
专业选修课（至少修习 6 学分）									
4070353120	聚物流变学 B Rheology of Polymer B	1.5	24					5	高分子化学
4070140110	复合材料界面 A Interface of Composite Materials A	2	32					6	材料复合原理
4070254120	复合材料制备新技术 B New Manufacturing Technology of Composite Materials	1.5	24					6	复合材料工艺与设备
4070252120	复合材料模具设计 B Mould Design of Composite Materials B	1.5	24					7	
4070049110	复合材料产品设计 A Product Design of Composite Materials A	2	32					7	复合材料结构设计
4070255120	功能复合材料 B Functional Composites B	1.5	24					7	
小 计 Subtotal		10	160	0	0	0	0		
修读说明：要求至少选修 20 学分。 NOTE: Minimum subtotal credits:20.									
(五) 个性课程 Personalized Elective Courses									
4070344130	复合材料学 A Composite Materials A	2	32					5	
4070116110	纳米材料与纳米技术 A Nanomaterials and Nanotechnology A	2	32					6	
4070596170	绿色建筑材料 C Green Materials for Building C	1.5	24					7	
4070345130	航空航天复合材料 Aerospace Composite Materials	1	16					7	
小 计 Subtotal		6.5	104	0	0	0	0		
修读说明：要求至少选修 6 学分，学生从以上个性课程目录中至少选修 4 学分。 NOTE: Minimum subtotal credits: 6. And students are required to obtain at least 4 credits from the Personalized Elective Courses listed above.									

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1

4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4070224110	专业实习 Practice of Specialty	2	2	4
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	5
4070198110	复合材料结构课程设计 Practice of Structural Design of Composite Materials	1	1	6
4070670170	岗位实习 On-the-job Training	6	6	7
4070598170	工程训练 B Engineering Training	1	1	7
4070599170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		24.5	34	

## 六、其它要求

### VI Recommendations on Course Studies

《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。

Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

学院教学责任人：赵春霞  
专业培养方案责任人：梅启林

# 新能源材料与器件专业 2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in New Energy Materials and Devices (2017)

专业名称	新能源材料与器件	主干学科	材料科学与工程, 化学、物理学
Major	New Energy Materials and Devices	Major Disciplines	Materials science and engineering, Chemistry, Physics
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering
所属大类	材料类	大类培养年限	1 年
Disciplinary	Materials	Duration	1 year

### 最低毕业学分规定

#### Graduation Credit Criteria

课程类别 Course Classification 课程性质 Course Nature	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	29	77.5	\	21.5	\	170
选修课 Elective Courses	9	17	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

培养具有社会责任感、人文社科素养和职业道德，具有创新意识和国际视野，能够在新能源材料合成与加工、结构与性能分析、器件设计与应用等领域，从事新能源材料研发、能源器件设计与研制、技术改造和产品开发、技术管理与经营管理等工作的高层次科学研究与工程技术人才。

本专业期待毕业生五年左右具有的职业能力和取得的职业成就如下：

- (1) 具有良好的社会责任感、人文社科素养和职业道德，具有环境保护和社会安全意识；
- (2) 能够进行新能源材料合成与加工、器件设计与产品研发、技术改造和生产管理、产品检验与质量监控等相关工作；
- (3) 在新能源材料设计与制备、结构调控与优化、性能测试与分析、能源器件设计与制作、产业化应用等领域具有就业竞争力；
- (4) 具有国际视野，在多元化发展中具有团队协作意识和领导能力，有担当并发挥作用；
- (5) 具有终身学习能力、创新意识和创新能力，并有能力服务社会。

#### (I) Program Educational Objectives

The major aims at cultivating high-level scientific researchers and engineers with social responsibility, humanities and social sciences literacy, professional ethics, initiative spirit and international view, who are competitive in new energy material development, design and preparation of new energy devices, technology

transferring and product development, technology and running management in the fields of synthesis and processing, structure and property analysis, device design and applications of new energy materials.

Graduates in this major are expected to achieve the following objectives in 5 years after graduation:

1. Having a good social responsibility, humanities and social sciences literacy and professional ethics as well as strong sense of environment protection and social security.
2. An ability of energy materials preparation, device design and product development, technology renovation and manufacturing management, production inspection and quality control et.al..
3. Having employment competitiveness in the fields of preparation of new energy materials, structure and property analysis, device design, processing and applications.
4. Having broad international perspectives and bear leading roles and cooperation sense in diversified teams.
5. An ability of lifelong learning, innovation sense and ability for serving the society.

## (二) 毕业要求

- (1) **工程知识:** 具有数学、自然科学、工程基础和材料专业知识, 能够将其用于解决新能源材料与器件研发、技术改造和服役过程等中的复杂工程问题。
- (2) **问题分析:** 能够应用数学、自然科学和工程科学的基本原理, 结合文献研究, 识别、表达并分析新能源材料与器件工程实践中的基本科学问题与技术问题, 得到合理有效结论。
- (3) **设计/开发解决方案:** 针对新能源材料领域复杂工程问题, 能够制定解决方案, 开发满足需求的材料、技术和工艺, 在设计中体现创新意识, 同时考虑社会、健康、安全、法律、文化以及环境等因素。
- (4) **研究:** 掌握材料科学与工程的基本理论和研究方法, 具有研究和开发新能源材料与器件的初步能力, 包括提出解决方案、实施实验计划、采集数据、分析实验结果、得出合理有效结论和撰写论文或技术报告。
- (5) **使用现代工具:** 能够开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具, 包括对复杂工程问题进行预测与模拟, 并理解所得结论的适用性和局限性。
- (6) **工程与社会:** 能够运用工程理论及相关背景知识评价专业实践和复杂工程问题的解决方案对社会、健康、安全、法律以及文化的影响, 并理解应承担的责任。
- (7) **环境和可持续发展:** 了解与本专业相关的规范、环境与可持续发展政策、法律和法规, 能够理解和评价工程实践及所包含的复杂工程问题对环境、社会和可持续发展的影响。
- (8) **职业规范:** 具有人文社会科学素养和社会责任感, 能够在材料类工程实践中理解并遵守职业道德和规范, 履行责任。
- (9) **个人和团队:** 具有表达与交往能力、团队协作和组织管理能力, 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。
- (10) **沟通:** 具备国际视野, 针对新能源材料相关领域的基本科学问题和复杂工程问题, 能够在跨文化背景下与业界同行及社会公众进行有效沟通和交流, 包括设计方案和撰写报告、陈述发言与问题讨论。
- (11) **项目管理:** 理解并掌握工程管理原理与经济决策方法, 具有在多学科背景下项目管理实践中应用的能力。
- (12) **终身学习:** 具有自主学习的能力、创新和终身学习的意识, 具有不断学习和适应社会发展的能力。

## (II) Graduation requirements

1. **Engineering knowledge:** Having basic knowledge of mathematics, science and engineering and professional knowledge in materials science, and an ability to solve complex engineering issues in the development and working process of new energy materials and devices.
2. **Problem analysis:** Combined with the literature reading, applying the basic principles and methods of mathematics, science and engineering to identify, interpret and analyze complex scientific and engineering issues in the related fields of new energy materials and devices for obtaining reasonable conclusions.

3. **Design / development solutions:** An ability to provide solutions for complex engineering problems in the field of new energy materials and devices, and material design, device parameters and process flow to meet desired needs with realistic concerns in society, health, safety, law, culture, and environment.
4. **Research:** Grasping the basic theories and research methods of materials science and engineering; having a preliminary ability in the research and development of new materials, including scheme design and experiment, data analysis and interpretation, results and discussion to get valid conclusion synthetically.
5. **Using modern tools:** An ability to develop, select and apply proper engineering and information tools to describe, characterize, predict and simulate engineering issues on the basis of knowing applicability and limitations of the conclusions.
6. **Engineering and society:** An ability to apply technology ethics and related to evaluate the impacts of major practice and complex engineering issues on society, health, security, law and culture, and understanding the corresponding responsibilities.
7. **Environment and sustainable development:** Understanding of standards, policies, laws, and regulations including the impacts of complex engineering issues on environment, society and sustainable development.
8. **Professional norms:** Having a sense of humanities and social science literacy and social responsibility, and obeying professional ethics and norms, and taking the responsibilities during the practice processes of materials research.
9. **Individuals and team:** An ability of expression and communication, teamwork and organization management, and an ability to undertake the roles of individuals, team members and leaders in a multidisciplinary team.
10. **Communication:** An ability to give solutions to complex engineering issues related to new energy materials and devices, and to communicate effectively with industry peers and the public in the cross-cultural background, including proposal design and report writing, presentation, and problem discussion.
11. **Project management:** Understanding and grasping the principles of engineering management and methods of economic decision, and an ability to apply them to solve engineering issues.
12. **Life-long learning:** An ability of self-study and a sense of innovation and lifelong learning for continuous study and adaption to the social development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√	√		
毕业要求 2		√	√		
毕业要求 3		√	√		√
毕业要求 4		√	√		
毕业要求 5		√	√		
毕业要求 6		√	√		
毕业要求 7	√				
毕业要求 8	√				
毕业要求 9				√	
毕业要求 10				√	
毕业要求 11		√	√		
毕业要求 12					√

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程：

材料科学基础、固体物理、材料物理、半导体物理基础、材料研究与测试方法、新能源材料制备与性能实验、新能源材料与器件组装实验

Fundamentals of Materials Science, Solid State Physics, Materials Physics, Fundamentals of Semiconductor Physics, Methods of Materials Research and Testing, Experiments of New Energy Materials' Preparation and Properties, Experiments of New Energy Materials and Devices Assembly

(二) 专业特色课程:

材料概论、材料科学基础、半导体物理基础、电化学原理与应用、器件设计训练、新能源材料与器件组装实验

Introduction to Materials, Fundamentals of Materials Science, Fundamentals of Semiconductor Physics, Electrochemical Fundamentals and Applications, Training on Devices Design, Experiments of New Energy Materials and Devices Assembly

附: 毕业要求实现矩阵:

专业核 心课程	专业特 色课程	课程名称	新能源材料与器件专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		思想道德修养与法律基础							L	L				
		中国近现代史纲要								L				M
		毛泽东思想和中国特色社会主义理论体系概论								M				L
		马克思主义基本原理								L				H
		军事理论									M			
		体育									L			
		大学英语										H		
		程序设计基础					M							
		计算机基础与程序设计综合实验					H							
		通识 类选 修课	创新创业类											M
			人文社科类								L			
			经济管理类											M
		高等数学	H											
		线性代数	L	M										
		概率论与数理统计		H		L								
		大学物理	H											
		物理实验				L								
		无机化学	M											
		无机化学实验								L				
		有机化学		L										
		有机化学实验				L								
		分析化学				L								
		分析化学实验										L		
		物理化学		M		L								
		物理化学实验		L		L								
		工程图学	L		L									
		电工与电子技术基础					H							
		机械设计基础			H									
		工程力学	H			L								
	√	材料概论							L			M		

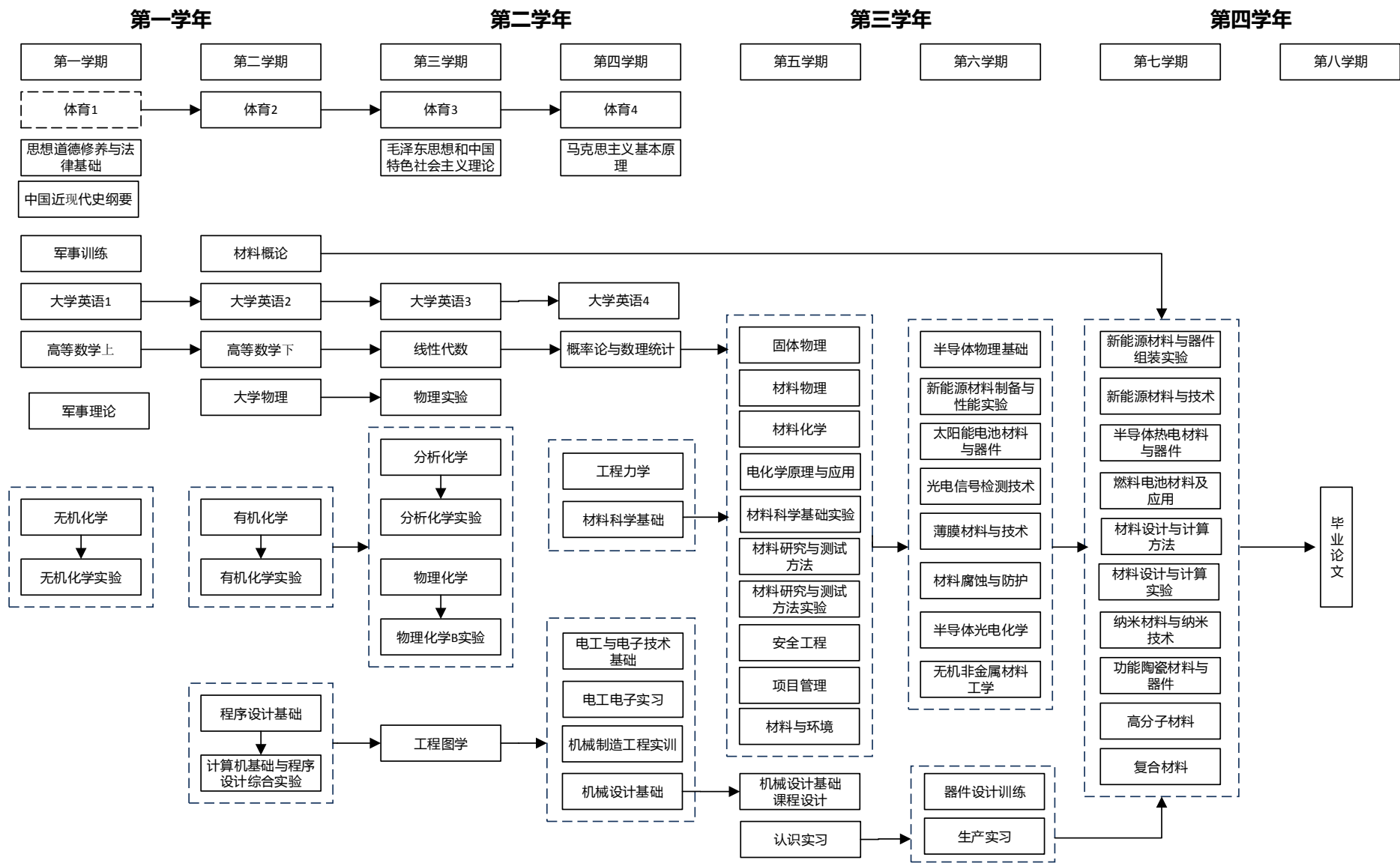


专业核 心课程	专业特 色课程	课程名称	新能源材料与器件专业毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		材料与环境								M				
√	√	材料科学基础	L	H		L								
		材料科学基础实验		L	L									
√		材料物理		L		M								
√		固体物理		H										
		材料化学		M		L								
√	√	半导体物理基础	M	L										
√		材料研究与测试方法				L	H							
		材料研究与测试方法实验				M	L	L						
	√	电化学原理与应用		M					L					
	√	器件设计训练			H						H	L		
√		新能源材料制备与性能实验									H			
√	√	新能源材料与器件组装实验				H								
		安全工程							H					
		项目管理											H	
		专业限选课							M			L		
		专业选修课												M
		军事训练									L			
		机械制造工程实训			L			M						
		电工电子实习								M				
		机械设计基础课程设计			M			L						
		认识实习						L		H				
		专业实习						H	L	M	L			
		毕业论文			M	H	M					H		

备注：表中用“H”、“M”、“L”分别表示该课程对指标点的支撑强度为“高”、“中”、“低”。

### 三、课程教学进程图

#### III Teaching Process Map



#### 四、理论教学建议进程表

#### IV Theory Course Schedule

(一) 通识教育必修课程									
General Education Required Courses									
课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1	
4220003110	毛泽东思想和中国特色社会 主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
以下两组语言课程要求二选一，取得 3 学分。									
4120339170	Python 程序设计基础 Foundations of Python Language Programing	2	32					2	
4120340170	计算机基础与 Python 程序设 计综合实验 Comprehensive Experiments of Foundation of Computer and Python Language Programming	1	32	32				2	
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					2	
4120336170	计算机基础与 C 程序设计综 合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				2	
小 计 Subtotal		29	640	32	0	48	64		

(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 1.5 个学分						要求至少取得 9 个学分	
人文社科类 Arts and Social Science Courses		至少选修 1 门							
经济管理类 Economy and Management Courses		要求至少取得 1.5 个学分							
科学技术类 Science and Technology Courses		至少选修 1 门							
艺术体育类 Art and Physical Education Courses		要求至少取得艺术类相关课程 2 学分							
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4200357170	无机化学 B Inorganic Chemistry	3	48					1	
4200358170	无机化学实验 B Inorganic Chemistry Experiment	1	32	32				1	无机化学
4050063110	高等数学 A 上 Advanced Mathematics I	5	80					1	
4050064110	高等数学 A 下 Advanced Mathematics II	5	80					2	高等数学 A 上
4070016110	材料概论 Introduction to Materials	2	32					2	
4200274120	有机化学 C Organic Chemistry	3	48					2	
4200302120	有机化学实验 D Organic Chemistry Experiment	1	32	32				2	有机化学
4050463130	大学物理 B Physics	5	80					2	高等数学
4050224110	物理实验 B Physics Lab.	1	32	32				3	大学物理
4050229110	线性代数 Linear Algebra	2.5	40					3	
4200303120	分析化学 C Analytical Chemist	1.5	24					3	
4200376170	分析化学实验 C Analytical Chemistry Experiment	1	32	32				3	分析化学
4200366170	物理化学 D Physical Chemistry	3.5	56					3	
4200367170	物理化学实验 B Physical Chemistry Experiment	1	32	32				3	物理化学
4080374170	工程图学 C Engineering Graphics	3	56				8	3	
4050598170	概率论与数理统计 C Probability and Mathematical Statistics	2.5	40					3	(2019 级以后)
4100214170	电工与电子技术基础 D Fundamentals of Electrical Engineering & Electric Technology	3	48					4	
4080457170	机械设计基础 B Fundamentals of Mechanical Design	2.5	40					4	
4050071110	工程力学 A Engineering Mechanics	4	64	4				4	

4070554170	材料科学基础 B Fundamentals of Materials Science	4	64				4	
4070304120	材料科学基础实验 B Experiments on Fundamentals of Materials Science	1	32	32			5	材料科学基础
4070079110	固体物理 B Solid Physics	3.5	56				5	
4050535140	材料物理 Materials Physics	3	48				5	
4070036110	材料研究与测试方法 B Methods of Materials Research and Testing	2.5	40				5	
4070555170	材料研究与测试方法实验 B Experiments on Materials Research and Testing Method	1	32	32			5	材料研究与测试方法
4070560170	材料化学 C Materials Chemistry	2	32				5	
4070138110	电化学原理与应用 Electrochemical Fundamentals and Applications	2	32				5 后半学期	
4070574170	半导体物理基础 C Fundamentals of Semiconductor Physics	3	48				6	材料物理
4070662170	新能源材料制备与性能实验 Experiments of New Energy Materials' Preparation and Properties	2	64	64			6	半导体物理
4070663170	新能源材料与器件组装实验 Experiments of New Energy Materials and Devices Assembly	3	96	96			7	电化学原理与应用
小 计 Subtotal		77.5	1440	388	0	0	8	
(四) 专业教育选修课程 Specialized Elective Courses								
4070672170	功能材料 A Functional Materials	1.5	24				4	
4070391130	聚合物形态与结构 B Polymer Morphology and Structures	2	32				4	
4070002110	安全工程 Safety Engineering	1	16				5 专业限选	
4070151110	项目管理 B Project Management	1	16				5 专业限选	
4070558170	材料与环境 B Materials & Environmental	1	16				5 专业限选	
4070313130	光电信号检测技术 Detection Technology of Photo-Electric Signals	2	32				6	
4070014110	材料腐蚀与防护 Materials Corrosion and Protection	2	32				6	
4070009110	薄膜材料与技术 Thin-film Materials and Technology	1	16				6	
4070318130	半导体光电化学 Semiconductor Photoelectrochemistry	1	16				6	

4070145110	无机非金属材料工学 B Inorganic Non-metallic Materials Engineering	2	32					6	
4070071110	新能源材料与技术 A New Energy Materials and Technology	2	32					7	专业限选
4070559190	材料设计与计算方法 Calculation Method for the Material Designing	1	16					7	
4070560190	材料设计与计算实验 Experiments on Calculation Method for the Material Designing	1			16			7	材料设计与计算方法
4070058110	高分子材料 Polymer Materials	2	32					7	
4070116110	纳米材料与纳米技术 A Nanomaterials and Nanotechnology	2	32					7	
4070077110	功能陶瓷材料与器件 Functional Ceramics Materials and Devices	2	32					7	
4070048110	复合材料 Composite Materials	2	32					7	
以下课程要求至少取得 4 学分									
4070332130	太阳能电池材料与器件 Solar Cell Materials and Devices	2	32					6	
4070331130	半导体热电材料与器件 Thermoelectric Semiconductors and Devices	2	32					7	
4070139110	燃料电池材料及应用 Fuel Cell Materials & Their Applications	2	32					7	
小 计 Subtotal		32.5	520	0	20	0	0		
修读说明：要求至少选修 17 学分。2+2 国际项目学生必须选修《功能材料》和《聚合物形态与结构》两门课程并取得学分。 NOTE: Minimum subtotal credits: 17.									
(五) 个性课程 Personalized Elective Courses									
4070135110	特种玻璃 A Special Glass	1.5	24					6	
4070081110	光电子材料及应用 Photoelectron Materials and its Applications	1	16					6	
4070047110	粉体科学与工程基础 Fundamental of Powder Science and Engineering	2	32					6	
4070531150	光纤传感材料与技术 Materials and Applications of Optical Fiber Sensor	1	16					7	
4070098110	金属材料 Metallic Materials	2	32					7	
4070061110	高分子材料研究进展 Development of Polymer Materials	2	32					7	
小 计 Subtotal		9.5	152	48	0	0	0		
修读说明：要求至少选修 6 学分，学生从以上个性课程目录中至少选修 4 学分。 NOTE: Minimum subtotal credits: 6. And students are required to obtain at least 4 credits from the Personalized Elective Courses listed above.									

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crs	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080152110	机械制造工程实训 D Training on Mechanical Manufacturing Engineering	1	1	4
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice of Fundamentals of Mechanical Design	2	2	5 (学期初)
4070549150	认识实习 Practice of Engineering Cognition	1	1	5
4070664170	器件设计训练 Training on Devices Design	3	3	6
4070550140	专业实习 Practice of Specialty	3	3	6 (暑期)
4070576170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		21.5	31	

## 六、其他要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1. Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2. The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人： 赵春霞

专业培养方案责任人： 赵春霞

# 材料成型及控制工程专业（卓越工程师班）2017 版本本科培养方案

## Undergraduate Education Plan for Specialty in Materials Forming and Control Engineering (Excellent Engineer Class) (2017)

专业名称	材料成型及控制工程	主干学科	机械工程、材料科学与工程
Major	Materials Forming and Control Engineering	Major Disciplines	Mechanical Engineering, Materials Science and Engineering
计划学制	四年	授予学位	工学学士
Duration	4 Years	Degree Granted	Bachelor of Engineering

### 最低毕业学分规定

#### Graduation Credit Criteria

课程性质 Course Nature	课程分类 Course Classification	通识教育课程 Public Basic Courses	专业教育课程 Specialized Courses	个性课程 Personalized Course	集中性实践教学环节 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses		29	69.5	\	26.5	\	170
选修课 Elective Courses		9	20	6	\	10	

### 一、培养目标与毕业要求

#### I Educational Objectives & Requirement

##### (一) 培养目标

本专业培养适应快速发展的国民经济和现代化建设需要，具有良好的社会责任感、职业道德、人文素养和良好的科学工程素质，具备系统的材料科学、机械工程和自动控制等基础知识和应用能力，既能够从事材料成型工程领域的科学研究、教学培训、新产品新工艺新技术开发、生产组织及工程服务等方面的工作，也能够承担经营管理、生产技术管理等工作，具有实践能力和创新意识的高级人才。

本专业期待毕业生几年之后能达成下列目标：

- (1) 具有良好的社会责任感、人文社科素养和职业道德；
- (2) 能够进行材料成型领域的科研与教学、产品研发、技术改造、生产经营和生产技术管理；
- (3) 在材料成型领域的研究与开发、生产工艺设计及控制等领域具有就业竞争力；
- (4) 能够通过终身学习促进专业发展，并在团队中具有协调和领导能力；
- (5) 有创新精神和能力，并有能力服务社会。

This program aims at training students who meet the requirements of the rapid growth of national economy and modernization as well as have a strong sense of social responsibility, professional ethics, humanistic quality and scientific engineering quality. With comprehensive knowledge and skills of materials science, mechanical engineering and automatic control, students can be competent to engage not only in the aspects of academic research, teaching, production organization, engineering services and development of



new product, novel process and technology but also in the management works of operation and production technique, showing excellent practical ability and innovate consciousness.

Students of this programs are expected to achieve the following objectives after graduation:

1. Have a strong sense of social responsibility, professional ethic and good quality of humanities and social sciences.
2. Be competent to engage in research, teaching, product development, technical reform, production management and production technology management related to materialsforming and control engineering.
3. Be competitive in the field of materialsforming and control engineering on the aspects of research, development, industrial design and control.
4. Promote professional development through life-long study with capacity in communication, negotiation, organization and executive.
5. Possess innovative spirit and ability and to serve our society.

## (二) 毕业要求

- (1) **工程知识:** 具有从事材料成型及控制工程领域相关工作所需要的数学, 自然科学, 工程基础和专业基础知识, 能够将其用于解决相关领域的复杂工程问题;
  - (2) **问题分析:** 能够应用数学、自然科学、工程科学和专业基础知识的基本原理, 并通过文献研究, 识别、表达、分析材料成型及控制相关领域的复杂工程问题, 以获得有效结论;
  - (3) **设计/开发解决方案:** 能够设计针对材料成型及控制相关领域复杂工程问题的解决方案, 能进行材料成型工艺设计, 成型过程控制设计, 成型装备或焊接结构设计等, 并能够在设计、开发环节中体现创新意识, 考虑社会、健康、安全、法律、文化以及环境等因素;
  - (4) **研究:** 能够综合运用材料成型及控制工程专业基础理论和技术手段对专业相关领域复杂工程问题进行研究, 包括设计实验、分析与解释数据, 并通过结果讨论得到合理有效的结论;
  - (5) **使用现代工具:** 能够针对材料成型及控制相关领域复杂工程问题, 选用现代工程开发工具和信息技术工具, 对材料成型工艺、成型装备或焊接结构进行设计, 对成型过程进行模拟和预测等, 并能够理解其局限性;
  - (6) **工程与社会:** 能够合理分析、评价材料成型及控制相关领域工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响, 并理解应承担的责任;
  - (7) **环境和可持续发展:** 树立可持续发展的工程思想, 能够理解和评价针对材料成型及控制相关领域复杂工程问题的工程实践对环境、社会可持续发展的影响;
  - (8) **职业规范:** 具有人文社会科学素养、社会责任感和道德情操, 能够在工程实践中理解并遵守工程职业道德和规范, 履行责任;
  - (9) **个人和团队:** 具有一定的组织管理能力、表达能力、人际交往能力和团队合作能力, 能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色;
  - (10) **沟通:** 能够就材料成型及控制相关领域复杂工程问题与业界同行及社会公众进行有效沟通和交流, 包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野, 能够在跨文化背景下进行沟通和交流;
  - (11) **项目管理:** 理解并掌握工程管理原理与经济决策方法, 并能在多学科环境中应用;
  - (12) **终生学习:** 具有自主学习和终身学习的意识, 有不断学习和适应发展的能力。
1. **Engineering knowledge:** Acquire mathematics, natural science, engineering principles and professional knowledge required for the work in the field of materials forming and control engineering, and be able to use them to solve complex engineering issues.
  2. **Problem analysis:** Apply the fundamental principle of applied mathematics, natural science,

- engineering science and professional knowledge to identify, express and analyze the complex engineering issues related to materials forming and control engineering through literature review, and to finally reach effective conclusions.
3. **Design/development solution:** Be capable to provide solutions to complex engineering problems in the field of materials forming and control engineering, design materials forming processes, forming process controlling, forming equipment, or welding constructions, as well as to reflect innovation consciousness in the design and development processes, taking factors including society, health, safety, laws, culture, and environment into considerations.
  4. **Research:** Be able to comprehensively apply fundamental theories and technical skills of materials forming and control engineering to investigate complex engineering problems in professional-related area, including experimental designs, analysis and interpretation of data, and acquiring reasonable and effective conclusion via discussing results.
  5. **Usage of modern tools:** Be able to select and use modern engineering development and information technology tools to solve complex engineering problems in the field of materials forming and control technology, design materials processing technology, processing equipment, or welding constructions, model and predict forming processes, and understand the limitations of the tools.
  6. **Engineering and society:** Be able to analyze and estimate the influences of engineering practice and complex engineering problem solutions properly in the field of materials forming and control engineering on society, health, safety, laws, culture and environment, and understand the responsibilities that should be taken for.
  7. **Environment and sustainable development:** Establish engineering thoughts of sustainable development, understand and estimate the influences of engineering practice of complex engineering problems in the field of materials forming and control engineering on sustainable development of environment and society.
  8. **Professional standards:** Have quality of humanities and social sciences, social responsibilities, and moral sentiments to understand and comply with engineering professional ethics and norms, and to fulfill the responsibilities.
  9. **Individual and team:** Acquire capabilities of organization management, expression, human communication and team work, and be able to play a role as an individual, team member or manager in a team with a multi-discipline background.
  10. **Communication:** Be able to negotiate and exchange with industry peers and the public on complex engineering problems in the field of materials forming and control engineering, including writing, designing and presenting reports clearly, and have certain international perspectives to communicate under the cross-cultural background.
  11. **Project management:** Understand and grasp engineering management principles and economic decision making methods, and be able to apply them in multi-discipline situations.
  12. **Life-long learning:** Acquire consciousness of self-learning and life-long learning, and capabilities of continuous learning and adaptive development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1		√			
毕业要求 2		√	√		
毕业要求 3	√	√	√		√

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 4		√	√		√
毕业要求 5				√	
毕业要求 6	√	√			√
毕业要求 7	√				
毕业要求 8	√				
毕业要求 9		√		√	
毕业要求 10		√	√	√	√
毕业要求 11		√	√		
毕业要求 12				√	

## 二、专业核心课程与专业特色课程

### II Core Courses and Characteristic Courses

#### (一) 专业核心课程:

材料力学、机械设计基础、电工与电子技术基础、金属学及热处理、材料成型原理、材料成型控制工程基础、CAD/CAM 基础、测试技术基础

Materials Mechanics, Foundation of Mechanical Design, Electrical Engineering, Metallography and Heat Treatment, Principle of Material Forming, Fundamentals of Material Forming Control and Engineering, Fundamentals of CAD/CAM, Fundamentals of Testing Techniques

#### (二) 专业特色课程:

电弧焊基础、微连接原理与方法、弧焊电源、焊接结构、焊接工艺评定实验、焊接结构生产实验、焊接自主设计实验

Fundamentals of Arc Welding, Principle and Method of Micro Joining, Arc Welding Power, Welding Structure, Experiment on Welding Process Qualification, Experiment on Welding Structure Production, Experiment on Independent Design of Welding

附：毕业要求实现矩阵：

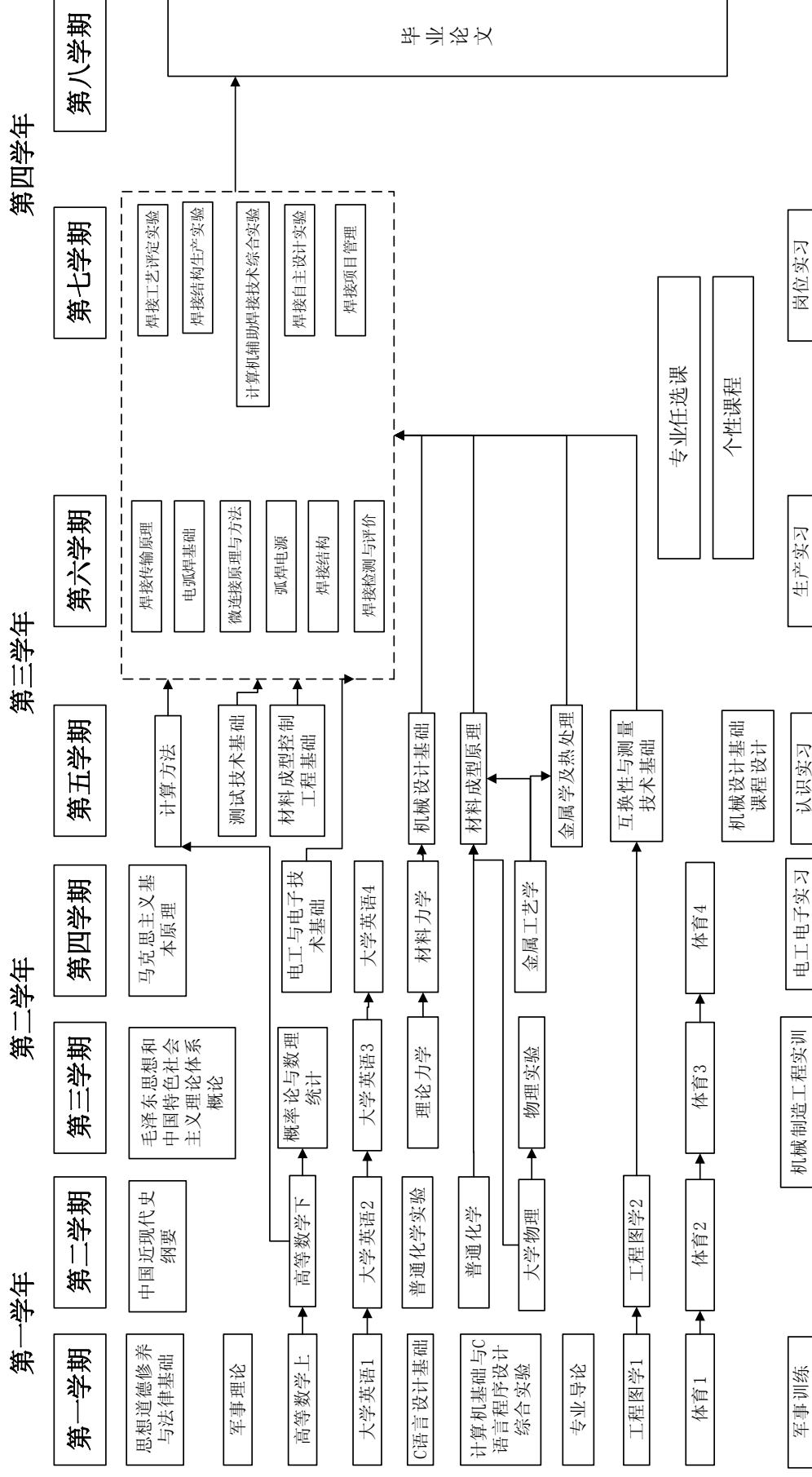
专业 核心 课程	专业 特色 课程	课程名称	材料成型及控制工程专业（卓越工程师班）毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		思想道德修养与法律基础						√	√	√				
		中国近现代史纲要								√				
		毛泽东思想和中国特色社会主义理论体系概论								√				
		马克思主义基本原理								√				
		军事理论								√				
		体育									√			
		大学英语					√					√		√
		C 语言设计基础					√							
		计算机基础与 C 语言程序设计综合实验					√							



专业 核心 课程	专业 特色 课程	课程名称	材料成型及控制工程专业（卓越工程师班）毕业要求											
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	√	焊接结构		√	√									
		材料焊接性		√		√								
		焊接传输原理	√			√								
		焊接质量检测与评价		√		√								
	√	焊接工艺评定实验		√		√								
	√	焊接结构生产实验		√	√									
		计算机辅助焊接技术综合实验		√	√		√							
	√	焊接自主设计实验			√	√						√		
		焊接工程项目管理							√				√	
		专业选修课						√						
		军事训练									√			
		机械制造工程实训						√						
		电工电子实习		√										
		机械设计基础课程设计		√		√								
		认识实习						√		√				
		生产实习						√					√	
		岗位实习						√	√					
		毕业论文				√						√		√

### 三、课程教学进程图

#### III Teaching Process Map



#### 四、 理论教学建议进程表

#### IV Theory Course Schedule

课程编号 Course Number	课 程 名 称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(一) 通识教育必修课程 General Education Required Courses									
4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1	
4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					2	
4220003110	毛泽东思想和中国特色社会主义理论体 系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		3	
4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		4	
1060003130	军事理论 Military Theory	1	32				16	1	
4210001170	体育 1 Physical Education I	1	26					1	
4210002170	体育 2 Physical Education II	1	34					2	
4210003170	体育 3 Physical Education III	1	34					3	
4210004170	体育 4 Physical Education IV	1	34					4	
4030002180	大学英语 1 College English I	3	60				12	1	
4030003180	大学英语 2 College English II	2	44				12	2	大学英语 1
4030004180	大学英语 3 College English III	2	44				12	3	大学英语 2
4030004180	大学英语 4 College English IV	2	44				12	4	大学英语 3
4120335170	C 程序设计基础 Foundations of C Language Programming	2	32					1	
4120336170	计算机基础与 C 程序设计综合实验 Comprehensive Experiments of Foundation of Computer and C Language Programming	1	32	32				1	
小 计 Subtotal		29	640	32	0	48	64		

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
(二) 通识教育选修课程 General Education Elective Courses									
创新创业类 Innovation and Entrepreneurship Courses		要求至少取得 9 个学分，且必须选修艺术体育类课程中的艺术类相关课程并取得至少 2 个学分，在经济管理类课程中至少选修一门，在创新创业类课程中至少选修一门。 Students are required to obtain at least 9 credits, which must contain art courses of 2 credits from the category of Art and Physical Education Courses, at least one course from the category of Innovation and Entrepreneurship Courses and the category of Economy and Management Courses respectively.							
人文社科类 Arts and Social Science Courses									
经济管理类 Economy and Management Courses									
科学技术类 Science and Technology Courses									
艺术体育类 Art and Physical Education Courses									
(三) 专业教育必修课程 Basic Disciplinary Required Courses									
4070234110	专业导论 Introduction to Materials Physics	1	16				1		
4050063110	高等数学 A 上 Advanced Mathematics I	5	80				1		
4050064110	高等数学 A 下 Advanced Mathematics II	5	80				2	高等数学上	
4080371170	工程图学 A 上 Engineering Graphics I	3	56			8	1		
4080372170	工程图学 A 下 Engineering Graphics II	2.5	56			16	2	工程图学上	
4200371170	普通化学 C General Chemistry	2	32				2		
4200372170	普通化学实验 C General Chemistry Lab	0.5	16	16			2		
4050229110	线性代数 Linear Algebra	2.5	40				2		
4050463130	大学物理 B Physics	5	80				2		
4050224110	物理实验 B Physics Lab.	1	32	32			3	大学物理	
4050058110	概率论与数理统计 B Probability and Mathematical Statistics	3	48				3	高等数学	
4050106110	计算方法 B Computing Method	2	32				3	高等数学下	
4050549140	理论力学 C Theoretical Mechanics	4	64				3		
4100011110	电工与电子技术基础 B Electrical Engineering	5.5	88	20			4		



课程编号 Course Number	课 程 名 称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4050015110	材料力学 A Materials Mechanics	5	80	8				4	理论力学
4080367170	金属工艺学 B Metallurgical Technology	2	32	2				4	
4080054110	互换性与测量技术 B Interchangeability and Measurement	2	32	4				5	工程图学
4080061110	机械设计基础 Foundation of Mechanical Design	3.5	56	6				5	材料力学
4070349120	金属学及热处理 B Metallography and Heat Treatment	3.5	56	4				5	金属工艺学
4070528130	材料成型原理 C Principle of Material Forming	4.5	72					5	金属学及热 处理
4070011110	材料成型控制工程基础 Fundamentals of Material Forming Control and Engineering	2.5	40	4				5	
4070172110	CAD/CAM 基础 A Fundamentals of CAD/CAM	2.5	40		8			6	
4070039110	测试技术基础 Fundamentals of Testing Techniques	2	32					6	
小 计 Subtotal		69.5	1160	96	8	0	24		
(四) 专业教育选修课程 Specialized Elective Courses									
限选课 Distributional Electives									
4070269120	电弧焊基础 A Fundamentals of Arc Welding	2.5	40	4				6	材料成型原 理
4070651170	微连接原理与方法 A Principle and Method of Micro Joining	2	32	4				6	材料成型原 理
4070652170	弧焊电源 C Arc Welding Power	1.5	24	4				6	电工与电子 技术基础
4070653170	焊接结构 A Welding Structure	2	32	4				6	材料成型原 理
4070630170	焊接传输原理 Principle of Transport Phenomena in Welding	1.5	24					6	材料成型原 理
4070654170	焊接质量检测与评价 A Welding Quality Inspection and Evaluation	2	32	4				6	

课程编号 Course Number	课 程 名 称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
4070655170	焊接工艺评定实验 Experiment on WPS	1	32	32				7	
4070656170	焊接结构生产实验 Experiment on Welding Structure Production	1	32	32				7	
4070657170	计算机辅助焊接技术综合实验 Comprehensive Experiment of Computer Aided Welding Technolog	1.5	48	48				7	
4070303120	焊接自主设计实验 B Experiment on Independent Design of Welding	1	32	32				7	
4070632170	焊接工程项目管理 Project Management of Welding	0.5	8					7	
小 计 Subtotal		16.5	336	164	0	0			
任选课 Free Electives									
4070277120	材料焊接性 B Materials Weldability	2	32					6	
4070658170	微电子制造技术 Microelectronics Manufacturing Technology	2	32					6	
4070637170	焊接工装设计 C Welding Fixture Design	1.5	24					6	
4070639170	钎焊 Brazing	1.5	24					6	
4070638170	压力焊 Pressure Welding	1.5	24					7	
4070659170	电子封装可靠性 Reliability of Electronic Packaging	1.5	24					7	
小 计 Subtotal		10	96						
修读说明：要求至少选修 20 学分：限选课 16.5 学分，任选课至少 3.5 学分。 NOTE: Minimum subtotal credits are 20: Distributional Electives are 16.5 credits, and Free Selectives are at least 3.5 credits.									
（五）个性课程 Personalized Elective Courses									
4070646170	材料力学性能 B Material Mechanical Performance	1.5	24					5	
4070645170	焊接数值模拟 C Numerical Simulation of Welding	1.5	24					5	
4070648170	材料分析测试方法 Material Analysis and Test Method	1.5	24					6	
4070647170	高能束焊 C High-energy Beam Welding	1.5	24					7	
小 计 Subtotal		4.5	72	0	0	0	0		

课程编号 Course Number	课程名称 Course Title	学分 Crts	学时分配 Including					建议 修读 学期 Suggested Term	先修课程 Prerequisite Course
			总学时 Tot hrs.	实验 Exp.	上机 Ope- ration	实践 Prac- tice	课外 Extra- cur		
修读说明：学生从以上个性课程中至少选修 3 学分，和从学校发布的其它个性课程目录中选修的学分一起，要求至少选修 6 学分。 NOTE: Students can select courses from above (at least 3credits) and the other personalized courses in catalog, and are required to obtain at least 6 credits.									

## 五、集中性实践教学环节

### V Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	学分 Crts	周数 Weeks	建议修读学期 Suggested Term
1060002110	军事训练 Military Training	1.5	3	1
4080150110	机械制造工程实训 B Training on Mechanical Manufacturing Engineering	4	4	3
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics	1	1	4
4080146110	机械设计基础课程设计 Practice for Foundation of Mechanical Design	2	2	5
4070220110	认识实习 Practice for Engineering Cognition	1	1	5
4070223110	生产实习 Practice for Producing	3	3	6
4070266120	岗位实习 Internship	5	5	7
4070650170	毕业论文 Graduation Thesis	9	17	8
小 计 Subtotal		26.5	36	

## 六、其它要求

### VI Recommendations on Course Studies

- 1、《形势与政策》和《心理健康教育》课程为课外必修课程，分别计 2 个和 1 个课外学分。
- 2、学生选修的通识选修课程和从学校发布的个性课程目录中选修的个性课程，要求与本专业培养方案内设置的课程内容不重复。

1.Situation & Policy (2 credits) and Mental Health Education (1 credit) are the required extracurricular courses.

2.The selected General Education Elective Courses and Personalized Elective Courses from the courses program by university must be different from the major undergraduate education plan in content.

学院教学责任人： 赵春霞  
专业培养方案责任人： 廖红卫