

材料化学专业简介

Introduction to the Specialty of Materials Chemistry

材料化学专业，学制 4 年，专业属性为非师范专业。本专业自 2003 年开始招生，2021 年入选国家级一流本科专业建设点。面向国际科技前沿和国家发展需求，依托传感薄膜材料、文物保护材料、功能高分子材料、光电功能材料、太阳能电池材料及储能材料，经过二十多年的建设，构建了以“材料制备、组成、结构与性能的基础及应用”为核心的完整课程体系，形成了特色鲜明的文物保护材料、太阳能电池材料等专业方向。

材料化学专业培养学生具有在材料学、材料工程、化学及相关交叉学科进行更高层次深造的能力，培养在企事业单位、科研机构从事科研、开发、教学工作的拔尖创新人才。毕业生可就业于科研院所、高等院校的教学科研岗位，也可在光电信息、石油化工、复合材料、新能源材料等行业内从事质检、产品开发、生产及技术管理等工作。

The materials chemistry is a non-normal specialty with a four-year schooling schedule. The major began enrolling students in 2003 and was selected as a national first-class undergraduate program in 2021. After over 20 years development relying on the sensing thin film materials, cultural relic protection materials, functional polymer materials, photoelectric functional materials, solar cell materials, and energy storage materials, it has established a complete curriculum system with a core of “the preparation, composition, structure, and properties of materials and their applications”, and has formed distinctive professional directions such as cultural relic protection materials and solar cell materials.

The materials chemistry major cultivates abilities to pursue higher-level studies in materials science, materials engineering, chemistry, and related interdisciplinary fields. It also trains them to become high-level specialized talents with composite skills who can engage in scientific research, development, and teaching in enterprises, institutions, and research organizations. Graduates can work in teaching and research positions in research institutes and universities, or in industries such as optoelectronics, petrochemicals, composite materials, and new energy materials, engaging in quality control, product development, production, and technical management.

材料化学专业培养方案

Training Program of the Specialty of Materials Chemistry

一、培养目标

I. Educational Objectives

本专业主要培养德智体美劳全面发展，身心健康，具有良好的世界观、价值观，良好的人文素质与科学素质，健全的人格和良好的心理素质，具有较强的创新精神和实践能力，具有坚实的数理基础、广博的材料学基本知识、系统扎实的材料学基础理论、基本实验方法和技能，了解材料学科发展前沿和科学发展趋势，受到科学思维和科学实验的训练，具有一定科学基础研究、应用基础研究及科技管理的综合能力，能在材料学、材料工程、化学及相关交叉学科进行更高层次深造，或在企业、科研机构、高校及事业单位从事科学研究、技术开发、教学工作的拔尖创新人才。

The program is designed to train applied talents with full development in morality, wisdom, physique and aesthetics, and with positive world view, philosophy and value. They are expected to possess good humanity quality, scientific quality, sound personality, good psychological quality, strong innovative spirit and practice ability. The program of Materials Chemistry is aimed at training students with solid foundation of natural science, and with basic theory knowledge and techniques of material science and chemistry. The graduates will be candidates to study further in material science, material engineering, chemistry and relative inter-disciplinarity, or be engaged in research on material science and related fields, as well as technical exploitation, teaching and administration in institute, company and government departments.

二、毕业要求

II. Graduation Requirements

本专业学生在年限 4—6 年，修满教学计划规定的学分，并达到以下基本要求后，方可毕业：

1. 爱党爱国爱人民，学习贯彻马克思列宁主义、毛泽东思想、邓小平理论、“三个代表”重要思想、科学发展观和习近平新时代中国特色社会主义思想，认同和拥护中国特色社会主义，自觉践行社会主义核心价值观，具有正确的世界观、人生观、价值观以及良好的道德品质。

2. 具备宽厚的自然科学理论基础；系统掌握材料学专业知知识，包括无机化学、有机化学、物理化学、结构化学、高分子化学与物理、大学物理、高等数学、材料科学基础、功能材料、材料表征与分析原理、材料物理性能测试原理等基础知识和基本理论；掌握无机功能材料、有机功能材料、高分子材料、液晶化学和纳米材料等专业领域所必需的专业知识。

3. 具备较强的实验和实践能力，能够使用现代实验设备进行观察、测试和分析；具有科研信息获取和数据分析的能力，以及应用信息技术解决本专业实际问题的能力；具有专业综合能力和创新能力，能够对本专业及交叉学科领域问题进行综合分析和研究，并提出解决方案。

4. 正确理解多学科背景下团队的意义和作用，能够在研发、生产等团队中承担团队成员以及负责人的角色，具有良好的团队精神和沟通表达能力。

5. 能够就材料化学相关领域专业问题与业界国内外同行进行沟通与合作，具备一定的国际视野和跨文化交流能力。

6. 能适应社会与科技发展，具有自主学习和终身学习的能力。

7. 在材料化学相关领域从事科学研究、材料设计、工程实践时，能够综合思考社会、健康、安全、法律、文化、环境保护和可持续发展等因素，具有安全意识、环保意识和可持续发展意识。

Within a period of 4-6 years to obtain all the credits in the teaching scheme, students of this specialty also need to meet the following basic requirements:

1. Love the Communist Party of China, love the motherland, love the people, love socialism, study and implement the Marxism-Leninism, the MAO Zedong Thought, Deng Xiaoping Theory and the Important Thought of "Three Represents", Scientific Outlook on Development and Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, recognize and support socialism with Chinese characteristics, consciously practice socialist core values, have correct viewpoint on the world, life and values as well as good moral character.

2. Possess a solid foundation in natural science theory; systematically master materials science knowledge, including inorganic chemistry, organic chemistry, physical chemistry, structural chemistry, polymer chemistry and physics, college physics, higher mathematics, materials science and engineering basics, functional materials, principles of material analysis and characterization, principles of material physical property testing, and other fundamental knowledge and basic theories; master the professional knowledge necessary in fields such as inorganic functional materials, organic functional materials, polymer materials, liquid crystal chemistry, and nanomaterials.

3. Possess strong experimental and practical abilities, be able to observe, test, and analyze using modern experimental equipment; have the ability to obtain scientific research information and analyze data, as well as the ability to apply information technology to solve practical problems in the field; possess professional comprehensive and innovative abilities, be able to conduct comprehensive analysis and research on problems in this major and related interdisciplinary fields, and propose solutions.

4. Understand the significance and role of teams in a multidisciplinary context, able to assume individual, team member, and leadership roles in research, development, production, and other teams in multidisciplinary backgrounds, with good teamwork spirit and communication skills.

5. Able to communicate and collaborate with domestic and international counterparts in the field of materials chemistry on professional issues, possessing certain international perspectives and cross-cultural communication abilities.

6. Adapt to social and technological developments, possessing the ability for autonomous learning and lifelong learning.

7. Engage in scientific research, material design, and engineering practice in the field of materials chemistry, able to comprehensively consider factors such as social, health, safety, legal, cultural, environmental protection, and sustainable development, with safety awareness, environmental awareness, and awareness of sustainable development.

三、主干学科

III. Core Disciplines

化学、材料科学与工程

Chemistry, Materials Science and Engineering

四、主干课程

IV. Main Courses

高等数学、基础物理及实验、无机化学、有机化学、物理化学、结构化学、高分子化学与物理、材料科学基础、功能材料、无机材料合成方法、材料表征技术、材料物理性能学等。

Advanced Mathematics, Fundamental Physics and Experiments, Inorganic chemistry, Organic Chemistry, Physical Chemistry, Structure Chemistry, Polymer Chemistry and Physics, Fundamentals of Materials Science, Functional Materials, Synthetic methods of Inorganic Materials, Material Characterization Techniques, Physical Properties of Materials.

五、学制及授予学位

V. Schooling System & Degree Granting

学制 4 年

Four years

理学学士

Bachelor of Engineering

六、学分要求

VI. Total Credits

152 学分

152 Credits

七、课程设置及学分比例

VII. Course Settings and Percentage of Credits

课 程 类 别 Course Catalogue		学分及比例 Credits and Percentage			
		学 分 Cre.	小 计 Sub-Total	占总学分比例 Percentage in Total Credits	小 计 Sub-Total
通识教育模块 Liberal Studies Courses	通识教育必修课 Liberal Studies Compulsory Courses	38	50	25.00%	32.89%
	通识教育选修课 Liberal Studies Elective Courses	12		7.89%	
学科基础模块 Disciplinary Foundation Courses	相关学科基础课 Related Disciplinary Foundation Courses	14.5	31.5	9.54%	20.72%
	本学科基础课 Disciplinary Foundation Courses	17		11.18%	
专业课程模块 Specialized Courses	专业核心课程 Specialized Core Courses	14.5	38.5	9.54%	25.33%
	专业方向课程 Specialized Orientation Courses	18		11.84%	
	专业拓展课程 Specialized Development Courses	6		3.95%	

专业技能模块 Professional Skills Courses	必修课 Compulsory Courses	13	13	8.55%	8.55%
	选修课 Elective Courses	0		0	
实践教学模块 Practice Work	必修课 Compulsory Courses	19	19	12.50%	12.50%
合计 Total		152		100%	
说明 Notes	1. 专业必修课（包括专业核心课程和学科基础课程）共 13 门。 2. 专业选修课共 14 门，分 4 个方向；专业拓展课程 12 门。学生应从专业方向课程中至少选修 18 学分，从专业拓展课程中至少选修 6 学分。 3. 实验课程共 9 门，其中独立开设的实验课 8 门，既有理论又有实验的课程 3 门，占实验课程总数的 44.44%。 4. 本专业实践教学内容包括实践教学模块和其他课程模块中的实践教学内容，实践教学环节学分占总学分的比例为 35.84%。 1. There are 13 specialized compulsory courses. 2. There are 14 specialized elective courses in total divided into 4 dimensions and 12 specialized development courses. Undergraduates should obtain 6 credits in total by taking specialized orientation courses and 4 credits by taking specialized development courses. 3. There are 9 experimental courses in total including 8 independent experimental courses, 3 theoretical and designable experimental courses which is 44.44% of the total experimental courses. 4. Practice work includes the courses of the specific module of practice work and those practice work within the courses of other modules, taking up 35.84% of the total credits.				

八、材料化学专业本科教学计划表

VIII. Teaching Scheme for Material Chemistry Undergraduate Candidates

(一) 通识教育模块 (50 学分)

(I) Liberal Studies Courses (50 credits)

1. 通识教育必修课 (38 学分)

1. Liberal Studies Compulsory Courses (38 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
1711031	思想道德与法治 The Ideological and Moral Cultivation and the Rule of Law	1	3	63	45	18	3	考试 Exam.	马院	
1711022	中国近现代史纲要 Outline of Modern and Contemporary Chinese History	1	3	63	45	18	3	考试 Exam.		
1711033	马克思主义基本原理 Principles of Marxism	2	3	63	45	18	3	考试 Exam.		
1711034	毛泽东思想和中国特色社会主义理论体系概论 Mao Zedong Thoughts and Theory of the Socialism with Chinese Characteristics	3	3	63	45	18	3	考试 Exam.		
1711035	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	4	3	63	45	18	3	考试 Exam.		
1711005- 1711011	形势与政策 1-7 The Current Situation and Policy(1-7)	1-7	2					考查 Quiz		
0211012	大学语文 (理工科类) College Chinese	2	2	36	36		2	考试 Exam.	文学院	混合式
1211044	计算机基础 (理工科) Fundamentals of Computer(for Science Specialties)	1	2	45	27	18	2	考试 Exam.	计科院	
1211056	Python 语言程序设计 (理工科) Python Programming (for Science Specialties)	2	3	72	36	36	4	考试 Exam.	计科院	
0411061	大学外语 (一) College English 1	1	2	54	18	36	3	考试 Exam.	外院	

0411062	大学外语（二） College English 2	2	2	54	18	36	3	考试 Exam.	外院	
0411063	大学外语（三） College English 3	3	2	36	36		2	考试 Exam.	外院	
0411064	大学外语（四） College English 4	4	2	36	36		2	考试 Exam.	外院	
1011039	大学体育（一） Physical Education 1	1	1	36		36	2	考试 Exam.	体院	
1011040	大学体育（二） Physical Education 2	2	1	36		36	2	考试 Exam.		
1011041	大学体育（三） Physical Education 3	3	1	36		36		考试 Exam.		
1011042	大学体育（四） Physical Education 4	4	1	36		36		考试 Exam.		
1611045	创新创业理论与实践 Theory &Practice of Innovation and Entrepreneurship	3	1	27	9	18	1.5	考试 Exam.	国商院	混合式
2011002	国家安全教育 National Security Education	1/2	1	18	18			考试 Exam.	国安院	混合式

2. 通识教育选修课（12 学分）

2. Liberal Studies Elective Courses（12 credits）

通识教育选修课共 12 学分，详见《陕西师范大学通识教育选修课课程方案》，具体课程清单以各学期发布的通知为准。在校期间须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。具体要求如下：

为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；

所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；

非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；

体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；

师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

Undergraduates will obtain 12 credits by taking liberal studies elective courses, see *Liberal Studies Elective Courses Scheme of Shaanxi Normal University*.

(二) 学科基础模块 (31.5 学分)

(II) Disciplinary Foundation Courses (31.5 credits)

1. 相关学科基础课 (14.5 学分)

1. Related Disciplinary Foundation Courses (14.5 credits)

课程编码 Course Code	课程名称 Course Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
0521005	高等数学(二)-1(理) Advanced Mathematics(II) -1 (for Science Specialties)	1	4	72	72		5	考试 Exam.	数统院	
0521006	高等数学(二)-2(理) Advanced Mathematics(II) -2 (for Science Specialties)	2	4	72	72		4	考试 Exam.	数统院	
3521005	基础物理 I 及实验 Fundamental Physics I and Experiments	2	3.5	72	54	18	4	考试 Exam.	材料学院	
3521002	线性代数与概率 Linear Algebra and Probability	3	3	54	54		4	考试 Exam.	数统院	

2. 本学科基础课 (17 学分)

2. Disciplinary Foundation Courses (17 credits)

课程编码 Course Code	课程名称 Course Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3522030	材料科学与工程专业导引 Introduction to Materials Science and Engineering	1	0.5	8	8		2	考查 Quiz.	材料学院	
3522029	实验室安全与规范 Laboratory Safety and Regulation	1	0.5	8	8		2	考查 Quiz.		
3522047	无机化学 Inorganic Chemistry	1	4	72	72		4	考试 Exam.		
3522048	有机化学 Organic Chemistry	2	4	72	72		4	考试 Exam.		
3522049	物理化学 Physical Chemistry	3	4	72	72		4	考试 Exam.		混合式
3522054	材料科学基础 Fundamentals of Materials Science	5	4	72	72		4	考试 Exam.		混合式

(三) 专业课程模块 (38.5 学分)

(III) Specialized Courses (38.5 credits)

1. 专业核心课程 (14.5 学分)

1. Specialized Core Courses (14.5 credits)

课程编码 Course Code	课程名称 Course Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3541036	结构化学 Structural Chemistry	4	3	54	54		3	考试 Exam.	材料学院	
3541033	材料表征技术 Material Characterization Techniques	5	4	72	72		4	考试 Exam.		
3544015	无机化学实验 Experiments in Chemistry	1	2	72		72	4	考试 Exam.		含劳动教育
3544016	有机化学实验 Experiments in Organic Chemistry	2	2	72		72	4	考试 Exam.		含劳动教育
3544017	物理化学实验 (含结构) Experiments in Physical /Structural Chemistry	3	2	72		72	4	考试 Exam.		含劳动教育
3544018	材料谱学分析实验 Material Spectral Analysis Experiments	5	1.5	54		54	4	考试 Exam.		

2. 专业方向课程 (18 学分)

2. Specialized Orientation Courses (18 credits)

课程编码 Course Code	课程名称 Course Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
常规型系列课程: Courses of Conventional Series:										
光电功能材料方向课程: Courses of photoelectronic functional materials series										

3542066	无机材料合成方法 Synthetic Methods of Inorganic Materials	4	2	36	36		2	考试 Exam.	材料学院	限选
3542067	材料物理性能学 Physical Properties of Materials	6	2.5	46	46		3	考试 Exam.		限选
3542068	功能材料 Functional Materials	6	3	54	54		3	考试 Exam.		限选
3542071	新能源材料 New Energy Materials	6	1.5	28	28		2	考查 Quiz.		
3542072	新能源电化学基础 Fundamentals of New Energy Electrochemistry	5	1.5	28	28		2	考查 Quiz.		
3542069	基础固体物理 Basic Solid State Physics	6	1.5	28	28		2	考试 Exam.		限选
3542051	纳米材料学 Nano-structural Materials	6	1.5	28	28		2	考查 Quiz.		
液晶与高分子方向课程： Courses of liquid crystal and Polymer series										
3542070	高分子化学与物理 Polymer Chemistry and Physics	4	3	54	54		2	考试 Exam	材料学院	限选
3542054	液晶材料 Liquid Crystal Materials	5	1.5	28	28		2	考查 Quiz.		
3542055	功能高分子多孔材料 Functional Porous Polymer Materials	6	1.5	28	28		2	考查 Quiz.		
3542056	仿生材料学 Biomimetic Materials	7	1.5	28	28		2	考查 Quiz.		

文物保护方向课程： Courses of protection of cultural relics series										
3542057	文物保护材料 Materials in Protection of Cultural Relics	5	1.5	28	28		2	考查 Quiz.	材料学院	
3542058	现代表征技术与科技考古 Modern Characterization Techniques and Archaeometry	6	1.5	28	28		2	考查 Quiz.		
3542059	档案保护与修复技术 Technology of Archive Protection and Restoration	7	1.5	28	28		2	考查 Quiz.		
科学研究型（研究生先修课）系列课程： Courses of Scientific Research Series:										
3542066	无机材料合成方法 Synthetic Methods of Inorganic Materials	4	2	36	36		2	考试 Exam.	材料学院	限选
3542067	材料物理性能学 Physical Properties of Materials	6	2.5	46	46		3	考试 Exam.		限选
3542068	功能材料 Functional Materials	6	3	54	54		3	考试 Exam.		限选
3542069	基础固体物理 Basic Solid State Physics	6	1.5	28	28		2	考试 Exam.		限选
3542070	高分子化学与物理 Polymer Chemistry and Physics	4	3	54	54		2	考试 Exam		限选
3542076	光伏材料与太阳能电池 Photovoltaic materials and solar cells	7	2	36	36		2	考查 Quiz		
3542057	文物保护材料 Materials in Protection of Cultural Relics	5	1.5	28	28		2	考查 Quiz		
说明 Notes	1. 专业方向课程分为常规型和科学研究型两类课程，其中常规型包含 14 门课程，科学研究型包含 7 门课程。 2. 材料化学专业必须在 5 门限选课程基础上，再从剩余课程中选择 4 门，选修够 18 学分。 1. The specialized orientation courses are divided into two types: conventional and scientific research series. The conventional series includes 14 courses, while the scientific research series includes 7 courses. 2. Undergraduates in Material Chemistry specialty should obtain 18 credits.									

3. 专业拓展课程（6 学分）

3. Specialized Development Courses (6 credits)

详见学院专业拓展课程。

See Specialized Development Courses of School of Materials Science and Engineering.

（四）专业技能模块（13 学分）

（IV）Professional Skills Courses (13 credits)

必修课（13 学分）

Compulsory Courses (13 credits)

课程编码 Course Code	课程名称 Course Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3544013	无机非金属材料制备与表征实验 Experiments in Preparation and Characterization of Inorganic Nonmetallic Materials	6	2	72		72	4	考试 Exam.	材料学院	
3544012	高分子材料制备与表征实验 Experiments in Preparation and Characterization of Polymer Materials	5	1.5	54		54	4	考试 Exam.		
3545001	功能材料综合实验 Comprehensive Experiments in Functional Materials	6	2	72		72	8	考试 Exam.		
3544014	微结构与性能表征实验 Experiments in Micro-structure and Properties of Materials	5	1.5	54		54	8	考试 Exam.		
3546008	材料化学专业实践 Practice of Material Chemistry Specialty	7	4	12 周		12 周		考查 Quiz.		
3541006	研究方法与学术论文写作 Research Approach and Academic Dissertation Writing	7	1	18	18		2	考查 Quiz.		
3541026	材料化学专业英语 Specialized English of Materials Chemistry	7	1	18	18		2	考查 Quiz.		

(五) 实践教学模块 (19 学分)

(V) Practice Work (19 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/Tr aining Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
2650102	军事理论与训练 Military Theory and Military Training	2	2					考查 Quiz	军事教研院	
3550017	必读书目阅读 Required Readings		1					考查 Quiz		
3550032	专业见习与实习 Professional Visits And Practice	1-7	4					考查 Quiz		
3550021	专业实践与社会调查 Professional Practice and Social Survey		1					考查 Quiz		
3850004	大学生职业生涯规划 College Students' Career Planning	2	0.5		10	9	2	考查 Quiz	招就处	
3850005	大学生求职指导与职场适应 Job Search Guidance and Workplace Adaptation for College Students	6	0.5		10	9	2	考查 Quiz	招就处	
3550022	科研训练 Scientific Research Training	3-6	2					考查 Quiz		
3550033	毕业论文 (设计) Graduation Thesis	7-8	4					考查 Quiz		
3950001	大学生心理健康 Mental Health for College Students		2					考查 Quiz	学工部	混合式
2050002	劳动教育 Labor Education		2					考查 Quiz	公共艺术中心	

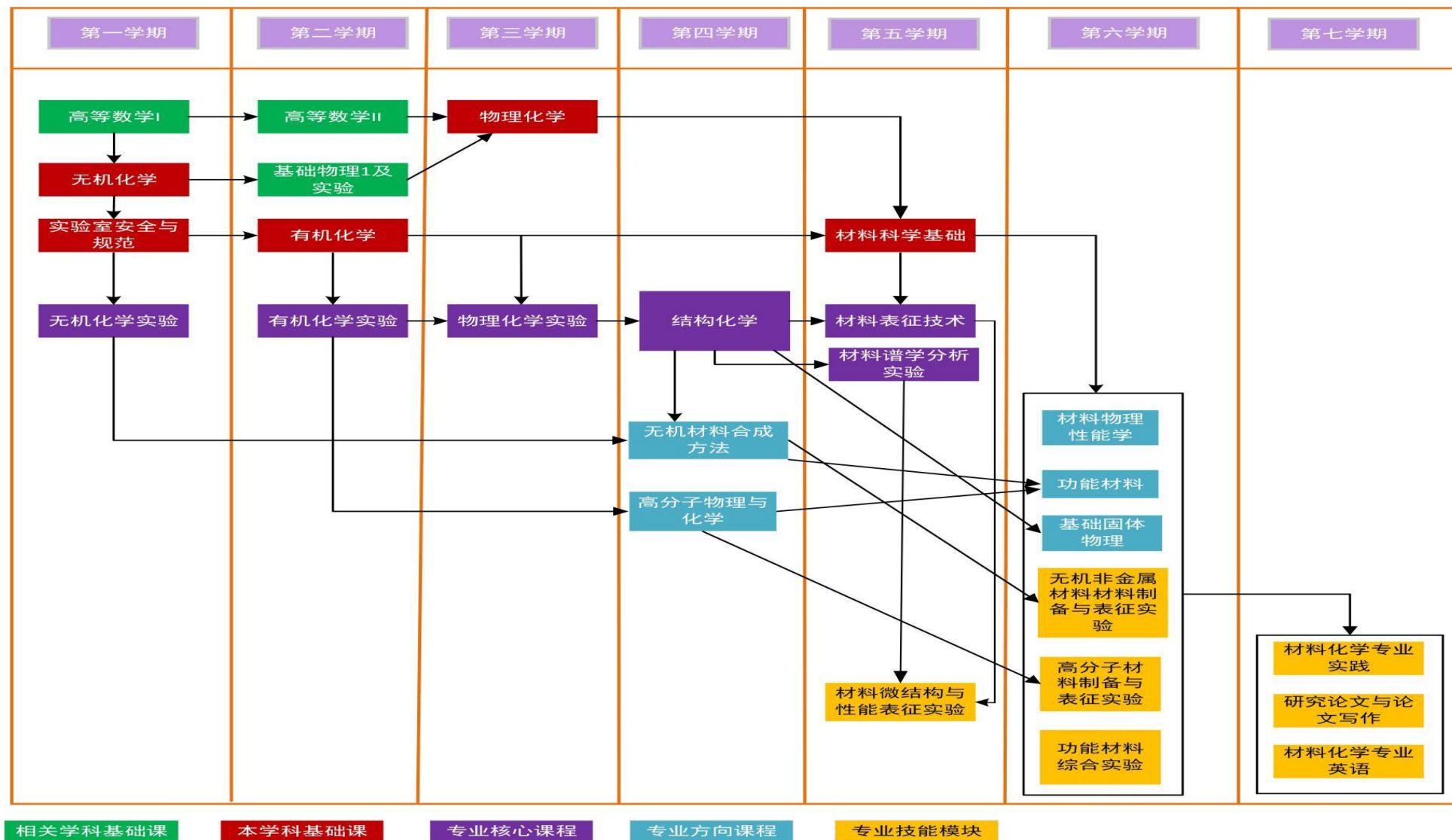
九、材料科学与工程学院专业拓展课程

IX. Specialized Development Courses of School of Materials Science and Engineering

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3543054	科学教育经典文献选读 Reading Classical Literature in Science Education	5	1.5	28	28		2	考查 Quiz.	材料学院	
3543055	现代化学专题 Special Topics in Modern Chemistry	5	1.5	28	28		2	考查 Quiz.		
3543056	现代物理专题 Special Topics in Modern Physics	5	1.5		28		2	考查 Quiz.		
3543032	稀土发光材料 Rare Earth Luminescent Materials	5	1.5	28	28		2	考查 Quiz.		
3543040	传感材料与技术 Materials and Technologies of Sensors	5	1.5	28	28		2	考查 Quiz.		
3543035	胶体化学与界面 Colloid Chemistry and Interface	5	1.5	28	28		2	考查 Quiz.		
3543052	光催化材料与技术 Photocatalytic Materials and Technology	5	1.5	28	28		2	考查 Quiz.		
3543041	有机光电材料与器件导论 Introduction of Organic Optoelectronic Materials and Devices	5	1.5	28	28		2	考查 Quiz.		
3543057	材料科学前沿进展 Frontiers of material Science	6	1.5	28	28		2	考查 Quiz.		

3543031	二维原子晶体材料与器件 Two-dimensional Atomic Crystal and Device	6	1.5	28	28		2	考查 Quiz.		
3543036	材料的力学性能 Mechanical Properties of Materials	6	1.5	28	28		2	考查 Quiz		
3543037	材料的相变原理 Phase Transformation Mechanisms of Materials	6	1.5	28	28		2	考查 Quiz.		
说明 Notes	1. 材料科学与工程学院专业任意选修课共 12 门。 2. 材料化学专业必须选修 6 学分。 1. There are 12 Specialized Non-restrictive Elective Courses. 2. Undergraduates inspecialty of materials chemistry should obtain 6 credits.									

十、专业课程先修关系图



十一、课程一毕业要求支撑矩阵

序号	课程信息		毕业要求						
			1	2	3	4	5	6	7
	课程类型	课程名称							
1	通识教育必修课 Liberal Studies Compulsory Courses	思想道德与法治 The Ideological and Moral Cultivation and the Rule of Law	H			L	L	L	H
2		中国近现代史纲要 Outline of Modern and Contemporary Chinese History	H			L	H	L	L
3		马克思主义基本原理 Principles of Marxism	H			L	L	L	L
4		毛泽东思想和中国特色社会主义理论体系概论 Mao Zedong Thoughts and Theory of the Socialism with Chinese Characteristics	H			L	L	L	L
5		习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	H			L	L	L	L
6		形势与政策 1-7 The Current Situation and Policy (1-7)	H			L	L	L	L
7		大学语文 College Chinese	H			L	L	L	L
8		计算机基础（理工科） Fundamentals of Computer (for Science Specialties)	M	M	H	L	L	L	
9		Python 语言程序设计 Python Programming	M	M	H	L	L	L	
10		大学外语课程 College English	M			H	L	L	L
11		大学体育（一） Physical Education 1	H			H	L	L	L
12		大学体育（二） Physical Education 2	H			H	L	L	L
13		大学体育（三） Physical Education 3	H			H	L	L	L

14		大学体育（四） Physical Education 4	H			H	L	L	L
15		创新创业理论与实践 Theory & Practice of Innovation and Entrepreneurship	H	H	H	H	H	L	L
16		国家安全教育 National Security Education	H			L	L	L	L
17	相关学科基础课 Related Disciplinary Foundation Courses	高等数学（二）—1（理） Advanced Mathematics(II) -1 (for Science Specialties)	L	H	M	M	L	L	
18		高等数学（二）—2（理） Advanced Mathematics(II) -2 (for Science Specialties)	L	H	M	M	L	L	
19		基础物理 I 及实验 Fundamental Physics I and Experiments	M	H	H		M	L	L
20		线性代数与概率 Linear Algebra and Probability	L	H	M		L	L	L
21	本学科基础课 Disciplinary Foundation Courses	材料科学与工程专业导引 Introduction to Materials Science and Engineering	L	H	L	L	H	L	L
22		实验室安全与规范 Laboratory Safety and Regulation	H	H	H	H	H	L	L
23		无机化学 Inorganic Chemistry	M	H	H	H	H	L	L
24		有机化学 Organic Chemistry	H	H	M	M	H	L	L
25		物理化学 Physical Chemistry	L	H	H	M	L	L	L
26		材料科学基础 Fundamentals of Materials Science	M	H	M	L	M	L	L
27	专业核心课程 Specialized Core Courses	结构化学 Structural Chemistry	L	H	H	L	L	L	L
28		材料表征技术 Material Characterization Techniques	H	H	H	H	H	L	L
29		无机化学实验 Experiments in Inorganic Chemistry	L	H	H	H	M	L	L
30		有机化学实验 Experiments in Organic Chemistry	H	H	H	H	M	L	L

31		物理化学实验（含结构） Experiments in Physical/Structural Chemistry	L	H	H	H	M	L	L
32		材料谱学分析实验 Material Spectral Analysis Experiments	L	H	H	H	M	L	L
33	专业方向课程 Specialized Orientation Courses	无机材料合成方法 Synthetic Methods of Inorganic Materials	L	H	H	M	H	M	M
34		材料物理性能学 Physical Properties of Materials	L	H	H	L	M	L	L
35		功能材料 Functional Materials	L	H	H	H	L	L	L
36		纳米材料学 Nano-structural Materials	L	H	H	H	H	L	L
37		新能源材料 New Energy Materials	L	H	H	H	H	L	H
38		新能源电化学基础 Fundamentals of New Energy Electrochemistry	L	H	H	H	L	L	M
39		基础固体物理 Basic Solid State Physics	L	H	H	H	L	L	L
40		高分子化学与物理 Polymer Chemistry and Physics	L	H	H	H	L	L	L
41		液晶材料 Liquid Crystal Materials	L	H	H	H	L	L	L
42		功能高分子多孔材料 Functional Porous Polymer Materials	L	L	H	H	H	L	L
43		仿生材料学 Biomimetic Materials	L	H	H	H	L	L	L
44		文物保护材料 Materials in Protection of Cultural Relics	L	H	H	H	H	L	M
45		现代表征技术与科技考古 Modern Characterization Techniques and Archaeometry	L	H	H	H	H	L	L
46		档案保护与修复技术 Technology of Archive Protection and Restoration	L	H	H	H	L	L	M
47		光伏材料与太阳能电池 Photovoltaic Materials and Solar cells	L	H	H	H	L	L	M

48	专业技能模块 Professional Skills Courses	无机非金属材料制备与表征实验 Experiments in Preparation and Characterization of Inorganic Nonmetallic Materials	M	H	H	H	H	L	L
49		高分子材料制备与表征实验 Experiments in Preparation and Characterization of Polymer Materials	M	H	H	H	H	L	L
50		功能材料综合实验 Comprehensive Experiments in Functional Materials	M	H	H	H	H	L	M
51		微结构与性能表征实验 Experiments in Micro-structure and Properties of Materials	M	H	H	H	H	L	L
52		材料化学专业实践 Practice of Material Chemistry Specialty	H	H	H	H	H	L	M
53		研究方法与学术论文写作 Research Approach and Academic Dissertation Writing	L	L	H	M	L	L	L
54		材料化学专业英语 Specialized English of Materials Chemistry	L	H	L	L	H	L	L
55		军事理论与训练 Military Theory and Military Training	L			L	L	L	L
56	实践教学模块 Practice Work	必读书目阅读 Required Readings	L	H	L	L	L	L	L
57		专业见习与实习 Professional Visits and Practice	M	H	H	L	H	L	L
58		专业实践与社会调查 Professional Practice and Social Survey	M	H	H	H	H	L	L
59		大学生职业生涯规划 College Students' Career Planning	L	H	L	L	L	L	L
60		大学生求职指导与职场适应 Job Search Guidance and Workplace Adaptation for College Students	L	H	H	H	L	L	L
61		科研训练 Scientific Research Training	H	H	H	H	H	L	M
62		毕业论文（设计） Graduation Thesis	H	H	H	H	H	L	L
63		大学生心理健康 Mental Health for College Students	H			H	H	L	L
64		劳动教育 Labor Education	H			H	H	L	L

十二、课程简介

XII. Brief Introduction of Main Courses

(一) 学科基础模块 (Disciplinary Foundation Courses)

I 相关学科基础课程 (Related Disciplinary Foundation Courses)

1. 课程名称：高等数学（二）——1（理）/高等数学（二）——2（理）

(1) 课程编码：0521005/0521006

(2) 课程简介：理工科《高等数学》是理工科专业学生必修的最重要的基础课程之一，对学生良好的数学素质的形成及后续专业课程的学习起着至关重要的作用。学习周期为两个学期，总学时 144 个，8 个学分，内容包括一元函数的极限、连续性，导数与微分，不定积分，定积分，常微分方程，空间解析几何，级数理论，多元函数的极限、连续性，多元函数的微分学、积分学。

1.Course Name: Advanced Mathematics(II)-1 (for Science Specialties)/Advanced Mathematics (II)- 2 (for Science Specialties)

(1) Course Code: 0521005/0521006

(2) Brief Introduction of the Course: *Advanced Mathematics* is one of the most important compulsory courses for students in science and engineering, which plays a crucial role in improving the quality of student mathematical conversations and studying the successive courses. The course runs for two terms, 144 class hours, 8 credits. The contents include the limit and continuity of single variable functions, derivative and differential, indefinite and definite integral, ordinary differential equations, spatial analytic geometry, series theory, the limit and continuity of a multivariable function, and derivative and differential of multivariable functions.

2. 课程名称：基础物理 I 及实验

(1) 课程编码：3521005

(2) 课程简介：《基础物理 I 及实验》课程是高等学校各理工科专业学生的一门重要的基础必修课。本课程以物理学最基本的概念、理论为主体，内容包括运动学、牛顿定律及其内在随机性、动量守恒定律与能量守恒定律、角动量守恒定律、机械振动、机械波静电场、稳定磁场、电磁感应、麦克斯韦方程组和电磁波、量子物理学基础等。通过本课程的教学，使学生对大学物理的基本概念、基本理论、基本方法能够有比较全面和系统的认识，并具有初步应用的能力，为学生进一步学习打下必要的基础。

(3) 课程负责人：贾丽超

2. CourseName: Basic Physics (I) and Experiments

(1) Course Code: 3521005

(2) Brief Introduction of the Course: *Basic Physics (I) and Experiments* is one of the most important compulsory courses for students in science and engineering, is the core of natural science and the foundation of technology innovation. This course mainly introduces the most basic concepts and theories of physics, studies of the basic structures and materials interaction and the most basic, the most common form of movement (mechanical, electromagnetic, micro motion and particle motion), the mutual transformation between them and science. This course is aimed to help students systematically understand the basic concepts, theories and the method of physics, to cultivate students comprehensive use of knowledge and ability, and lay the foundation for further study of materials and physics.

(3) Course Leaders: Lichao Jia

3. 课程名称：线性代数与概率

(1) 课程编码：3521002

(2) 课程简介：课程内容包括行列式的性质及变换、矩阵的定义与运算、向量的相关性、线性方程组的解、相似矩阵及二次型、概率论的基本概念、随机变量及其分布数理论

计等相关内容。通过该课程的学习，可以使获得线性代数、概率论及数理统计相关知识，培养学生具备将数学知识应用到工程领域的能力。

3. Course Name: Linear Algebra and Probability

(1) Course Code: 3521002

(2) Brief Introduction of the Course: The course content includes properties and transformations of determinants, definitions and operations of matrices, linear dependence of vectors, solutions of linear equations, similar matrices and quadratic forms, basic concepts of probability theory, random variables, and mathematical statistics. By studying this course, students can acquire knowledge in linear algebra, probability theory, and mathematical statistics, and develop the ability to apply mathematical knowledge to the field of engineering.

II 本学科基础课模块 (Disciplinary Foundation Courses)

1. 课程名称：材料科学与工程专业导引

(1) 课程编码：3522030

(2) 课程简介：《材料科学与工程专业导引》是材料化学、新能源材料与器件两个本科专业的一门必修专业课。主要内容包括四个方面：一是材料科学与工程学科简介。包括学科的形成与发展，材料分类及其在人类社会进程中的地位与作用；二是光电功能材料的基本原理及应用、发展现状与趋势；三是材料化学、新能源材料与器件专业介绍。通过分别解读两个专业培养计划，使学生熟悉两个专业的课程设置、培养目标；四是材料科学与工程学院学科简介。包括学科平台、师资队伍、硬件条件、学习环境等，使学生熟悉未来学习环境和资源。

(3) 课程负责人：曾京辉

1. Course Name: Introduction to Materials Science and Engineering

(1) Course Code: 3522030

(2) Brief introduction: *Introduction to Materials Science and Engineering* is majors a compulsory professional course for Materials Chemistry, New Energy Materials and Devices. The contents of this course mainly includes four aspects: (1) Brief introduction of the disciplinary of Materials Science and Engineering, including the formation and development of the subject, materials classification and their roles in the human civilization; (2) Brief introduce of basic principles and applications of photoelectric materials, current situation and trend of development; (3) Brief introduce of specialties including Materials Chemistry, New Energy Materials and Devices. Based on the interpretation of the two professional training plans, it is helpful for students to be familiar with difference and relation of two professions, professional learning methods; (4) Introduction of School of Materials science and Engineering, including the discipline platform, teachers, hardware conditions, learning environment, to help students to be familiar with the school environment and resources.

(3) Course Leaders: Jinghui Zeng

2. 课程名称：实验室安全与规范

(1) 课程编码：3522029

(2) 课程简介：实验是自然科学研究最基本的方法。实验室已成为学生们学习、科研实践的重要场所之一。在实验中使用设备、玻璃仪器、电器、试剂等都有一定的潜在危险。没有科学规范的实验操作，将会显著增加发生触电、中毒、烫伤、着火和爆炸等意外事故几率。因此，掌握科学实验方法、熟悉实验室基本的安全规范，对于避免危险事故发生具有极其重要的意义。同时，了解与熟悉各种事故应急处置方法，对于降低二次伤害也具有特别重要意义。本课程主要内容包括：实验室安全防护；危险品、废弃物处置以及事故应急处置方法。同时，本课程将结合学院大型仪器平台，讲授现代仪器分析的实验技术与安全操作，并介绍国外高校化学实验室的安全与管理。通过本课程的学习能够增强学生的安

全和环保意识，养成良好的安全习惯，掌握应急救援技能，有效降低实验室事故发生的概率。

(3) 课程负责人：胡道道

2. Course Name: Laboratory Safety and Regulation

(1) Course Code: 3522029

(2) Brief Introduction of the course: Experiment is the most basic method in natural scientific research. Laboratory has become one of the important places for students learning and practice in scientific research. There are some potential hazards in experimental process. The various accidents could take place if there are no scientific and standardized experimental operations. Therefore, it is very important to understand and grasp scientific experimental methods and safety specification in laboratory. Additionally, it is also significant to understand and to be familiar with handling methods of various emergencies for reducing the greater damages. In this course, laboratory safety protection, knowledge of dangerous reagents, waste disposal and treatment methods of accident emergency, etc. Additionally, according to our large-scale instrument platform, modern instruments are also introduced. This course is beneficial for students to enhance the safety and environmental awareness in laboratory.

(3) Course Leaders: Daodao Hu

3. 课程名称：无机化学

(1) 课程编码：3522047

(2) 课程简介：《无机化学》是材料化学专业的第一门主干必修基础课。其内容包括基础化学原理，其介绍了原子结构与元素周期系、分子结构、配合物、化学平衡及其指导下的四大平衡、化学热力学基础、化学动力学基础等。通过本课程的学习，使学生能够全面掌握无机化学的基本理论和基本知识，了解国内外无机化学的研究进展，具备解决无机化学领域中实际问题的基本能力。同时为学生学习后续课程打下坚实的基础。

(3) 课程负责人：刘宗怀

3. Course Name: Inorganic Chemistry

(1) Course Code: 3522047

Brief Introduction of the Course: *Inorganic Chemistry* is a compulsory course for undergraduates majoring in Material Chemistry. The contents of the course are divided in two sections. The section of chemistry principles introduces the fundamentals of atomic structure, the periodic system of elements, molecular structure, metal complexes, chemical equilibrium, chemical thermodynamics, and chemical kinetics. The other section emphasizes the structure, properties, preparation and applications of main group elements and compounds, and transition metal elements and compounds. Through this course, students can gain a comprehensive understanding of the fundamental theories and knowledge of inorganic chemistry, become aware of the development and research progress in inorganic chemistry both domestically and internationally, and acquire the basic skills necessary to address practical problems in the field. Additionally, the course will provide a solid foundation for further advanced studies.

(3) Course Leaders: Zonghuai Liu

4. 课程名称：有机化学

(1) 课程编码：3522048

(2) 课程简介：《有机化学》是材料化学专业本科生的主干必修基础课程。内容主要包括共价键的性质、有机化合物的立体异构、空间效应、电子效应、共振论等有机化学的基础理论；各类有机化合物的结构、物理性质、反应性质、反应机理及其制备方法和用途；有机化合物结构测定现代物理方法等。

(3) 课程负责人：陈新兵

4. Course Name: Organic Chemistry

(1) Course Code: 3522048

(2) Brief Introduction of the Course: *Organic Chemistry* course is a compulsory foundation course for undergraduates majoring in Material Chemistry. The course is divided into three sections. The first section introduces and explains the fundamentals of conjugated system, stereochemistry, spatial effects, electronic effects, and resonance. The second section shows the structure and properties of organic molecules. The last section introduces the modern physical methods to determine the structure of organic compounds.

(3) Course Leaders: Xinbing Chen

5. 课程名称: 物理化学

(1) 课程编码: 3522049

(2) 课程简介: 《物理化学》是本科生的的一门主干必修基础课程。主要内容包括热力学第一定律、热力学第二定律、相平衡、化学平衡、电解质溶液、可逆电池电动势及其应用、电解和极化作用、化学动力学基础 (I) 和 (II)、界面物理化学等。

(3) 课程负责人: 雷志斌

5. Course Name: Physical Chemistry

(1) Course Code: 3522049

(2) Brief Introduction of the Course: *Physical Chemistry* is a compulsory course for students in School of Material Science and Engineering. The contents of this course include the fundamentals of the first law and second law of thermodynamics, phase diagrams, chemical equilibrium, the fundamentals of equilibrium electrochemistry, chemical reaction kinetics, interfacial physical chemistry, etc.

(3) Course Leaders: Zhibin Lei

6. 课程名称: 材料科学基础

(1) 课程编码: 3522054

(2) 课程简介: 《材料科学基础》系材料化学专业的核心课程, 属于专业基础课 (4 学分)。本课程从材料科学与工程的基本原理出发, 综合介绍各种材料的组成、结构、制备工艺、性能及应用的共性规律及金属材料、无机非金属材料 and 有机高分子材料的特点和多组分复合体系的基本特征。内容包括物质结构基础、材料组成与结构、材料的性能、材料制备与加工成型。通过本课程的学习使学生建立材料制备—加工—结构—性能关系的整体概念。

(3) 课程负责人: 孙颀

6. Course Name: Fundamentals of Materials Science

(1) Course Code: 3522054

(2) Brief Introduction of the Course: *Fundamentals of Materials Science* is a compulsory course for chemistry material majors in School of Material Science and Engineering. It introduces and explains the foundation of material structure, especially the structure, properties and preparation of functional materials. The purpose of this course is to make the students know the relationship of preparation, structure and properties.

(3) Course Leaders: Jie Sun

(三) 专业课程模块 (Specialized Courses)

I 专业核心课程简介 (Specialized Core Courses)

1. 课程名称: 结构化学

(1) 课程编码: 3541036

(2) 课程简介: 《结构化学》是材料化学等相关专业的一门主干基础课程, 是物理学的重要分支。它是在原子、分子的水平上研究原子、分子、晶体结构的运动规律以及物

质微观结构和其性能间的关系的科学。主要内容包括量子力学基础、原子结构理论、分子轨道理论、杂化轨道理论、双原子分子结构与光谱、紫外光电子能谱与成键性质、HMO 法及共轭分子的结构、分子对称性与点群、前线轨道理论与对称性守恒原理、配位场理论、几何结晶学、X—射线结晶学、结晶化学等。学习这门课程的目的在于使学生在前修课程的基础上进一步掌握微观物质运动的基本规律——量子力学基础，获得原子、分子和晶体结构的基本理论和基础知识，深入理解结构和性能之间的关系，深化对前修课程的理解，培养学生能运用结构化学的基本原理和方法去分析和解决实际问题的能力。

(3) 课程负责人：江瑞斌

1. Course Name: Structural Chemistry

(1) Course Code: 3541036

(2) Brief Introduction of the Course: *Structural Chemistry* is a compulsory course for material chemistry majors in School of Material Science and Engineering. The contents of this course contain the principle of quantum mechanics, atomic structure theory, molecular orbital theory, hybrid orbital theory, structure and spectra of diatomic molecules, ultraviolet photoelectron spectra and bonding properties, HMO method and structure of conjugated molecular, molecular symmetry and group of points, frontier molecular orbital theory and conservation principle of symmetry, crystal-field theory of complexes, coordination field theory, geometric crystallography, x-ray geometric crystallography, crystal chemistry, etc. The purpose of this course is to build on previous coursework to further master the fundamental principles of quantum mechanics, which govern microscopic matter motion. Students will acquire basic theories and knowledge about atomic, molecular, and crystal structures, gain a deeper understanding of the relationship between structure and properties, enhance their comprehension of earlier subjects, and develop the ability to apply the fundamental principles and methods of structural chemistry to analyze and solve practical problems.

(3) Course Leaders: Ruibin Jiang

2. 课程名称：材料表征技术

(1) 课程编码：3541033

(2) 课程简介：《材料表征技术》是材料化学专业的一门专业必修课程。主要介绍材料组成、结构和形貌分析表征相关仪器的基本原理与应用。其中包括材料分析方法基础、X 射线衍射分析方法、电子显微分析方法、光谱、电子能谱分析方法以及热分析方法等。介绍这些表征方法在金属材料、无机非金属材料、有机高分子材料和复合材料等方面的应用。

(3) 课程负责人：沈淑坤

2. Course Name: Material Characterization Techniques

(1) Course Code: 3541033

(2) Brief Introduction of the Course: *Material Characterization Techniques* is a compulsory course for chemistry material majors in School of Material Science and Engineering. Its main message is that the fundamentals and application of instruments characterizing the composition, structure and morphology of materials. It provides introduction to the analytical method of materials, such as X-ray diffraction, Electron microscope, spectrum, energy dispersive x-ray spectroscopy, thermogravimetric analysis. Moreover, it introduces the application of analytical method in metal materials, inorganic non-metal materials, organic polymer materials, and composite materials.

(3) Course Leaders: Shukun Shen

3. 课程名称：无机化学实验

(1) 课程编码：3544015

(2) 课程简介：《无机化学实验》是材料化学专业的第一门必修基础实验课，对学生

打下良好的实验基础至关重要。课程采用“一体化、多层次、开放式”的教学模式，重点培养学生扎实的无机化学实验知识和基本技能。教学内容包括性质实验、合成实验和综合实验。性质实验帮助学生深化对无机元素知识的理解，合成实验和综合实验则在巩固基本实验技能的基础上，着重培养学生实验设计、实验操作、数据分析等综合实践能力。

(3) 课程负责人：石峰

3. Course Name: Experiments in Inorganic Chemistry

(1) Course Code: 3544015

(2) Brief Introduction of the Course: *Experiments in Inorganic Chemistry* is the first mandatory fundamental laboratory course for materials chemistry majors, crucial for establishing a solid experimental foundation for students. The course employs an “integrated, multi-level, and open” teaching model, focusing on developing students' solid knowledge and basic skills in inorganic chemistry experiments. The curriculum includes property experiments, synthesis experiments, and comprehensive experiments. Property experiments deepen students' understanding of inorganic element knowledge, while synthesis and comprehensive experiments, based on reinforcing basic experimental skills, emphasize developing students' abilities in experimental design, operation, and data analysis.

(3) Course Leaders: Feng Shi

4. 课程名称：有机化学实验

(1) 课程编码：3544016

(2) 课程简介：《有机化学实验》，是一门独立于有机化学课程之外的必修课。本课程突出对学生有机化学综合实验能力的培养。课程的安排着力于培养具有宽广的有机化学知识基础和熟练的基本技能、能够适应未来发展需要的专业人才。本课程内容主要包含有机化学实验的基本知识、基本操作及其原理与要点；典型化合物的合成和制备技术；较复杂有机化合物的多步骤合成实验；有机化合物的定性鉴定和波谱学分析。通过这些实验使学生掌握有机化学实验的基本操作技能，学会正确选择有机化合物的合成路线、分离提纯及分析鉴定的方法等。

(3) 课程负责人：邢惠萍

4. Course Name: Experiments in Organic Chemistry

(1) Course Code: 3544016

(2) Brief Introduction of the Course: *Experiments in Organic Chemistry* is a mandatory course independent of the organic chemistry lecture series. This course emphasizes developing students' comprehensive experimental abilities in organic chemistry. The curriculum focuses on cultivating professionals with a broad foundation in organic chemistry knowledge and proficient basic skills, who are capable of meeting future developmental needs. The course content primarily includes fundamental knowledge and principles of organic chemistry experiments, basic operations, synthesis and preparation techniques for typical compounds, multi-step synthesis experiments for more complex organic compounds, and qualitative identification and spectroscopic analysis of organic compounds. Through these experiments, students will master basic operational techniques and skills in organic chemistry, learn to select appropriate synthesis methods, and perform separation, purification, and analysis effectively.

(3) Course Leaders: Huiping Xing

5. 课程名称：物理化学实验（含结构）

(1) 课程编码：3544017

(2) 课程简介：本课程突出对学生物理化学综合实验能力的培养。内容主要包括物理化学实验的基本知识、基本操作及其基本原理。通过强化实验技能训练，使学生系统掌握物理化学的基本实验技能、研究方法和基本技术。

(3) 课程负责人：孙颀

5. Course Name: Experiments in Physical /Structural Chemistry

(1) Course Code: 3544017

(2) Brief Introduction of the Course: *Experiments in Physical Chemistry* focuses on the cultivation of students' comprehensive experimental ability in physical chemistry. It mainly covers the basic knowledge, basic operations, and fundamental principles of physical chemistry experiments. By strengthening the training of experimental skills, students can systematically master the basic experimental skills, research methods, and basic techniques of physical chemistry.

(3) Course Leaders: Jie Sun

6. 课程名称：材料谱学分析实验

(1) 课程编码：3544018

(2) 课程简介：《材料谱学分析实验》是化学和材料专业本科生必修的一门专业基础课程。课程内容主要有原子发射光谱法、原子吸收光谱法、紫外-可见吸收光谱法、红外吸收光谱法、核磁共振波谱法、电位分析法、电解和库仑分析法、伏安法和极谱法、色谱法、质谱法等。通过本课程的学习，使学生能基本掌握常用的仪器分析方法的原理和特点，并能综合利用相关仪器实现对材料的化学组成、含量及特性进行测定。

(3) 课程负责人：沈淑坤

6. Course Name: Material Spectral Analysis Experiments

(1) Course Code: 3544018

(2) Brief Introduction of the Course: *Material Spectral Analysis Experiments* is a compulsory basic course for undergraduates in chemistry and materials-related fields. The course covers various techniques including atomic emission spectroscopy, atomic absorption spectroscopy, UV-Vis spectroscopy, infrared spectroscopy, nuclear magnetic resonance spectroscopy, potentiometric analysis, electrolysis and coulometry, voltammetry and polarography, chromatography, and mass spectrometry. Through this course, students will learn the principles and characteristics of commonly used analytical instruments and acquire the ability to use these tools to determine the chemical composition, content, and properties of materials.

(3) Course Leaders: Shukun Shen

II 专业方向课程简介 (Specialized Orientation Courses)**1. 课程名称：无机材料合成方法**

(1) 课程编码：3542066

(2) 课程简介：《无机材料合成方法》是材料化学专业的重要必修课程，涵盖了气相法、液相法和固相法三大类合成技术。课程详细介绍了水热/溶剂热法、溶胶凝胶法、沉淀法、化学气相沉积法、高温/低温固相法以及单晶生长法等多种方法，并探讨了无机材料合成领域的最新进展。通过学习本课程，学生将掌握这些合成方法的基本原理、工艺流程及合成参数，进而具备利用这些技术开发新型无机材料的能力。

(3) 课程负责人：陈沛

1. Course Name: Synthetic Methods of Inorganic Materials

(1) Course Code: 3542066

(2) Brief Introduction of the Course: *Synthetic methods of Inorganic Materials* is an essential required course for the Materials Chemistry major, covering three main synthesis techniques: gas-phase, liquid-phase, and solid-phase methods. The course provides detailed insights into various techniques, including hydrothermal/solvothermal methods, sol-gel methods, precipitation methods, chemical vapor deposition, high/low-temperature solid-state methods, and single-crystal growth methods, as well as the latest developments in the field of inorganic material synthesis. Through this course, students will grasp the basic principles, process flows, and synthesis parameters of these methods, and will be equipped with the ability to develop new

inorganic materials using these techniques.

(3) Course Leaders: Pei Chen

2. 课程名称：材料物理性能学

(1) 课程编码：3542067

(2) 课程简介：《材料物理性能学》是材料化学专业的必修课程，从材料科学理论出发并结合工程实际应用，强调多学科知识的交叉与渗透。课程系统讲述了评价材料性能的各项指标，包括其定义、本质、测试方法和适用范围，并分析了材料性能指标之间的相互关系和不同材料的性能特点及应用领域。课程内容还涵盖了固体中电子能量结构和状态，材料的电、介电、光、热、磁、弹性和内耗性能及其发展，阐述了各种性能的重要原理、微观机制以及材料成分、组织结构与性能的关系。特别地，课程对金属、陶瓷和高聚物材料的物理性能进行了对比，以帮助学生掌握材料物理性能的一般规律和特殊性，同时分析了内在因素（如材料成分、组织状态）和外在因素（如应力状态、温度、环境介质）对材料性能的影响，并提出了相应的解决途径。

(3) 课程负责人：高斐

2. Course Name: Physical Properties of Materials

(1) Course Code: 3542067

(2) Brief Introduction of the Course: *Physical Properties of Materials* is a required course for materials chemistry majors, starting from the theory of materials science and integrating engineering applications. It emphasizes the intersection and integration of multidisciplinary knowledge. The course provides a systematic discussion of evaluating various performance indicators of materials, including their definitions, essence, testing methods, and applicable ranges. It also covers the interrelationships between different performance indicators, the characteristics and application areas of different materials. Additionally, it examines the impact of intrinsic factors (such as material composition and organizational state) and extrinsic factors (such as stress conditions, temperature, and environmental media) on material performance, offering corresponding solutions. The course includes content on the electronic energy structure and state in solids, as well as the electrical, dielectric, optical, thermal, magnetic, elastic, and damping properties of materials and their development. It explains the fundamental principles and microscopic mechanisms of various properties and the relationship between material composition, organizational structure, and performance. Notably, the course contrasts the physical properties of metals, ceramics, and polymers to help students grasp general rules and specificities of material physical properties.

(3) Course Leaders: Fei Gao

3. 课程名称：功能材料

(1) 课程编码：3542068

(2) 课程简介：《功能材料》是材料化学专业一门重要的专业必修课。功能材料是具有电、磁、光、声、热、力、化学以及生物学功能的新型材料，是信息技术、生物技术、能源技术、环境保护等高新技术领域和国防建设的重要基础材料。本课程主要介绍与学科发展前沿相关的功能材料类型及其组成、结构、性能、制备和应用等内容。着重介绍功能材料物理化学性能与其组成和微观结构之间的关联性，加深学生对材料功能特性产生的内在本质理解。同时，该课程还将介绍材料功能特性基本实验测试方法与分析技术，以提高学生综合分析、解决问题的能力，为今后从事新材料研究与技术开发奠定基础。

(3) 课程负责人：雷志斌

3. Course Name: Functional Materials

(1) Course Code: 3542068

(2) Brief Introduction of the Course: *Functional Materials* is a compulsory course for material chemistry majors in School of Materials Science and Engineering. Functional materials

are a large class of new materials with special features, such as electric, magnetic, optical, acoustic, thermal, mechanical, chemical, and biological features. They are the important basic materials in the area of information technology, biotechnology, energy technology, national defense construction, etc. The course focuses on the types, composition, structure, properties, preparation, and applications of functional materials at the cutting edge of the discipline. It emphasizes how the physical and chemical properties of functional materials relate to their composition and microscopic structure, deepening students' understanding of the intrinsic nature of material functionalities. Additionally, the course will cover fundamental experimental testing methods and analytical techniques for functional materials, aiming to enhance students' comprehensive analysis and problem-solving skills, and laying a solid foundation for future research and development in new materials.

(3) Course Leaders: Zhibin Lei

4. 课程名称：新能源材料

(1) 课程编码：3542071

(2) 课程简介：《新能源材料》是材料化学本科专业的一门专业方向课程，主要介绍世界及中国的能源和消费现状、石化材料的应用、太阳能应用材料、电池、燃料电池、储氢及热电转换材料等。本课程从分析各种新能源（热能、氢能、太阳能、燃料电池等）的特点出发，学习各种新材料在能源转换中的应用和研究，以及材料基础理论在其中的应用和发展。

(3) 课程负责人：刘渝城

4. Course Name: New Energy Materials

(1) Course Code: 3542071

(2) Brief Introduction of the Course: *New Energy Materials* is one non-restrictive elective course of School of Materials Science and Engineering. It mainly introduces the energy resources and consumption, materials for fossil fuels applications, materials for electricity generation, application of solar energy materials, batteries, fuel cells, hydrogen storage and alternative power generations. From the analysis of all kinds of energy (hydrogen energy, solar energy, fuel cell and the like) characteristics, students will learn the application and research progress of materials in energy conversion and the application and development of materials theories in this field.

(3) Course Leaders: Yucheng Liu

5. 课程名称：新能源电化学基础

(1) 课程编码：3542072

(2) 课程简介：《新能源电化学基础》是材料化学本科专业的一门专业方向课程。本课程旨在使学生掌握电化学基本理论（包括电化学热力学和电化学动力学）和电化学测试方法（包括电化学实验的基本知识，稳态电化学测试方法、暂态测试方法）。课程在系统讲述电化学基本原理的基础上，理论联系实际，重点突出电化学基本原理在材料科学中特别是化学电源中的应用，反映电化学在材料科学的综合性、边缘性和前瞻性。

(3) 课程负责人：陈煜

5. Course Name: Fundamentals of New Energy Electrochemistry

(1) Course Code: 3542072

(2) Brief Introduction of the Course: *Fundamentals of New Energy Electrochemistry* is one non-restrictive elective course of School of Materials Science and Engineering. It mainly includes two parts: a) Fundamental theory of electrochemistry including electrochemical thermodynamics and kinetics. b) Electrochemical measurement methods: fundamental knowledge of electrochemical experiment, steady-state measurement methods, and transient-state measurement methods. This course aims to introduce systematically the fundamental theory of electrochemistry. Linking theory with practice, it is emphasized on the practical applications of the fundamental

theory of electrochemistry in materials science, especially in chemical power sources, presenting the comprehensiveness, marginality and perceptiveness of electrochemistry.

(3) Course Leaders: Yu Chen

6. 课程名称：基础固体物理

(1) 课程编码：3542069

(2) 课程简介：《基础固体物理》是一门专业基础课程。固体材料的键合方式及微观结构决定了材料的宏观热学、电学、光学性质，能够理解和分析两者之间的关联是材料化学专业学生必须掌握的知识，对学生将来从事材料类相关工作至关重要。本课程通过对微观粒子的运动规律、晶体的结构与测定、晶体结合方式、晶体中原子振动及电子状态等内容的讲授，使学生掌握固体物理的基本概念和物理图像，学习从微观角度理解和分析宏观物理现象的思路和方法，培养分析问题和解决问题的能力，为今后从事材料科学的研究打下理论基础。

(3) 课程负责人：曾京辉

6. Course Name: Basic Solid State Physics

(1) Course Code: 3542069

(2) Brief Introduction of the Course: *Basic Solid State Physics* is a professional foundational course. The bonding mode and microstructure of solid materials determine their macroscopic thermal, electrical, and optical properties. Understanding and analyzing the relationship of electron structure-property is a necessary knowledge for students majoring in materials chemistry, which is crucial for their future work in materials related fields. This course aims to teach students the basic concepts and physical images of solid physics through the study of the motion laws of micro particles, crystal structure and measurement, crystal bonding methods, atomic vibrations and electronic states in crystals. Students will learn the ideas and methods of understanding and analyzing macroscopic physical phenomena from a micro perspective, cultivate the ability to analyze and solve problems, and lay a theoretical foundation for future research in materials science.

(3) Course Leaders: Jinghui Zeng

7. 课程名称：高分子化学与物理

(1) 课程编码：3542070

(2) 课程简介：《高分子化学与物理》是我院本科生的必修课程。主要内容包括高分子化合物的分类和命名、高分子化学的基本概念与基本理论、自由基聚合与共聚合、离子聚合、配位聚合、聚合方法、逐步聚合反应、聚合物的化学反应、高分子化学的新进展与功能高分子，聚合物的结构和性能的关系。通过研究聚合反应和高分子化学反应的原理及实施方法，了解聚合物的结构和性能的关系，使学生能够选择廉价原料，寻找优质催化剂，确定合理的合成路线，制定最佳工艺条件合成或改性制备具有一定性能的聚合物。通过本课程学习，使学生掌握高分子的基本概念，熟悉合成高分子化合物的基本原理及控制聚合物反应速率和分子量的方法，了解高分子化学反应的特征、聚合方法的选择及聚合物的结构和性能的关系。为学生进一步学习高分子相关内容奠定基础。

(3) 课程负责人：邓字巍

7. Course Name: Polymer Chemistry and Physics

(1) Course Code: 3542070

(2) Brief Introduction of the Course: *Polymer Chemistry and Physics* is a compulsory course for students in School of Material Science and Engineering. The main content includes the classification and nomenclature of polymer compounds, fundamental concepts and theories of polymer chemistry, free radical polymerization and copolymerization, ionic polymerization, coordination polymerization, polymerization methods, step-growth polymerization reactions, chemical reactions of polymers, recent advances in polymer chemistry, functional polymers, and

the relationship between polymer structure and properties. By studying the principles and implementation methods of polymerization reactions and polymer chemistry reactions, students will understand the relationship between polymer structure and properties. This will enable them to select inexpensive raw materials, find high-quality catalysts, determine reasonable synthesis routes, and develop optimal process conditions for synthesizing or modifying polymers with desired properties. Through this course, students will gain a proficient understanding of fundamental concepts of polymers, become familiar with the basic principles of polymer compound synthesis, and learn methods for controlling polymerization reaction rates and molecular weights. They will also understand the characteristics of polymer chemistry reactions, the selection of polymerization methods, and the relationship between polymer structure and properties. This will lay a foundation for further study in polymer-related fields.

(3) Course Leaders: Ziwei Deng

8. 课程名称：液晶材料

(1) 课程编码：3542054

(2) 课程简介：《液晶材料》是材料化学专业一门专业方向课程。液晶材料是功能化的软材料之一，是 21 世纪信息时代的一种重要显示用材料。本课程主要讲述液晶材料的基本概念；液晶作为显示用材料要满足的基本要求；液晶化合物结构与性能的关系；液晶化合物的合成设计与典型反应；液晶化合物的纯化分离及表征方法；液晶混合配方的设计原则；液晶材料的发展趋势等内容。该课程的主要任务是使学生理解液晶形成的内在本质，掌握液晶材料的合成、纯化和分析表征技术，为今后从事新材料开发与研制工作打下坚实基础。

(3) 课程负责人：陈新兵

8. Course Name: Liquid Crystal Materials

(1) Course Code: 3542054

(2) Brief Introduction of the Course: *Liquid Crystal Materials* is an elective course for material chemistry majors. As one kind of soft materials, liquid crystal materials have played an important role in our daily lives in the information era. The course places an emphasis on the definition and classification of liquid crystal materials, the basic requirements of liquid crystal materials for LCD application, the relationships between structure and properties of liquid crystal, the design and classical reactions for liquid crystals, the characterization and purification methods for liquid crystals, the rules for liquid crystal mixture, the progress in liquid crystal materials. It will help students to understand the driving forces for the formation of liquid crystal phase, to grasp the synthesis, purification and characterization of liquid crystals. The students are supposed to lay a solid foundation for future development of new materials from the course.

(3) Course Leaders: Xinbing Chen

9. 课程名称：功能高分子多孔材料

(1) 课程编码：3542055

(2) 课程简介：《功能高分子多孔材料》是材料化学专业的一门专业方向课程。该课程的内容主要包括聚合物多孔材料的分类，功能化高分子多孔材料的分子设计、制备方法、表征技术和手段以及其在非均相催化、气体吸附、分离工程等应用领域的介绍，加深学生对材料科学当前研究前沿和热点问题的认识。着重介绍功能化多孔材料的物理化学性能与其组成和微观结构之间的关联性，加深学生对材料功能化特性内在本质的理解。通过介绍功能高分子多孔材料的表征手段和分析技术，培养学生综合分析和解决问题的能力，为学生今后从事新材料的研究奠定理论基础。

(3) 课程负责人：邓宇巍

9. Course Name: Functional Porous Polymer Materials

(1) Course Code: 3542055

(2) Brief Introduction of the Course: *Functional Polymer Materials with Porous Structure* is an elective course for material chemistry majors. The contents of this course are mainly focused on the introduction of classification of polymeric porous material, the molecular design, preparation and characterization of functional macromolecular porous materials and their potential applications such as catalysis, gas storage and separation science. Through the introduction of the relationship between physical & chemical properties and structure & composition of functional macromolecular porous material, students will strengthen the intrinsic understanding of the functional material and improve their abilities of analyzing and solving problems.

(3) Course Leaders: Ziwei Deng

10. 课程名称: 仿生材料学

(1) 课程编码: 3542056

(2) 课程简介: 《仿生材料学》是材料化学本科专业的一门专业方向课程。仿生材料学主要受自然界生物特殊结构和功能的启示, 模仿或利用生物体结构、功能和生化过程并应用到材料设计, 以便获得接近或超过生物材料优异特性的新材料, 或利用天然生物合成的方法获得所需材料的一门学科。本课程主要介绍仿生合成的原理, 仿生材料的制备与设计, 成分和结构材料的仿生, 功能和性能仿生, 仿生材料的应用。通过对仿生制备材料理论的学习, 启发学生利用大自然的规律合成制备新型材料, 提高学生的综合理论知识, 促进学生对多学科交叉科学研究的兴趣。

(3) 课程负责人: 邓字巍

10. Course Name: Biomimetic Materials

(1) Course Code: 3542056

(2) Brief Introduction of the Course: *Biomimetic Materials* is one non-restrictive elective course of School of Materials Science and Engineering. It is one discipline that involves in studying the functional materials prepared by the bio-inspired concepts from nature. The basic contents including the fundamental theory of bio-synthesis, preparation design and application of biomimetic materials, materials bio-synthesized based on natural structures and properties will be introduced in the course of Biomimetic Materials. This course is aimed to help students grasp functional materials preparation and application, which will make them study new concepts inspired from nature to design and prepare new materials, and help them have more interesting on materials science.

(3) Course Leaders: Ziwei Deng

11. 课程名称: 文物保护材料

(1) 课程编码: 3542057

(2) 课程简介: 《文物保护材料》是材料化学本科专业的一门专业方向课程, 主要讲授以下三方面内容: 第一, 文物与古遗迹材料的化学组成研究; 第二, 文物与古遗迹病害机理在相关环境中的衰变规律以及适宜保存环境研究; 第三, 文物与古遗迹材料的保护修复机理、保护修复材料和保护修复工艺研究。

(3) 课程负责人: 李玉虎

11. Course Name: Materials in Protection of Cultural Relics

(1) Course Code: 3542057

(2) Brief Introduction of the Course: *Materials in Protection of Cultural Relics* is one non-restrictive elective course of School of Materials Science and Engineering. The main content includes three aspects as follows: firstly, chemical compound study of relics and sites material; secondly, research on disease mechanism, law of radioactive decay in certain environment, and suitable preservation unit; thirdly, study of the conservation mechanism, material and technology.

(3) Course Leaders: Yuhu Li

12. 课程名称：现代表征技术与科技考古

(1) 课程编码：3542058

(2) 课程简介：《现代表征技术与科技考古》是材料化学专业的专业方向课程，是自然科学与人文科学形成的重要交叉方向。课程主要介绍在金属、陶瓷、漆木器、纺织品和动植物类文物中常用的相关表征技术，使学生了解文物样品的前处理、表征技术和数据处理等方法。课程目的在于在前修课程的基础上加深学生对表征技术应用情况的了解，使学生了解古代人类使用材料历史发展脉络，拓展学生的知识面。

(3) 课程负责人：金普军

12. Course Name: Modern Characterization Techniques and Archaeometry

(1) Course Code: 3542058

(2) Brief Introduction of the Course : *Modern Characterization Techniques and Archaeometry* is an elective course for material chemistry majors in School of Materials Science and Engineering, which is an interdisciplinary science of natural science disciplines and humanities subjects. It introduces the analytical techniques applied to research metal, ceramic, lacquer or wood, textile and plant or animal heritage and contains three main parts, such as the cultural relics sample pretreatment, the relative analytical techniques and the data processing. The course intends to deepen student's horizon on relative analytical techniques based on the prior courses and broaden their knowledge of those materials once used in ancient times.

(3) Course Leaders: Pujun Jin

13. 课程名称：档案保护与修复技术

(1) 课程编码：3542059

(2) 课程简介：《档案保护与修复技术》是材料化学专业的一门专业方向课程。档案保护与修复是文化遗产保护领域的一个重要组成部分，本课程主要针对档案系统收藏的纸张文献、古旧书籍与字画、感光影像档案常见病害现象，结合我院历史文化遗产保护教育部工程研究中心在档案保护领域学科优势，讲授常见档案保护与修复技术以及创新技术研发过程，扩展学生知识面，培养学生应用所学知识解决实际问题的能力，提高学生专业学习积极性。

(3) 课程负责人：周亚军

13. Course Name: Technology of Archive Protection and Restoration

(1) Course Code: 3542059

(2) Brief Introduction of the course: *Technology of Archive Protection and Restoration* is one of the restrictive selective courses of the specialty of materials chemistry. Archive protection and restoration is an important part in the field of cultural heritage protection. Combining with the subject advantages of our Engineering Research Center of Historical and Cultural Heritage Protection in the field of archive protection, the contents of the course include the research process of common archive protection and restoration technology and innovation technology, aiming at the common diseases phenomenon of paper documents collected in archive system, ancient books, ancient calligraphy and painting, photographic image files, etc. The objective is to expand the students knowledge, train the students' ability to apply knowledge to solve practical problems, and improve the students' study enthusiasm.

(3) Course Leaders: Yajun Zhou

14. 课程名称：纳米材料学

(1) 课程编码：3542051

(2) 课程简介：本课程主要介绍纳米材料的定义与分类，不同纳米结构单元的制备与生长机制，纳米材料的基本物理效应，纳米材料的光学、电学、磁学和光催化性能及其与尺寸、形貌、暴露晶面的关系以及纳米材料最新研究进展。使学生掌握目前纳米材料的制备及其结构与性能研究现状，了解纳米材料进一步发展方向。为他们从事纳米材料教学和

科学研究的奠定基础。

(3) 课程负责人: 杨合情

14. Course Name: Nanomaterials and Nanostructures

(1) Course Code: 3542051

(2) Brief Introduction of the course: This course mainly introduces the definition and classification of nanomaterials, the preparation and growth mechanisms of different nanostructured units, the basic physical effects of nanomaterials, the optical, electrical, magnetic, and photocatalytic properties of nanomaterials and their relationship with size, morphology, and exposed crystal planes, as well as the latest research progress of nanomaterials. It aims to equip students with an understanding of the current state of nanomaterial preparation and the research on their structure and properties, and to familiarize them with the future development directions of nanomaterials. This will lay a solid foundation for their future work in nanomaterial teaching and scientific research.

(3) Course Leaders: Heqing Yang

15. 课程名称: 光伏材料与太阳能电池

(1) 课程编码: 3542076

(2) 课程简介: 太阳能电池发电技术是一种清洁发电技术,可以减少温室气体的排放,助力国家“碳中和、碳达峰”目标的实现。本课程包括太阳能电池器件物理基础、太阳能电池的发展历程、种类和最新进展等内容,让学生掌握和了解太阳能电池的基本原理和产业发展。

(3) 课程负责人: 赵奎

15. Course Name: Photovoltaic materials and solar cells

(1) Course Code: 3542076

(2) Brief Introduction of the course: Solar cell power generation technology is a clean power generation technology that can reduce greenhouse gas emissions and help achieve the national goal of carbon neutrality and peak carbon emissions. This course includes the physical foundation of solar cell devices, the development history, types, and latest progress of solar cells, etc., allowing students to master and understand the basic principles and industrial development of solar cells.

(3) Course Leaders: Kui Zhao

III 专业拓展课程简介 (Specialized Development Courses)

1. 课程名称: 科学教育经典文献选读

(1) 课程代码: 3543054

(2) 课程简介: 《科学教育经典文献选读》是一门专业选修课。主要内容包括四个方面:一是国内外高质量科学教育期刊与文献检索方法介绍;二是文献阅读方法介绍,帮助学生掌握不同类型科学教育文献的篇章结构、阅读步骤和关键信息提取;三是国内外经典文献与最新科学教育文献阅读和主题梳理,旨在引导学生了解科学教育研究的最新进展与发展趋势,并学会围绕特定主题进行文献综述;四是基于文献综述的问题提出,旨在培养学生用批判性精神阅读已有研究并创造性地提出研究问题与解决思路。

(3) 课程负责人: 郭习佩

1. Course Name: Reading Classical Literature in Science Education

(1) Course Code: 3543054

(2) Brief Introduction of the Course: “Reading Classical Literature in Science Education” is a professional elective course. The main contents include four aspects: ①the introduction of domestic & foreign high-quality science education journals and literature search methods; ②the introduction of literature reading methods to help students master the chapter structure, reading steps, and key information extraction of different types of science education literature; ③the

science education literature reading and theme combing. It aims to guide students to understand the latest progress and trend of science education research, further learn to conduct literature review around specific topics; ④the problem formulation based on literature review, which aims to cultivate students to read the existing research in a critical spirit and creatively put forward research problems and solution ideas.

(3) Course Leaders: Xipei Guo

2. 课程名称：现代化学专题

(1) 课程代码：3543055

(2) 课程简介：《现代化学专题》是一门针对科学教育专业学生开设的课程，旨在深入探讨现代化学的前沿领域和重要概念。本课程涵盖了化学领域的多个方面，包括但不限于化学结构与性质、化学键与分子构型、化学反应动力学、催化剂与反应机制、材料化学与纳米技术等。学生将通过理论学习、实验探究以及案例分析等方式，全面了解化学领域的最新进展和研究动态，培养其扎实的化学基础、科学思维和实验操作能力。

(3) 课程负责人：李建锋

2. Course Name: Special Topics in Modern Chemistry

(1) Course Code: 3543055

(2) Brief Introduction of the Course: Special Topics in Modern Chemistry is a course designed for students majoring in science education, aiming to delve into the frontier areas and important concepts of modern chemistry. This course covers various aspects of chemistry, including but not limited to chemical structure and properties, chemical bonding and molecular configuration, chemical reaction kinetics, catalysts and reaction mechanisms, materials chemistry and nanotechnology, etc. Through theoretical study, experimental exploration, and case analysis, students will comprehensively understand the latest developments and research trends in the field of chemistry, cultivate their solid foundation in chemistry, scientific thinking, and practical laboratory skills.

(3) Course Leaders: Jianfeng Li

3. 课程名称：现代物理专题

(1) 课程代码：3543056

(2) 课程简介：这门课是一门研究自然科学和工程技术的基础课程。本课程包括振动与波（单摆和复摆、双簧管音色、薄板控制噪声、驻波）、光学（激光陀螺仪、光的相干性、光栅原理）、热学（铀浓缩原理、真空度、熵与绝热）、量子物理（地球温暖、恒星命运预测）、质点力学（阿特伍德机作用、汽车驾乘人安全力学、动量迁移）、刚体（物体极限转速、转速与受力模型、空速管系统）、相对论（狭义相对论中佯谬问题、相对论与导航系统、时空的形状）、电磁场（大气中的电现象、场致发射显微镜、无线充电、磁透镜的聚焦原理）。

(3) 课程负责人：王大鹏

3. Course Name: Special Topics in Modern Physics

(1) Course code: 3543056

(2) Brief introduction of the course: It is a fundamental course in the study of natural sciences and engineering technology for engineering majors in higher education institutions. This course includes vibration and waves (pendulum and compound pendulum, oboe sound, thin plate controlled noise, standing waves), optics (laser gyroscope, coherence of light, grating principle), thermodynamics (uranium enrichment principle, vacuum degree, entropy and adiabation), quantum physics (Earth warmth, stellar fate prediction), particle mechanics (Atwood machine effect, safety mechanics for drivers and passengers, momentum transfer), rigid bodies (object limit speed, speed and force model, airspeed tube system), relativity (paradox problem in special relativity, relativity and navigation system, shape of time and space), and electromagnetic fields

(electrical phenomena in the atmosphere, field emission microscopy, wireless charging, the focusing principle of magnetic lenses).

(3) Course Leaders: Dapeng Wang

4. 课程名称：稀土发光材料

(1) 课程编码：3543032

(2) 课程简介：《稀土发光材料》是一门专业拓展课程，本课程旨在使学生掌握稀土离子发光的基础知识和基本原理，主要包括以下内容：一、发光的基本原理和机制，包括激发态吸收、能量传递、辐射跃迁、无辐射跃迁等。二、发光材料的制备及其应用：稀土上转换材料及其发光机理、长余辉材料、电致发光材料等。课程在系统讲述稀土发光材料机理的基础上，理论联系实际，重点突出稀土发光材料在材料科学中特别是在生物医学及太阳能电池领域的应用，突出稀土发光材料在材料科学的综合性，边缘性和前瞻性。

(3) 课程负责人：石峰

4. Course Name: Rare Earth Luminescent Materials

(1) Course Code: 3543032

(2) Brief Introduction of the Course: *Rare Earth Luminescent Materials* is one specialized development course. It mainly includes two parts: a) The basic principle of luminescence and mechanisms: excited state absorption, energy transfer, radiative transition, nonradioactive transition and so on. b) The preparation of luminescent materials and their applications: rare earth conversion materials and luminescence mechanisms, long persistence phosphors, electroluminescent materials. This course aims to master relevant fundamental knowledge and basic theory of rare earth luminescent materials. Linking theory with practice, it is emphasized on the practical applications of the fundamental theory of rare earth luminescent materials in materials science, especially in biomedicine and solar cell, presenting the comprehensiveness, marginality and perceptiveness of rare earth luminescent materials.

(3) Course Leaders: Feng Shi

5. 课程名称：传感材料与技术

(1) 课程编码：3543040

(2) 课程简介：纳米传感技术是纳米材料和传统传感技术交叉渗透而形成的一个新领域，它在航天、机械、仪器仪表、汽车制造、油气勘探、电子工程及医疗器械行业都有广泛用途，被欧盟评为对未来影响最大的六项前沿技术之一。本课程主要介绍纳米敏感材料与传感技术的基本概念、分子识别元件及其生物和化学反应基础。重点介绍电导型半导体氧化物纳米传感器、电化学传感器、纳米结构分子印迹化学 / 生物微纳传感器、电导型 DNA 及其复合纳米材料传感器、纳米材料化学发光传感器的原理。

(3) 课程负责人：贾丽超

5. Course Name: Materials and Technologies of Sensors

(1) Course Code: 3543040

(2) Brief Introduction of the Course : Nanosensor technology is a new emerging interdisciplinary of nanomaterials and traditional sensing technology. It has been widely used in space, machinery, instrument, automobile manufacturing, oil and gas exploration, electronic engineering and medical instrument industry. This course introduces the basic concepts of nanomaterials and sensing technology, molecular recognition components and their reaction basis of biology and chemistry. This course is mainly focus on the principle of conductivity type semiconductor oxide nanosensor, electrochemical sensor, nanostructured molecular imprinted chemical/biosensor, conductivity DNA and its composite nanomaterial sensor, nanomaterial chemiluminescence sensor.

(3) Course Leaders: Lichao Jia

6. 课程名称：胶体化学与界面

(1) 课程编码: 3543035

(2) 课程简介: 胶体化学与界面课程是一门研究胶体和界面现象的化学学科。该课程将介绍胶体化学与界面科学的基本概念、原理和方法, 包括分散体系、表面活性剂、胶体稳定性、界面吸附等。此外, 课程还将深入探讨各种实际应用, 如涂料、化妆品、石油工业、生物医学等领域的胶体和界面现象。通过实验和实践环节, 学生将有机会探索胶体和界面的制备、表征和性能测试过程, 培养解决实际问题的能力。本课程旨在培养学生对胶体化学与界面科学的兴趣和专业知识的, 为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人: 沈淑坤

6. Course Name: Colloid Chemistry and Interface

(1) Course Code: 3543035

(2) Brief Introduction of the Course: *Colloid Chemistry and Interfacial Science* is a branch of chemistry that studies colloid and interface phenomena. This course will introduce the basic concepts, principles, and methods of colloid chemistry and interfacial science, including dispersion systems, surfactants, colloid stability, and interfacial adsorption. Additionally, the course will delve into various practical applications, such as coatings, cosmetics, the petroleum industry, biomedicine, and other fields involving colloid and interface phenomena. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of colloids and interfaces, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of colloid chemistry and interfacial science, providing support for their research and development work in related fields.

(3) Course Leaders: Shukun Shen

7. 课程名称: 光催化材料与技术

(1) 课程编码: 3543052

(2) 课程简介: 光催化材料与技术课程是一门介绍光催化材料及其在能源、环境等领域应用的课程。该课程将重点介绍光催化材料的原理、制备、性能和应用, 包括光催化材料的基本性质、光催化反应机制、光催化材料的合成与改性等方面的知识。此外, 课程还将深入探讨光催化技术在分解水制氢、污染物降解、太阳能转换等领域的应用, 以及面临的挑战和未来的发展方向。通过实验和实践环节, 学生将有机会探索光催化材料的制备、表征和性能测试过程, 培养解决实际问题的能力。本课程旨在培养学生对光催化材料与技术的兴趣和专业知识的, 为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人: 闫俊青

7. Course Name: Photocatalytic Materials and Technology

(1) Course Code: 3543052

(2) Brief Introduction of the Course: *Photocatalytic Materials and Technology* is a course that introduces photocatalytic materials and their applications in energy, environment, and other fields. This course will focus on the principles, preparation, properties, and applications of photocatalytic materials, including basic properties of photocatalytic materials, photocatalytic reaction mechanisms, synthesis and modification of photocatalytic materials. Additionally, the course will delve into the applications of photocatalytic technologies in areas such as water splitting for hydrogen production, pollutant degradation, solar energy conversion, as well as challenges and future perspective. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of photocatalytic materials, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of photocatalytic materials and technology, providing support for their research and development work in related fields.

(3) Course Leaders: Junqing Yan

8. 课程名称：有机光电材料与器件导论

(1) 课程编码：3543041

(2) 课程简介：《有机光电材料与器件导论》旨在使学生了解有机光电材料与器件这一新兴领域，并熟悉相关基础知识与基本理论。主要内容包括有机（包括小分子和聚合物）半导体的基本知识、有机光电材料的分子结构、导电与发光机理、有机光电器件的分类与工作原理以及有机光电材料在有机发光二极管和发光电化学池、有机太阳能电池、有机场效应晶体管、有机存储器、有机生物化学传感器、有机光泵浦激光器以及有机非线性光学材料等方面的应用。

(3) 课程负责人：胡鉴勇

8. Course Name: Introduction to Organic Optoelectronic Materials and Devices

(1) Course Code: 3543041

(2) Brief Introduction of the Course: This course is intended to introduce the new field of organic optoelectronic materials and devices to students and acquaint them with relevant fundamental knowledge and basic theory. The course includes the foundation knowledge of organic semiconductors (small molecules and polymers), the molecular structure of organic optoelectronic materials, conductive and light-emitting mechanism, classification and the principles of diverse organic optoelectronic devices, and the applications of organic optoelectronic materials in the devices, such as organic light-emitting diodes, emitting electrochemical cells, organic solar cells, organic field-effect transistors, organic memories, organic biochemical sensors, organic optical pumped lasers, and organic non-linear optical materials, etc.

(3) Course Leaders: Jianyong Hu

9. 课程名称：材料科学前沿进展

(1) 课程代码：3543057

(2) 课程简介：《材料科学前沿进展》是高等学校材料学专业基础课程之一。本课程结合材料与人类文明发展历史，介绍包括现代功能玻璃、功能陶瓷、纳米材料、金属材料、高分子材料、生物医用材料、能源材料、催化材料、光电材料、碳材料等不同前沿材料。通过本课程学习，学生将了解材料如何影响我们的生活，新材料的概况、制备生产技术应用，以及材料科学的未来及发展方向。

(3) 课程负责人：向万春

9. Course Name: Frontiers of material Science

(1) Course code: 3543057

(2) Brief introduction. Frontiers of material Science is one of the fundamental courses for students majoring in materials. Combining materials with the evolution of human civilization, this course contains modern functional glass, functional ceramics, nanomaterials, metal, polymers, biomedical materials, energy materials, catalytic materials, optoelectronic materials, carbon materials, etc. Through learning this course, students can know how materials affect our daily lives, the updated information of different materials, and their manufacturing and applications. Students can also know the future of the development of material science.

(3) Course Leaders: Wanchun Xiang

10. 课程名称：材料的力学性能

(1) 课程编码：3543036

(2) 课程简介：《材料的力学性能》是一门专业拓展课程。本课程主要介绍材料在力、能量、环境和时间单独或复合作用下，材料力学行为的响应规律、物理本质、评定方法、测试方法和工程应用。所涉及的内容主要有四部分：材料的基本力学性能，包括弹性、塑性，形变强化、强度、韧性和硬度等；断裂的抗力及其表征，主要包括断裂韧性、脆断的微观机制、缺口件的断裂和冲击能量作用下的断裂；与时间有关的失效机理和抗力，主要

有疲劳、蠕变、应力腐蚀和氢脆、摩擦与磨损及接触疲劳等。

(3) 课程负责人: 孙颀

10. Course Name: Mechanical Properties of Materials

(1) Course Code: 3543036

(2) Brief Introduction of the Course: *Mechanical Properties of Materials* is a professional development course. This course mainly introduces the response law, physical nature, evaluation method, test method and engineering application of mechanical behavior of materials under the action of force, energy, environment and time alone or in combination. Four main parts are involved in this course: the basic mechanical properties of the material, including elasticity, plasticity, deformation strengthening, strength, toughness and hardness; the resistance of the fracture and its characterization, including fracture toughness, microscopic mechanism of brittle fracture, fracture of the notched piece and under impact energy; time-dependent failure mechanism and resistance, mainly including fatigue, creep, stress corrosion and hydrogen embrittlement, friction, wear and contact fatigue.

(3) Course Leaders: Jie Sun

11. 课程名称: 材料的相变原理

(1) 课程编码: 3543037

(2) 课程简介: 《材料的相变原理》是一门专业拓展课程。本课程是《材料科学基础》中凝固和相图理论的拓展和延伸, 主要以材料相变的基本原理为出发点, 从材料相变过程的热力学、动力学和晶体学角度论述各类典型材料相变过程中的基本规律, 并对相变研究的前沿领域进行简要介绍和展望。本课程的主要内容包括: ① 材料相变的分类和基本规律(相变热力学、动力学和晶体学); ② 液-固相变的基本理论(凝固、熔化和过热); ③ 固态相变的基本理论(扩散型相变、无扩散型相变和二级相变); ④ 纳米材料相变简介。

(3) 课程负责人: 孙颀

11. Course Name: Phase Transformation Mechanisms of Materials

(1) Course Code: 3543037

(2) Brief Introduction of the Course: *Phase Transformation Mechanisms of Materials* is a professional development course. This course is an extension of the theory of solidification and phase diagram in the course of "Fundamentals of Materials Science". It mainly takes the basic principle of material phase transition as the starting point, discussing the basic laws of various typical phase transformations from the perspectives of thermodynamics, dynamics and crystallography. Moreover, brief introduction and prospective on the frontier research field of phase transformation are also involved in this course. The main contents include: ① Classification and basic laws of phase transition of materials (phase transition thermodynamics, kinetics and crystallography); ② Basic theory of liquid-solid phase transition (solidification, melting and superheating); ③ Basic theory of solid state phase transition (diffusion phase transition, non-diffusion phase transition and secondary phase transition); ④ Introduction to phase transition in nanomaterials.

(3) Course Leaders: Jie Sun

12. 课程名称: 二维原子晶体材料与器件

(1) 课程编码: 3543031

(2) 课程简介: 《二维原子晶体材料与器件》是一门专业拓展课。本课程旨在使学生了解二维原子晶体材料与器件这一前沿领域, 并熟悉相关基础知识与基本理论, 激发学生科学研究兴趣。课程主要内容包括二维原子晶体材料; 二维原子晶体材料的种类和制备方法、结构和性质; 二维原子晶体材料光电器件的种类与工作原理; 二维原子晶体材料在光电探测、场效应晶体管、存储器件、逻辑电路和传感等电子原器件中的应用; 二维原子晶体材料的发展前景、问题与挑战。

(3) 课程负责人: 徐华

12. Course Name: Two-dimensional Atomic Crystal and Device

(1) Course Code: 3543031

(2) Brief Introduction of the Course: *Two-dimensional Atomic Crystal and Device* is one professional development courses. This course is intended to introduce the frontier field of two-dimensional atomic crystal materials and devices to students and acquaint them with relevant fundamental knowledge and basic theory, and excite their interest to scientific research. The course includes the foundation knowledge of two-dimensional atomic crystal materials; the classification, preparation, property and preparation of two-dimensional atomic crystal materials; classification and the principles of diverse two-dimensional atomic crystal optoelectronic devices, and the applications of two-dimensional atomic crystal optoelectronic materials in the devices, such as photodetector, field-effect transistors, memory, logical circuit, sensor; the prospect, problem and challenge of the two-dimensional atomic crystal materials.

(3) Course Leaders: Hua Xu

(四) 专业技能课程 (Professional Skills Courses)

1. 课程名称: 无机非金属材料制备与表征实验

(1) 课程编码: 3544013

(2) 课程简介: 材料制备与表征实验是材料化学专业的一门专业必修课程。主要通过高温固相反应、水热法和化学气相沉积法制备发光材料、陶瓷材料和纳米材料。通过扫描电镜、透射电镜、X射线衍射对所制备的材料进行结构表征,确定其微观结构和晶体结构,采用光刻技术制备出图案化结构 Au 纳米颗粒阵列。使学生掌握材料制备、微加工和结构表征的方法与原理,了解材料表征仪器的结构和使用方法。

(3) 课程负责人: 杨祖培

1. Course Name: Experiments in Preparation and Characterization of Inorganic Nonmetallic Materials

(1) Course Code: 3544013

(2) Brief Introduction of the Course: *Experiments in preparation and characterization of Inorganic Nonmetallic Materials* is a compulsory course for chemistry material majors. The aim of this course is to let the students master the method and principle of preparing and characterizing materials, and know the structure and operation method of instruments characterizing materials. The contents of this course is as follows: the materials (Luminescent materials, ceramics and Nano-materials) are prepared by methods such as high temperature solid-phase reaction, hydrothermal method and chemical vapor deposition; the materials are characterized by using techniques of scanning electron microscope, transmission electron microscope, and X-ray diffraction; pattern structure of Au Nano-particle arrays are prepared by the method of photolithography.

(3) Course Leaders: Zupei Yang

2. 课程名称: 高分子材料制备与表征实验

(1) 课程编码: 3544012

(2) 课程简介: 《高分子材料制备与表征实验》是材料化学专业的一门基础实验课程,对学生在高分子材料领域的研究和实践具有重要意义。学生通过本课程学习达到以下目标:掌握高分子材料的重要物理性质与重要高分子聚合物的制备过程;通过实验深化对基本理论和基础知识的理解和掌握;掌握高分子材料科学研究的基本知识和操作技能;初步树立严谨的科学态度;提升准确观察化学反应现象和处理实验数据的能力。

(3) 课程负责人: 邓字巍

2. Course Name: Experiments in Preparation and Characterization of Polymer Materials

(1) Course Code: 3544012

(2) Brief Introduction of the Course: *Experiments in Preparation and Characterization of Polymer Materials* is a fundamental experimental course for material chemistry major, holding significant importance for students' research and practice in the field of polymer materials. Through this course, students will achieve the following objectives: master the key physical properties of polymer materials and the preparation processes of important polymers; deepen their understanding of basic theories and foundational knowledge through experimental validation; acquire essential knowledge and operational skills for polymer materials science research; develop an initial rigorous scientific attitude; and enhance their abilities to accurately observe chemical reaction phenomena and process experimental data.

(3) Course Leaders: Ziwei Deng

3. 课程名称：功能材料综合实验

(1) 课程编码：3545001

(2) 课程简介：《功能材料综合实验》是材料科学与工程学院本科生的必修课。该实验是在微结构与物性专业基础实验、无机光电功能材料与性能及高分子光电功能材料与性能等专业实验基础上，开设的综合性实验。该课程是以组装器件为目标，实现涵盖从原料到功能器件组装的整个过程。学生通过压电器件组装及应用、超级电容器组装及应用、染料敏化太阳能电池组装及应用、燃料电池组装及应用等实验，亲历由原材料到器件功能化整个过程，不仅有利于学生从最基本原理出发理解和学习光电功能材料，而且能够有效提高学生专业学习积极性。

(3) 课程负责人：陈新兵

3. Course Name: Comprehensive Experiments in Functional Materials

(1) Course Code: 3545001

(2) Brief Introduction of the Course: *Comprehensive Experiments in Functional Materials* is a compulsory course for materials chemistry major. The experiments build on the foundational experiments in microstructure and physical properties, inorganic optoelectronic functional materials and properties, and polymer optoelectronic functional materials and properties. The experimental contents mainly focus on device assembly. Through these experiments, students can experience the whole process from raw materials to devices. The experiments include piezoelectric device assembly and application, super-capacitor assembly and application, dye-sensitized solar cell and fuel-cell assembly. These experiments are favorable for students not only to understand and learn optoelectronic functional materials from basic principles but also to effectively enhance their interest in professional learning.

(3) Course Leaders: Xinbing Chen

4. 课程名称：微结构与性能表征实验

(1) 课程编码：3544014

(2) 课程简介：《微结构与性能表征实验》是材料化学专业的一门专业必修课程。主要包括利用扫描电镜、透射电镜、X射线衍射、拉曼光谱和物理吸附仪等对纳米材料、介孔材料和陶瓷材料的组成、形貌、尺寸以及晶体结构进行表征分析，确定其微结构。同时，还开展纳米材料、介孔材料和陶瓷材料的光学性能、导电性能、磁学性能、铁电与压电性能等的测试实验。使学生掌握材料结构表征以及物理性能测试方法与原理，了解相关仪器的使用方法。

(3) 课程负责人：苟婧

4. Course Name: Experiments in Micro-structure and Properties of Materials

(1) Course Code: 3544014

(2) Brief Introduction of the Course: *Experiments in Micro-structure and Properties of Materials* is a compulsory course for chemistry material majors. The aim of this course is to let

the students know the principle and method of characterizing the structure and physical properties of materials, as well as the operation method of the related instruments. The composition, morphology, size and the structure of crystal are characterized using techniques of scanning electron microscope, transmission electron microscope, Raman spectrum and nitrogen physisorption, etc. The properties of materials (i.e., Nano-materials, mesoporous materials and ceramic materials) would be analyzed, for example, optical properties, conductivity, magnetism, ferroelectric and piezoelectric properties.

(3) Course Leaders: Jing Gou

5. 课程名称：材料化学专业实践

(1) 课程编码：3546008

(2) 课程简介：该课程由以下四部分组成。

(a) 科研实践项目（2 学分）：学生在学期间，须在导师指导下，申请并主持国家级、省级、校级大学生创新性项目、材料学子创新基金、勤助科研项目等。在项目支持下，进入导师的实验室进行科研训练并顺利完成项目者，可获得 2 个学分。参加国家级项目的前三人认定相同学分，非国家级项目前两人认定相同学分；

(b) 企业高管讲座（1 学分）：在学期间，学生参加不少于 5 次的企业高管讲座报告，报告结束后，撰写 500 字左右的讲座内容及心得体会；

(c) 毕业论文（设计）准备阶段（1 学分）：学生毕业论文（设计）的调研准备工作。

(3) 课程负责人：陈沛

5. Course Name: Professional practice

(1) Course Code: 3546008

(2) Brief Introduction of the Course: *Professional practice* consists of four parts, i.e. scientific research practice (2 credit), attending the lecture (1 credit), professional visits (1 credit) and preparing for the graduation thesis (1 credit). In scientific research practice, students should apply for innovative projects that can be the national, provincial, university and school-level. Supported by these projects, students who can successfully complete the project will receive 3 credits. The first three participants in state-level projects will be given the same credits, while the first two participants in non-state-level projects get the same credits.

(3) Course Leaders: Pei Chen

6. 课程名称：研究方法 with 学术论文写作

(1) 课程编码：3541006

(2) 课程简介：《研究方法 with 学术论文写作》指导是本科生的一门必修课。通过该课程学习，使学生较全面地了解科学研究的一般方法以及提高运用这些方法能力的途径。掌握多种形式学术论文的一般写作规范，提高学生学术论文写作能力，为将来撰写不同形式学术论文打下一定的基础，以适应研究型人才培养需求。为达到此目的，该课程将主要涉及两个方面的内容：一是研究方法：主要包括科学方法论、近代科学研究方法特点、复杂性科学研究方法论纲和典型科学研究方法解析等内容。二是学术论文写作：主要包括学术论文的一般形式和特点、学术论文各部分的写作要求与写作方法和开题报告与答辩报告的一般要求等内容。

(3) 课程负责人：胡道道

6. Course Name: Research Approach and Academic Dissertation Writing

(1) Course Code: 3541006

(2) Brief Introduction of the Course: *Research Approach and Academic Dissertation Writing* is a compulsory course for chemistry material majors. One aim of this course is to let the students know the methods of research as well as improve their ability in applying those methods. The other aim is to let the student master the writing standard of scientific paper, improving the writing ability of students. To meet the needs above, the contents of this course are divided into

two sections. One section concerns with research method, including scientific methodology, the outline of complex scientific methodology, as well as the analysis of representative scientific methodology. The other section is related to composition of scientific paper, containing the form and characteristic of scientific paper, the writing requirement and the method of scientific paper, as well as the standard of opening and replying report.

(3)Course Leaders:Daodao Hu

7. 课程名称：材料化学专业英语

(1) 课程编码：3541026

(2) 课程简介：《材料化学专业英语》内容主要包括无机、有机、分析、物化及材料化学与物理等专业词汇，元素的英文名及符号，常用玻璃器皿、常见聚合物材料的缩写，常用化学分子式、方程式及数学式的读法，化学常用词头及词尾的含义，化学上常见的缩略语，各种专业参考书、文献中的表述方法等。

(3) 课程负责人：石峰

7. Course Name: Specialized English of Materials Chemistry

(1) Course Code: 3541026

(2) Brief Introduction of the Course: *Specialized English of Materials Chemistry* includes vocabularies and abbreviations of elements, compounds, polymers, and glassware in inorganic, organic, analytic, physical chemistry, and fundamental words in physics, along with their pronunciation. The course also explains the prefixes and suffixes of chemical compounds and common expressions in references and literatures.

(3)Course Leaders:Feng Shi

(五) 实践教学模块 (Practice Work)

1. 课程名称：专业见习与实习

(1) 课程编码：3550032

(2) 课程简介：《专业见习与实习》课程是根据本专业特点，在功能材料生产企业或研究机构进行参观与实践的教学活动。通过为期3到4个周的参观与实践，旨在让学生了解企业生产与管理机制、产品开发与市场对接、规模化生产的实际情况，以及专业知识与生产实践之间关系等，为毕业后从事相关工作奠定基础。

(3) 课程负责人：陈沛

1. Course Name: Professional Visits and Practice

(1) Course Code: 3550032

(2) Brief Introduction of the Course: *Professional Visits and Practice* is a practice course in enterprises and institutes which is engaged in functional material production and investigation. Students should undertake 3-4 weeks of this professional practice. The aim of this course is to make students understand production process and management, exploitation of products, large-scale production, and relation between knowledge and practice in enterprises, thus laying a foundation for their future careers in related fields.

(3)Course Leaders:Pei Chen

2. 课程名称：专业实践与社会调查

(1) 课程编码：3550021

(2) 课程简介：《专业实践与社会调查》是学生学习实践的一个很重要环节，通过专业实践，使学生受到一次系统而深刻的专业思想教育，每位学生在做好专业实践的同时，结合专业实践的实际，有目的地进行一些专题调查，写出有一定水平的调研报告，增强其从事本职工作的责任心，提高学生综合运用所学专业知识和理论知识及基本技能的水平，培养其从事相关工作的能力。

(3) 课程负责人：陈沛

2. Course Name: Professional Practice and Social Survey

(1) Course Code: 3550021

(2) Brief Introduction of the Course: *Professional Practice and Social Survey (PPSS)* is the most important integral part of learning practices, and students can get a systematic and profound specialized ideological education. Each student makes a destination for some special investigation combining with the actual professional practice, and writes a certain level of research report, which can enhance their work sense of responsibility and improve the students to use their professional knowledge, basic skill level and cultivate working ability.

(3) Course Leaders: Pei Chen

3. 课程名称：毕业论文（设计）

(1) 课程编码：3550033

(2) 课程简介：《毕业论文》是获得学士学位的必要条件，要求学生在老师的指导下发现或提出科学问题，进行文献资料检索，阅读文献，写出开题报告，设计针对所研究问题的实验方案，并在指定的时间内完成实验、数据采集和统计分析工作，在此基础上写出学位论文，最后通过院系组织的答辩委员会的论文答辩。通过毕业论文培养学生应用所学的专业知识和技能解决实际问题、综合应用知识和各种工具的能力以及文字及学术表达、团队协作、学术表达以及创新能力。

(3) 课程负责人：陈沛

3. Course Name: Graduation Thesis (Design)

(1) Course Code: 3550033

(2) Brief Introduction of the Course: *Graduation Thesis (Design)* is the important practical process of cultivating students' comprehensive quality and practical ability. This will greatly help to cultivate the students' ability to solve practical problems, the comprehensive ability of applying knowledge and various tools, writing ability, communication ability, team cooperation ability and spirit of innovation. For about half a year, the students need to carry out research problem choosing, thesis proposal writing, researching, thesis writing and thesis defense.

(3) Course Leaders: Pei Chen

4. 课程名称：科研训练

(1) 课程编码：3550022

(2) 课程简介：科研方法训练是材料科学与工程学院在本科生培养计划中设立的必修实践环节，体现在学生从入学到毕业的各个阶段和各个环节中，其中本门课程重点包括以下几个方面：(a) 通过专业综合性、设计性、创新性实验有目的地培养学生自己设计实验和动手能力。(b) 通过野外实习、专业实习和生产实践培养学生理论联系实践和解决实际问题的能力；(c) 通过参加每周的学术报告和讨论会等学术活动培养学生科学素养；(d) 通过主持或参与国家级、校级和院系级的各种科研项目开展科研实践。通过四年的学习和科研训练，能够在老师的指导下设计课题，完成实验，并写出具有一定质量的学术论文；学生在毕业时将具有一定创新意识 and 创新能力、有一定参与实验和实践的能力以及分析问题和解决问题的能力，为今后独立开展科学研究打下基础。

(3) 课程负责人：陈沛

4. Course Name: Scientific Research Training

(1) Course Code: 3550022

(2) Brief Introduction of the Course: *Scientific Research Training* is established in the School of Material Sciences and Engineering in the undergraduate program of compulsory practice, reflected in all stages of students from admission to graduation and a variety of links. This course covers the following aspects: (a) to train students abilities by designing integrated and innovative experiments; (b) to solve practical problems by fieldwork, professional practice and practice of cultivating student link theory with practice and ability; (c) to develop students scientific literacy by participating in academic symposiums and weekly seminars and other

academic activities, and (d) hosting or participating national, school or department-level scientific research and development projects. Through four years of study and research training, subject to design under the guidance of the teacher, finished the experiment, write with a certain quality of academic papers and students at graduation will have a sense of innovation and innovation ability, must participate in the experiment and practice of ability and the ability to analyze and solve problems, lay the foundation for future scientific research independently.

(3)Course Leaders:Pei Chen

材料化学专业修读指南

一、指导性教学计划

第一学期			第二学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711031	思想道德与法治	3	0211012	大学语文	2
1211044	计算机基础（理工科）	2	1211056	Python 语言程序设计	3
0411061	大学外语（一）	2	0411062	大学外语（二）	2
1011039	大学体育（一）	1	1011040	大学体育（二）	1
0521005	高等数学（二）—1（理）	4	0521006	高等数学（二）—2（理）	4
3522047	无机化学	4	3521005	基础物理 I 及实验	3.5
3522029	实验室安全与规范	0.5	3850004	大学生职业生涯规划	0.5
3522030	材料科学与工程专业导引	0.5	3522048	有机化学	4
2011002	国家安全教育	1	2650102	军事理论与训练	2
1711022	中国近现代史纲要	3	1711033	马克思主义基本原理	3
3544015	无机化学实验	2	3544016	有机化学实验	2
3950001	大学生心理健康	2			
合计	必修 25 学分		合计	必修 27.5 学分	
(1) “形势与政策”为通识教育必修课，第 1-7 学期上课，共 2 学分。			(1) 在第 2-6 学期中，须修读通识教育选修课 12 学分，每学期最多选修 2 门课程。		
第三学期			第四学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711034	毛泽东思想和中国特色社会主义理论体系概论	3	1711035	习近平新时代中国特色社会主义思想概论	3
0411063	大学外语（三）	2	0411064	大学外语（四）	2
1011041	大学体育（三）	1	1011042	大学体育（四）	1
1611045	创新创业理论与实践	1	3541036	结构化学	3
3521002	线性代数与概率	3	3542070	高分子化学与物理	3
3544017	物理化学实验（含结构）	2	3542066	无机材料合成方法	2
3522049	物理化学	4			
合计	必修 16 学分		合计	必修 14 学分	
			(1) 本学期进行大学英语四级口语测试。		
第五学期			第六学期		
课程号	课程名称	学分	课程号	课程名称	学分
3522054	材料科学基础	4	3542068	功能材料	3
3544014	微结构与性能表征实验	1.5	3542067	材料物理性能学	2.5

3544018	材料谱学分析实验	1.5	3544013	无机非金属材料制备与表征实验	2
3541033	材料表征技术	4	3545001	功能材料综合实验	2
3544012	高分子材料制备与表征实验	1.5	3850005	大学生求职指导与职场适应	0.5
			3550022	科研训练	1
专业方向课程			专业方向课程		
3542054	液晶材料	1.5	3542051	纳米材料学	1.5
3542057	文物保护材料	1.5	3542071	新能源材料	1.5
3542072	新能源电化学基础	1.5	3542055	功能高分子多孔材料	1.5
			3542058	现代表征技术与科技考古	1.5
			3542069	基础固体物理	1.5
专业拓展课程			专业拓展课程		
3543041	有机光电材料与器件导论	1.5	3543031	二维原子晶体材料与器件	1.5
3543052	光催化材料与技术	1.5	3543057	材料科学前沿进展	1.5
3543035	胶体化学与界面	1.5	3543036	材料的力学性能	1.5
3543040	传感材料与技术	1.5	3543037	材料的相变原理	1.5
3543056	现代物理专题	1.5			
3543055	现代化学专题	1.5			
3543054	科学教育经典文献选读	1.5			
3543032	稀土发光材料	1.5			
合计	必修 12.5 学分，专业方向课程 4.5 学分，专业拓展课程 12 学分		合计	必修 11.5 学分，专业方向课程 7.5 学分，专业拓展课程 6 学分	
			(1) 到本学期末应完成通识教育选修课 12 学分的修读。		
第七学期			第八学期		
课程号	课程名称	学分	课程号	课程名称	学分
3546008	材料化学专业实践	4	3550033	毕业论文（设计）	4
3550032	专业见习与实习	4			
3541006	研究方法与学术论文写作	1			
3541026	材料化学专业英语	1			
专业方向课程					
3542059	档案保护与修复技术	1.5			
3542056	仿生材料学	1.5			
3542076	光伏材料与太阳能电池	2			
合计	必修 10 学分，专业方向课程 3 学分，专业拓展课程 3 学分		合计	必修 4 学分	
(1) 到本学期末应完成专业方向课程 18.5 学分和专业拓展课程 6 学分的修读。			(1) 完成毕业论文（学校会对毕业论文进行查重、盲审和答辩，一般安排在第 10-14 教学周）； (2) 本学期止，总学分应不得少于 152 学分； (3) 本学期第 17 教学周开始办理离校手续。		

二、修读指导和说明

1. 总学分说明

材料化学专业毕业前须修读至少 152 学分，必修课学分为 116；选修课学分为 36；其中，通识教育课程必修学分为 38，选修学分 12；专业课程必修学分为 31.5，选修课程学分

为 24；实践教学必修学分为 19。

2. 本专业设置了常规培养型、科学研究培养路径，达到毕业要求即可毕业。

3. 部分专业课程修读说明：

与专业课程相关的课程分为：学科基础模块、专业课程模块、专业技能模块及实践模块。每个模块是由具有特定共同内涵的多门课程组成的课程群组成。

(1) 专业基础模块：主要由相关学科基础课和本学科基础课组成。主要涉及数学、物理、化学、材料科学基础、材料科学与工程专业引导等课程。数理基础与化学基础是材料化学专业的基础，这些课程均为本专业的必修课程。

(2) 专业课程模块：分为专业核心课程、专业方向课程、专业拓展课程等三部分。

专业核心课程：主要涉及功能材料设计合成、性能及测试技术等课程，这些课程均为本专业的必修课。

专业方向课程：专业方向课程是按特定学科范畴组成的课程群，每个方向具有较高的关联度。这些课程均为选修课。期望通过关联度较高的选修课程学习，有利于形成具有特点的知识体系。该专业方向课程由 3 个方向组成，分别为光电功能材料、液晶与高分子及文物保护材料。建议按专业方向课程集中选课。每个方向的课程均在第五，六、七学期开课，故建议按学期在特定方向选课，三个学期最少修满 18 学分。

专业拓展课程：是为拓展学生知识视野组织的专业选修课程体系。本专业的拓展课程由 3 个系列组成，分别是光电材料、有机无机复合材料及电工电子元器件。材料化学专业学生必须在拓展课程中最少修满 6 学分。这些课程主要分布在第五，六、七学期，请根据自己情况斟酌选课。

(3) 专业技能模块：主要由专业技能相关的实验课程、专业英语、研究方法与学术论文写作等课程组成。这些课程均为必修课。主要培养动手能力、专业文献阅读能力、科研方法及论文写作能力。

(4) 专业课程考核方式说明

必修课程考核方式为多元化过程性评价，结合学生考勤（10%）、课堂表现（10%）、平时作业（10%）及期末考试（70%），给出最终成绩。

选修课程及实验课程考核方式以平时成绩及期末考查相结合综合评分。

4. 通识教育选修课修读说明

通识教育选修课分为人文社会科学、自然科学与技术、艺术与美育、生命与健康、教师教育 5 个系列。学生在校期间（建议第 2-6 学期）必须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

5. 国际交流预备课程修读说明

拟参加出国出境交换交流学习，并需要与我校进行学分互认项目的学生须修读 2 学分“国际交流预备课程”。项目包括交换学生项目、双学位联合培养项目、访学项目、暑期短期交流项目及其他需要进行学分互认的项目。具体规定见《国际交流预备课程学分认定细则》（师教〔2017〕3 号）。

6. 本科生国际暑期学校修读说明

国际暑期学校课程是国际交流预备课程的重要组成部分，修读国际暑期学校课程所得学分计入通识教育选修课中的国际交流预备课程学分。

每年暑假期间（第1-2周），学校邀请海外知名大学外籍教师为我校全校本科生开设通识类全英语课程（6次讲座，3次沙龙），为同学们创造与外籍教师面对面交流互动的平台。

同学们可在每个春季学期关注国际暑期学校相关动态，并在指定时间内在教务系统中进行选课。

7. 实践模块修读说明

（1）必读书目阅读：根据《陕西师范大学关于全面提高本科教学质量的实施意见》文件要求，本科生在校期间本科生大学四年期间须阅读不少于5大类共48本的课外书籍，建议每个月阅读课外书籍至少1本，达到阅读数量与质量要求的学生，共需提交10篇读书笔记，方可毕业。

（2）专业见习与实习：专业见习从第1学期至第6学期均可进行，形式为统一组织去相关企业、科研机构参观、学习，或邀请校外企业机构负责人、专家来校讲座；专业实习一般不少于8周，安排在第7或第8学期，一般为集中实习，学院统一组织学生前往企业或科研机构进行专业实习，并于实习结束后形成实习报告、成果。专业见习与实习合计4学分。

（3）专业实践与社会调查：《专业实践与社会调查》为学生结合实习、实践过程，有目的地进行一些专题调查，写出有一定水平的调研报告。学院根据专业特点和课程需要，组织学生利用课外时间开展专业实践与社会调查，结合专业相关知识，形成与专业领域相关的成果，每个学生至少完成2篇专业实践与社会调查报告，经学院考核合格，计1学分。

（4）毕业论文（设计）：参照《材料科学与工程学院毕业设计（论文）工作实施细则（试行）》执行。

新能源材料与器件专业简介

Introduction to the Specialty of New Energy Materials & Devices

新能源材料与器件专业，学制 4 年，专业属性为非师范专业。该专业于 2017 年开始招生，对标国家“碳达峰，碳中和”战略目标，以新型能源的转化和存储过程中涉及的材料制备原理、表征方法、器件构筑和性能评估等方面的专业知识和实践技能为主要培养内容，拟通过 5—10 年的努力，建成在太阳能电池、电化学储能材料与器件和催化与燃料电池等领域具有一定影响力的品牌专业。

本专业培养在新能源、新材料、新能源汽车、节能环保、高端装备制造等国家战略性新兴产业领域内，从事科学研究、技术开发、工艺和器件设计及相关管理工作的理工兼备的拔尖创新人才。毕业生可在化学能源、太阳能电池材料等领域从事科学研究与教学、技术开发、工艺设计等方面工作，也可以在能源、电力、通讯、汽车、航天、医疗等领域从事新能源材料和器件的设计、开发、生产和管理工作。同时，毕业生还可选择继续攻读能源、材料、物理、化学等相关学科的高层次专业学位。

The new energy materials and devices with a four-year schedule is a non-normal specialty. This major, which in line with the national strategic goal of "carbon peaking and carbon neutrality", mainly cultivates professional knowledge and practical skills in material preparation principles, characterization methods, device construction, and performance evaluation involved in the conversion and storage of new energy, was approved for enrollment in 2017. We plan to build a brand professional with certain influence in the fields of solar cells, electrochemical energy storage materials and devices, and catalysis and fuel cells through 5-10 years of effort.

This major cultivates composite senior professionals who engage in scientific research, technological development, process and device design and related management work in national strategic emerging industries such as new energy, new materials, new energy vehicles, energy conservation and environmental protection, and high-end equipment manufacturing. Graduates can be engaged in scientific research and teaching, technology development, process design in the fields of chemical energy, solar cell materials. They can also be engaged in the design, development, production and management of new energy materials and devices in the fields of energy, electricity, communication, automobile, aerospace, medical care, etc. At the same time, graduates can also choose to continue pursuing high-level professional degrees in related disciplines such as energy, materials, physics and chemistry.

新能源材料与器件专业培养方案

Training Program of the Specialty of New Energy Materials and Devices

一、培养目标

I. Educational Objectives

本专业立足国家“碳达峰，碳中和”战略和新能源产业发展规划，培养德智体美劳全面发展，身心健康，系统掌握新能源材料与器件的设计方法、工艺开发、性能测试等方面的专业知识和实践技能，能够综合运用所学知识解决与新能源材料制备、器件组装和性能优化应用等方面的相关复杂问题，具有一定科学基础研究、应用基础研究及科技管理的综合能力，同时兼具优良的人文素养、社会责任感、团队合作精神和国际化视野，能够在企业、科研机构、高校及事业单位胜任相关的科学研究、工程开发及管理等方面工作并引领未来的拔尖创新人才。

This specialty is based on the national "carbon peaking and carbon neutrality" strategy and development plan of the new energy industry, cultivating compound senior specialized talents with comprehensive development of morality, intelligence, physical fitness, aesthetics and labor, combined with physical and mental health. Graduates are also required to be able to comprehensively apply their knowledge to solve complex problems related to new energy material preparation, device assembly, and performance optimization applications. Moreover, they are also asked to have comprehensive abilities in scientific and applied basic research, technological management, as well as excellent humanistic literacy, social responsibility, teamwork spirit and international perspective, capable of future leading works in enterprises, research institutions, universities, and public institutions in related scientific research, engineering development and management.

二、毕业要求

II. Graduation Requirements

本专业学生在修读年限 4-6 年内，修满教学计划规定的学分，并达到以下基本要求后，方可毕业：

毕业要求 1. 品德修养：爱党爱国爱人民，学习贯彻马克思列宁主义、毛泽东思想、邓小平理论、“三个代表”重要思想、科学发展观和习近平新时代中国特色社会主义思想，认同和拥护中国特色社会主义，自觉践行社会主义核心价值观，具有正确的世界观、人生观、价值观以及良好的道德品质。

毕业要求 2. 工程知识：能够将数学、化学、物理学、材料科学、计算机、工程基础和新能源材料与器件的专业知识用于解决复杂工程问题。

2.1 掌握数学与化学、物理学、材料学的基础知识，能对新能源材料与器件领域内的工程问题进行模型建立、正确性分析和论证、求解以及结果的讨论和分析；

2.2 具有对新能源材料与器件相关问题进行表征、分析的物理、化学和材料学知识；

2.3 具有解决新能源材料与器件相关问题的基础和专业知识；

2.4 掌握新能源材料与器件基础工程知识，能将其用于分析、解决新能源材料与器件领域内相关的工程问题。

毕业要求 3. 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新能源材料与器件相关问题，并获得有效结论。

3.1 能够运用新能源材料与器件的相关基本理论，识别和表达新能源材料和器件的相关科学问题；

3.2 掌握新能源材料与器件专业重要文献的来源并具备熟练获取文献的能力；

3.3 能够通过调查和研究,分析新能源材料和器件的相关复杂科学和工程问题并获得有效结论。

毕业要求 4. 设计/开发解决方案:具有追求创新的态度和意识,掌握基本的科学创新方法,具有综合运用理论和技术手段设计新能源材料与组装相关器件的能力,并在上述过程中能够综合考虑经济、环境、法律、安全、健康、伦理等制约因素。

4.1 了解新能源材料与器件相关技术发展历史中的重大技术突破及其带来的影响;

4.2 掌握基本的科学创新原理和方法,具有追求创新的态度和意识;

4.3 具有综合运用理论和技术手段设计新能源材料与器件的能力,设计过程中能够综合考虑经济、环境、法律、安全、健康、伦理等制约因素。

毕业要求 5. 研究:掌握新能源材料与器件的基础理论,具备新能源材料与器件的设计开发、制备组装和检测表征的能力,能基于基本科学原理,采用科学方法对新能源材料与器件领域的复杂工程问题开展研究,包括设计与开展实验、分析与整理数据,并能够通过汇总相关信息获得合理有效的结论。

5.1 掌握新能源材料与器件的特性和与之相关的各类物理现象和规律,具有应用材料、物理、化学、电工电子学等基础知识进行设计和实施实验的能力,并能够对实验结果进行分析处理;

5.2 熟悉光/电转换器件、电化学储能器件、光电化学器件等新能源器件的工作原理,具备对器件各模块特征参数和运行参数进行测量和调试的能力,并能够对测试结果进行分析;

5.3 熟悉各类材料表征、器件性能分析等仪器设备的工作原理、技术参数和适用范围,具备对新能源材料与器件的控制参数、状态参数和工艺结果进行测量和测试的能力,并能够对实验结果进行分析。

毕业要求 6. 使用现代工具:能够针对复杂的新能源材料与器件相关问题,选择和使用恰当的技术、资源和信息技术工具,对问题进行预测和模拟,并能够理解其局限性。

6.1 能够选择合适的电工电子、计算机专业软件和网络信息等技术和工具,解决新能源材料和器件制备组装过程中面临的复杂工程问题;

6.2 具备运用新能源材料制备、表征和器件组装及测试技术,开展新材料与能源器件测试和分析的能力。

毕业要求 7. 工程与社会:能够基于新能源材料与器件的相关背景知识进行分析,评价领域内复杂工程问题的解决方案对社会、健康、安全、法律以及文化等方面的影响,并理解应承担的责任。

7.1 了解新能源材料与器件领域内的相关技术标准、知识产权、产业政策以及法律法规;

7.2 能够基于新能源材料与器件的相关专业知识,分析评价相关新产品、新技术、新工艺、新材料的开发和应用对社会、健康、安全、法律以及文化影响。

毕业要求 8. 环境和可持续发展:能够理解和评价新能源材料与器件制造过程、装备运行对环境、社会可持续发展的影响。

8.1 能够准确评价新能源材料与器件领域复杂工程问题的实践对环境和社会可持续发展的影响;

8.2 能够理解环境保护和社会可持续发展的内涵和意义,理解环境保护的相关法规,树立正确的新能源材料与器件产业发展与环境保护之间关系的认知。

毕业要求 9. 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。

9.1 具有正确的人生观和价值观,良好的人文社会科学素养,科学精神和社会责任感;

9.2 在工程实践过程中,能够遵守相关法律法规和职业道德规范,认真履行岗位职责。

毕业要求 10. 个人与团队：能够在多个交叉学科背景下组成的团队中承担个体、团队成员以及负责人的角色。

10.1 理解新能源材料与器件专业具有广泛的多学科融合特性以及合作的必要性；

10.2 能够充分认识团队合作分工的意义和价值，具有一定的人际交往和在团队中发挥作用的能力。

毕业要求 11. 沟通：能够就新能源材料与器件领域的复杂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。同时，需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。

11.1 了解新能源材料与器件相关领域的国内外的研究发展现状，对相关复杂工程问题具备较强的沟通和表达能力，能够结合复杂工程问题撰写报告、设计文稿、清晰陈述观点和回答问题；

11.2 至少掌握一门外语，具有较强的听、说、读、写、译能力和专业外语应用能力，了解不同文化背景的差异，具有一定的国际视野和跨文化交流能力。

毕业要求 12. 项目管理：理解并掌握工程项目管理的原理与经济决策方法，并能在多学科环境中熟练应用。

12.1 理解工程项目管理基本原理和流程，并能将其应用于新能源材料与器件专业的相关多学科交叉项目中；

12.2 理解并掌握工程经济决策方法，并能在能源、材料、化学和物理等多学科环境中应用。

毕业要求 13. 终身学习：具有自主学习和终身学习的意识，能够适应社会需求变化，根据自身条件主动适应，并在实践中持续提高自己的能力。

13.1 对于自我发展和终身学习的必要性、重要性有正确的认识；

13.2 对新能源材料与器件领域的技术现状和发展趋势具有明确认知，具有不断学习和适应行业发展的能力。

Within a period of 4-6 years to obtain all the credits in the teaching scheme, students of this specialty also need to meet the following basic requirements:

1. Moral Cultivation: Love the Communist Party of China, love the motherland, love the people, love socialism, study and implement the Marxism-Leninism, the MAO Zedong Thought, Deng Xiaoping Theory and the Important Thought of "Three Represents", Scientific Outlook on Development and Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, recognize and support socialism with Chinese characteristics, consciously practice socialist core values, have correct viewpoint on the world, life and values as well as good moral character.

2. Engineering Knowledge: Ability to apply knowledge in mathematics, chemistry, physics, materials science, computer science, engineering fundamentals, and new energy materials and devices to solve complex engineering problems.

2.1 Mastery of foundational knowledge in mathematics, chemistry, physics, and materials science, capable of establishing models, conducting correctness analysis, and providing justification for solving engineering problems within the field of new energy materials and devices.

2.2 Possession of knowledge in physics, chemistry, and materials science for characterization and analysis of issues related to new energy materials and devices.

2.3 Proficiency in foundational and specialized knowledge for addressing problems related to new energy materials and devices.

2.4 Mastery of foundational engineering knowledge in new energy materials and devices, capable of analyzing and solving engineering problems within the relevant field.

3. Problem Analysis: Ability to apply basic principles of mathematics, natural sciences, and engineering science to identify, express, and analyze issues related to new energy materials and devices through literature research, leading to effective conclusions.

3.1 Application of fundamental theories related to new energy materials and devices, identifying, and expressing scientific problems associated with these materials and devices.

3.2 Familiarity with sources of important literature in new energy materials and devices and proficiency in literature retrieval.

3.3 Analysis of complex scientific and engineering issues related to new energy materials and devices through investigation and research, resulting in effective conclusions.

4. Design/Development of Solutions: Possession of an innovative attitude, awareness, and the ability to apply basic scientific innovation methods. Proficient in using theoretical and technical means to design new energy materials and assemble related devices, considering economic, environmental, legal, safety, health, ethical, and other constraining factors.

4.1 Understanding major technological breakthroughs in the history of new energy materials and devices.

4.2 Mastery of basic principles and methods of scientific innovation, with a proactive attitude toward innovation.

4.3 Proficiency in designing new energy materials and devices, considering constraints such as economic, environmental, legal, safety, health, and ethics.

5. Research: Mastery of the fundamental theory of new energy materials and devices, with the ability to design, develop, prepare, assemble, and characterize these materials and devices. Capable of conducting research on complex engineering problems in the field based on basic scientific principles, employing scientific methods, including experimental design, data analysis, and summarization of relevant information to draw rational and effective conclusions.

5.1 Mastery of the characteristics of new energy materials and devices, understanding various physical phenomena and laws related to these materials.

5.2 Familiarity with the working principles of new energy devices, such as photovoltaic converters, electrochemical energy storage devices, and photoelectrochemical devices. Ability to measure and debug device parameters and analyze test results.

5.3 Familiarity with the working principles, technical parameters, and applicable scope of various characterization instruments and equipment. Ability to measure and test control parameters, state parameters, and process results for new energy materials and devices, and analyze experimental results.

6. Use of Modern Tools: Ability to select and use appropriate technical, resource, and information technology tools to predict and simulate complex problems related to new energy materials and devices, understanding their limitations.

6.1 Ability to choose suitable electrical and electronic, computer software, and network information technologies to solve complex engineering problems in the preparation and assembly process of new energy materials and devices.

6.2 Proficiency in using new energy material preparation, characterization, device assembly, and testing technologies, and conducting testing and analysis of new materials and energy devices.

7. Engineering and Society: Ability to analyze the solutions to complex engineering problems in the context of new energy materials and devices, evaluating their impact on society, health, safety, law, and culture, and understanding the responsibilities involved.

7.1 Understanding relevant technical standards, intellectual property rights, industrial policies, and laws and regulations in the field of new energy materials and devices.

7.2 Ability to analyze and evaluate the impact of the development and application of new products, technologies, processes, and materials in the field of new energy materials and devices on society, health, safety, law, and culture, based on relevant professional knowledge.

8. Environment and Sustainable Development: Ability to understand and evaluate the impact of the manufacturing process and equipment operation of new energy materials and devices on the environment and social sustainable development.

8.1 Accurate assessment of the practical impact of complex engineering problems in the field of new energy materials and devices on environmental and social sustainable development.

8.2 Understanding the content and significance of environmental protection and social sustainable development, awareness of relevant regulations on environmental protection, and establishing a correct understanding of the relationship between the development of new energy materials and devices and environmental protection.

9. Professional Ethics: Possession of humanistic and social science literacy, social responsibility, and the ability to understand and adhere to engineering professional ethics and standards in practice.

9.1 Possession of correct life and value views, good humanistic and social science literacy, scientific spirit, and social responsibility.

9.2 Compliance with relevant laws and regulations and professional ethical standards in engineering practice, conscientiously fulfilling job responsibilities.

10. Individual and Team: Ability to assume roles as an individual, team member, and leader in teams composed of multiple interdisciplinary backgrounds.

10.1 Understanding the extensive interdisciplinary nature and necessity of cooperation in the field of new energy materials and devices.

10.2 Recognizing the significance and value of teamwork in collaborative work, possessing interpersonal communication skills, and the ability to contribute effectively within a team.

11. Communication: Ability to effectively communicate and interact with peers and the general public on complex issues related to new energy materials and devices. This includes writing reports, designing documents, presenting speeches, expressing ideas clearly, and responding to instructions. Additionally, possessing an international perspective and the ability to communicate in cross-cultural contexts.

11.1 Understanding the current domestic and international research and development status in the field of new energy materials and devices, with strong communication and expressive capabilities regarding complex engineering problems. Able to write reports, design documents, clearly articulate viewpoints, and answer questions related to complex engineering problems.

11.2 Proficiency in at least one foreign language, with strong listening, speaking, reading, writing, translating abilities, and practical application skills in professional foreign languages. Awareness of cultural differences and possessing an international perspective and cross-cultural communication skills.

12. Project Management: Understanding and mastery of the principles of engineering project management and economic decision-making methods, with the ability to proficiently apply them in interdisciplinary projects related to new energy materials and devices.

12.1 Understanding the basic principles and processes of engineering project management and their application in interdisciplinary projects related to new energy materials and devices.

12.2 Understanding and mastering engineering economic decision-making methods, applying them in interdisciplinary environments related to energy, materials, chemistry, and physics.

13. Lifelong Learning: Awareness and capability of independent and lifelong learning, adaptability to changes in societal demands, proactive adjustment based on personal conditions, and continuous improvement of one's abilities through practical experience.

13.1 Correct understanding of the necessity and importance of self-development and lifelong learning.

13.2 Having a clear awareness of the current technological status and development trends in the field of new energy materials and devices, with the ability to continuously learn and adapt to industry development trends.

三、主干学科

III. Core Disciplines

化学、物理学、材料科学与工程

Chemistry、Physics、Materials Science and Engineering

四、主干课程

IV. Main Courses

高等数学、基础物理、无机化学、有机化学、物理化学、材料科学基础、材料表征技术、材料物理性能学、半导体物理与器件、能源存储材料与器件、能源转换材料与器件等。

Advanced Mathematics, College Physics, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Fundamentals of Materials Science, Materials Characterization Technique, Physical Properties of Materials, Semiconductor Physics and Devices, Energy Storage Materials and Devices, Energy Conversion Materials and Devices.

五、学制及授予学位

V. Schooling System & Degree Granting

学制 4 年

Four years

工学学士

Bachelor of Engineering

六、学分要求

VI. Total Credits

155 学分

155 Credits

七、课程设置及学分比例

VII. Course Settings and Percentage of Credits

课 程 类 别 Course Catalogue		学分及比例 Credits and Percentage			
		学 分 Cre.	小 计 Sub-Total	占总学分比例 Percentage in Total Credits	小 计 Sub-Total
通识教育模块 Liberal Studies Courses	通识教育必修课 Liberal Studies Compulsory Courses	38	50	24.52%	32.26%
	通识教育选修课 Liberal Studies Elective Courses	12		7.74%	
学科基础模块 Disciplinary Foundation Courses	相关学科基础课 Related Disciplinary Foundation Courses	17	27	10.97%	17.42%
	本学科基础课 Disciplinary Foundation Courses	10		6.45%	
专业课程模块 Specialized Courses	专业核心课程 Specialized Core Courses	18	46.5	11.61%	30.00%
	专业方向课程 Specialized Orientation Courses	23		14.84%	
	专业拓展课程 Specialized Development Courses	5.5		3.55%	
专业技能模块 Professional Skills Courses	必修课 Compulsory Courses	12.5	12.5	8.06%	8.06%
	选修课 Elective Courses	0		0	
实践教学模块 Practice Work	必修课 Compulsory Courses	19	19	12.26%	12.26%

合计 Total		155	100%
说明 Notes	1. 专业必修课（包括专业核心课程和学科基础课程）共 13 门。 2. 专业选修课共 42 门，其中专业方向课程 29 门，分 2 个方向；专业拓展课程 12 门。学生应从专业方向课程中至少选修 23 学分，从专业拓展课程中至少选修 5.5 学分。 3. 实验课程共 7 门，其中独立开设的实验课 6 门，既有理论又有实验的课程 1 门，含综合性、设计性实验的课程 3 门，占实验课程总数的 50.0%。 4. 本专业实践教学内容包括实践教学模块和其他课程模块中的实践教学内容，实践教学环节学分占总学分的比例为 29.35%。 1. There are 11 specialized compulsory courses. 2. There are 42 specialized elective courses in total including 33 specialized orientation courses divided into 2 dimensions and 12 specialized development courses. Undergraduates should obtain 23 credits in total by taking specialized orientation courses and 5.5 credits by taking specialized development courses. 3. There are 7 experimental courses in total including 6 independent experimental courses, 1 course combines theories and experiment. There are 3 designable experimental courses which is 50.0% of the total experimental courses. 4. Practice work includes the courses of the specific module of practice work and those practice work within the courses of other modules, taking up 29.35%/32.93% of the total credits/teaching hours.		

八、新能源材料与器件专业本科教学计划表

VIII. Teaching Scheme for (New Energy Materials and Devices) Undergraduate Candidates

(一) 通识教育模块 (50 学分)

(I) Liberal Studies Courses (50 credits)

1. 通识教育必修课 (38 学分)

1. Liberal Studies Compulsory Courses (38 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
1711031	思想道德与法治 The Ideological and Moral Cultivation and the Rule of Law	1	3	63	45	18	3	考试 Exam.	马院	
1711022	中国近现代史纲要 Outline of Modern and Contemporary Chinese History	1	3	63	45	18	3	考试 Exam.		
1711033	马克思主义基本原理 Principles of Marxism	2	3	63	45	18	3	考试 Exam.		
1711034	毛泽东思想和中国特色社会主义理论体系概论 Mao Zedong Thoughts and Theory of the Socialism with Chinese Characteristics	3	3	63	45	18	3	考试 Exam.		
1711035	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	4	3	63	45	18	3	考试 Exam.		
1711005- 1711011	形势与政策 1-7 The Current Situation and Policy (1-7)	1-7	2					考查 Quiz		
0211012	大学语文 College Chinese (理工科类)	2	2	36	36		2	考试 Exam.	文学院	混合式
1211044	计算机基础 (理工科) Fundamentals of Computer (for Science Specialties)	1	2	45	27	18	2	考试 Exam.	计科院	
1211056	Python 语言程序设计 (理工科) Python Programming (for Science Specialties)	2	3	72	36	36	2	考试 Exam.		

0411061	大学外语（一） College English 1	1	2	54	18	36	3	考试 Exam.	外院	
0411062	大学外语（二） College English 2	2	2	54	18	36	3	考试 Exam.	外院	
0411063	大学外语（三） College English 3	3	2	36	36		2	考试 Exam.	外院	
0411064	大学外语（四） College English 4	4	2	36	36		2	考试 Exam.	外院	
1011039	大学体育（一） Physical Education 1	1	1	36		36		考试 Exam.	体院	
1011040	大学体育（二） Physical Education 2	2	1	36		36		考试 Exam.		
1011041	大学体育（三） Physical Education 3	3	1	36		36		考试 Exam.		
1011042	大学体育（四） Physical Education 4	4	1	36		36		考试 Exam.		
1611045	创新创业理论与实践 Theory &Practice of Innovation and Entrepreneurship	3	1	27	9	18	1.5	考查 Quiz	国商学院	混合式
2011002	国家安全教育 National Security Education	1/2	1	18	18			考试 Exam.	国安院	混合式

2. 通识教育选修课（12 学分）

2. Liberal Studies Elective Courses（12 credits）

通识教育选修课共 12 学分，详见《陕西师范大学通识教育选修课课程方案》，具体课程清单以各学期发布的通知为准。在校期间须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。具体要求如下：

为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；

所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；

非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；

体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；

师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

Undergraduates will obtain 12 credits by taking liberal studies elective courses, see *Liberal Studies Elective Courses Scheme of Shaanxi Normal University*.

(二) 学科基础模块 (27 学分)

(II) Disciplinary Foundation Courses (27 credits)

1. 相关学科基础课 (17 学分)

1. Related Disciplinary Foundation Courses (17 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
0521005	高等数学 (二) -1 (理) Advanced Mathematics 1 (for Science Specialties)	1	4		72		5	考试 Exam.	数统院	
0521006	高等数学 (二) -2 (理) Advanced Mathematics 2 (for Science Specialties)	2	4		72		4	考试 Exam.	数统院	
3521005	基础物理 I 及实验 Fundamental Physics I and Experiments	2	3.5	72	54	18	3	考试 Exam.	材料学院	
3521006	基础物理 II Fundamental Physics II	3	2.5	46	46		3	考试 Exam.	材料学院	
3521002	线性代数与概率 Linear Algebra and Probability	3	3	54	54		4	考试 Exam.	数统院	

2. 本学科基础课 (10 学分)

2. Disciplinary Foundation Courses (10 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3522047	无机化学 Inorganic Chemistry	1	4	72	72		4	考试 Exam.	材料学院	
3522048	有机化学 Organic Chemistry	2	4	72	72		4	考试 Exam.	材料学院	

3522029	实验室安全与规范 Laboratory Safety and Regulation	1	0.5	8	8		2	考查 Quiz.	材料学院	
3522030	材料科学与工程专业导引 Introduction to Materials Science and Engineering	1	0.5	8	8		2	考查 Quiz.	材料学院	
3522056	工程制图 Engineering Drawing	4	1	18	18		2	考试 Exam.	材料学院	

(三) 专业课程模块 (46.5 学分)

(III) Specialized Courses (46.5 credits)

1. 专业核心课程 (18 学分)

1. Specialized Core Courses (18 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3541035	物理化学 Physical Chemistry	3	4	72	72		4	考试 Exam.	材料学院	混合式
3541037	材料科学基础 Fundamentals of Materials Science	5	4	72	72		4	考试 Exam.	材料学院	混合式
3541033	材料表征技术 Material Characterization Techniques	5	4	72	72		4	考试 Exam.	材料学院	
3544015	无机化学实验 Experiments in Chemistry	1	2			72	4	考试 Exam.	材料学院	含劳动教育
3544016	有机化学实验 Experiments in Organic Chemistry	2	2			72	4	考试 Exam.	材料学院	含劳动教育
3544017	物理化学实验 (含结构) Experiments in Physical /Structural Chemistry	3	2			72	4	考试 Exam.	材料学院	含劳动教育

2. 专业方向课程 (23 学分)

2. Specialized Orientation Courses (23 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
常规型系列课程： Courses of Conventional Series:										
3542094	固体物理学 Solid State Physics	5	3	54	54		3	考试 Exam.	材料学院	限选
3542078	半导体物理与器件 Semiconductor Physics and Device	6	2.5	46	46		3	考试 Exam.	材料学院	限选
3542067	材料物理性能学 Physical Properties of Materials	6	2.5	46	46		3	考试 Exam.	材料学院	限选
3542080	电工电子学基础 Fundamentals of Electrics and Electronics	4	2.5	46	46		3	考试 Exam.	材料学院	限选
3542081	高分子化学与物理 Polymer Chemistry and Physics	4	3	54	54		3	考试 Exam.	材料学院	限选
3542082	能源电化学 Energy Electrochemistry	4	2	36	36		2	考试 Exam.	材料学院	限选
3542083	能源存储材料与器件 Energy Storage Materials and Devices	5	2.5	46	46		3	考试 Exam.	材料学院	限选
3542084	能源转换材料与器件 Energy Conversion Materials and Devices	6	2.5	46	46		3	考试 Exam.	材料学院	限选
3542036	纳米材料学 Nanometer Materials Science	6	1.5	28	28		2	考查 Quiz.	材料学院	
3542046	薄膜材料与制备技术 Thin Film Materials Preparation and Technology	6	1.5	28	28		2	考查 Quiz.	材料学院	
3542086	光电检测技术 Optoelectric Detection Technology	6	1.5	28	28		2	考查 Quiz	材料学院	
3542087	光电子技术 Optoelectronic Technology	6	2.5	46	4		3	考试 Quiz	物信院	
3542089	无机层状材料的制备与能源存储 Preparation of Inorganic Materials with Layered Structure and Energy Storage	6	1.5	28	28		2	考查 Quiz	材料学院	
3542090	储能用碳基纳米材料 Carbon Based Nanomaterials for Energy Storage	5	1.5	28	28		2	考查 Quiz	材料学院	

3542091	化合物太阳能电池材料与器件 Compound Materials and Devices for Solar Cells	5	1.5	28	28		2	考查 Quiz	材料学院	
科学研究型（研究生先修课）系列课程： Courses of Scientific Research Series:										
3542094	固体物理学 Solid State Physics	5	3	54	54		3	考试 Exam.	材料学院	限选
3542078	半导体物理与器件 Semiconductor Physics and Device	6	2.5	46	46		3	考试 Exam.		限选
3542067	材料物理性能学 Physical Properties of Materials	6	2.5	46	46		3	考试 Exam.		限选
3542080	电工电子学基础 Fundamentals of Electrics and Electronics	4	2.5	46	46		3	考试 Exam.		限选
3542081	高分子化学与物理 Polymer Chemistry and Physics	4	3	54	54		3	考试 Exam.		限选
3542082	能源电化学 Energy Electrochemistry	4	2	36	36		2	考试 Exam.		限选
3542083	能源存储材料与器件 Energy Storage Materials and Devices	5	2.5	46	46		3	考试 Exam.		限选
3542084	能源转换材料与器件 Energy Conversion Materials and Devices	6	2.5	46	46		3	考试 Exam.		限选
3542036	纳米材料学 Nanometer Materials Science	6	1.5	28	28		2	考查 Quiz.		
3542046	薄膜材料与制备技术 Thin Film Materials Preparation and Technology	6	1.5	28	28		2	考查 Quiz.		
3542086	光电检测技术 Optoelectric Detection Technology	6	1.5	28	28		2	考查 Quiz		
3542087	光电子技术 Optoelectronic Technology	6	2.5	46	46		3	考试 Quiz	物信院	
说明：1.专业方向课程分为常规型和科学研究型两类课程，其中常规型包含 16 门课程，科学研究型包含 13 门课程。 2.专业必须选修够 23 学分。 1. The specialized orientation courses are divided into two types: conventional and scientific research series. The conventional series includes 16 courses, while the scientific research series includes 13 courses. 2. Undergraduates in new energy materials and devices specialty should obtain 23 credits.										

3. 专业拓展课程（5.5 学分）

3. Specialized Development Courses (5.5 credits)

详见材料科学与工程学院专业拓展课程。

See Specialized Development Courses of School of Materials Science and Engineering

（四）专业技能模块（12.5 学分）

（IV）Professional Skills Courses(12.5 credits)

必修课（12.5 学分）

Compulsory Courses (12.5 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3545010	新能源材料与器件综合实训 Comprehensive Training of New Energy Materials and Devices	6	2	72		72	8	考试 Exam.	材料学院	
3546007	新能源材料制备与器件组装 New Energy Materials Preparation and Device Assembly	5	2	72		72	8	考试 Exam.	材料学院	
3544014	微结构与物理性能实验 Experiments in Physical Properties and Micro-structure of Materials	5	1.5	54		54	8	考试 Exam.	材料学院	
3546005	新能源器件设计与制造工艺 Design and Fabrication Technology of New Energy Devices	7	4			12 周		考查 Quiz	材料学院	
3541006	研究方法 with 学术论文写作 Research Approach and Academic Dissertation Writing	7	1	18	18		2	考查 Quiz.	材料学院	
3541025	新能源材料与器件专业英语 Professional English in New Energy Materials and Device	7	1	18	18		2	考试 Exam.	材料学院	
3541045	企业管理 Enterprise Management	3	1	18	18		2	考试 Exam.	国商院	

(五) 实践教学模块 (19 学分)

(V) Practice Work (19 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
2650102	军事理论与训练 Military Theory and Military Training	1-2	2					考查 Quiz	军事教研室	
3550017	必读书目阅读 Required Readings		1					考查 Quiz	材料学院	
3550032	专业见习与实习 Professional Visits And Practice	1-7	4					考查 Quiz	材料学院	
3550021	专业实践与社会调查 Professional Practice and Social Survey		1					考查 Quiz	材料学院	
3850004	大学生职业生涯规划 College Students' Career Planning	2	0.5		10	9	2	考查 Quiz	招就处	
3850005	大学生求职指导与职场适应 Job Search Guidance and Workplace Adaptation for College Students	6	0.5		10	9	2	考查 Quiz	招就处	
3550022	科研训练 Scientific Research Training	3-6	1					考查 Quiz	材料学院	混合式
3550033	毕业论文(设计) Graduation Thesis	7-8	4					考查 Quiz	材料学院	
3950001	大学生心理健康 Mental Health for College Students		2					考查 Quiz	学工部	混合式
2050002	劳动教育 Labor Education		2	36	18	18		考查 Quiz	公共艺术 中心	

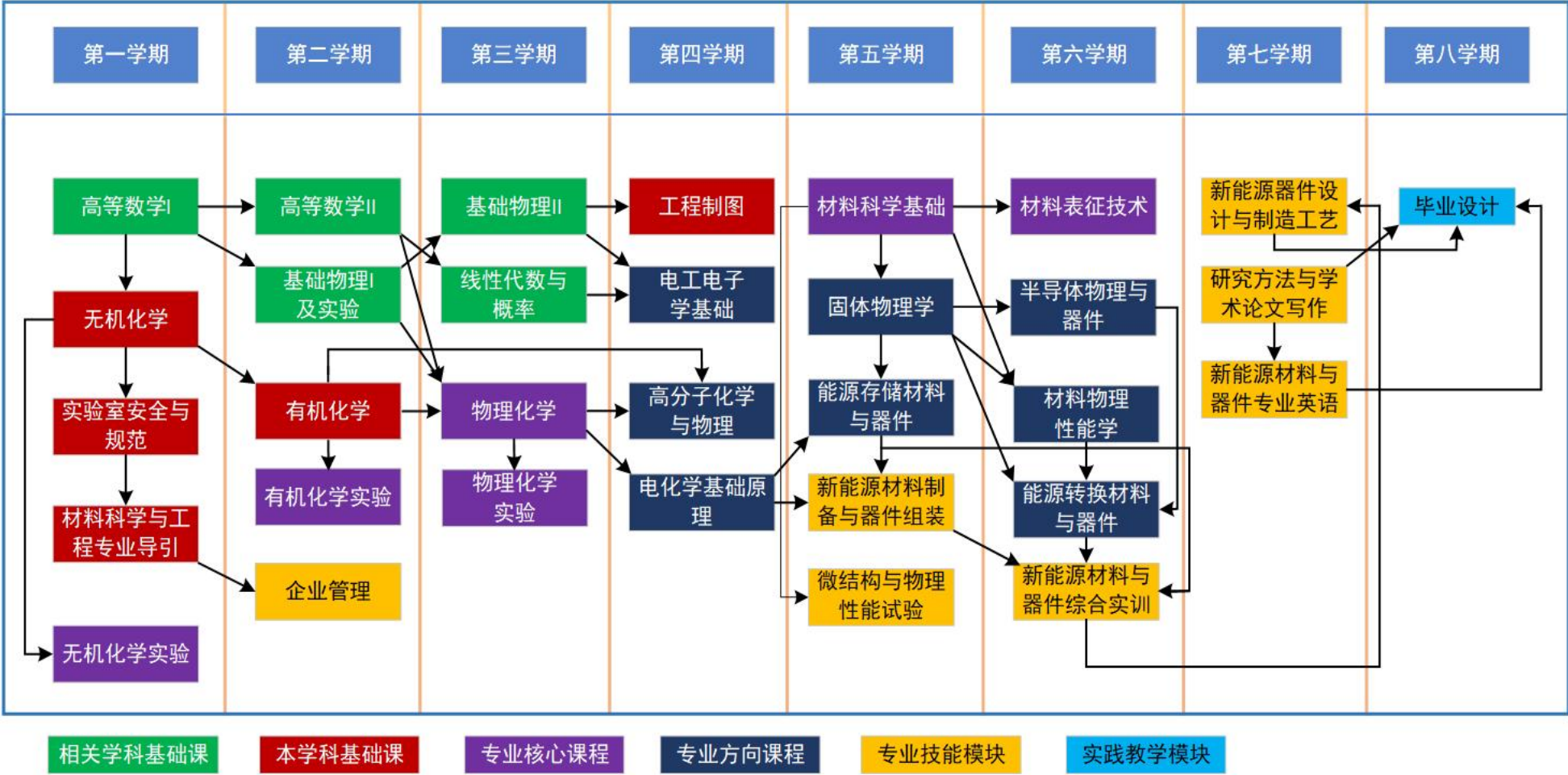
九、材料科学与工程学院专业拓展课程

IX. Specialized Development Courses of School of Materials Science and Engineering

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
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3543054	科学教育经典文献选读 Reading Classical Literature in Science Education	5	1.5	28	28		2	考查 Quiz.	材料学院	
3543055	现代化学专题 Special Topics in Modern Chemistry	5	1.5	28	28		2	考查 Quiz.		
3543056	现代物理专题 Special Topics in Modern Physics	5	1.5		28		2	考查 Quiz.		
3543032	稀土发光材料 Rare Earth Luminescent Materials	5	1.5	28	28		2	考查 Quiz.		
3543040	传感材料与技术 Materials and Technologies of Sensors	5	1.5	28	28		2	考查 Quiz.		
3543035	胶体化学与界面 Colloid Chemistry and Interface	5	1.5	28	28		2	考查 Quiz.		
3543052	光催化材料与技术 Photocatalytic Materials and Technology	5	1.5	28	28		2	考查 Quiz.		
3543041	有机光电材料与器件导论 Introduction of Organic Optoelectronic Materials and Devices	5	1.5	28	28		2	考查 Quiz.		
3543057	材料科学前沿进展 Frontiers of material Science	6	1.5	28	28		2	考查 Quiz.		
3543031	二维原子晶体材料与器件 Two-dimensional Atomic Crystal and Device	6	1.5	28	28		2	考查 Quiz.		
3543036	材料的力学性能 Mechanical Properties of Materials	6	1.5	28	28		2	考查 Quiz.		
3543037	材料的相变原理 Phase Transformation Mechanisms of Materials	6	1.5	28	28		2	考查 Quiz.		
说明 Notes	1. 材料科学与工程学院专业任意选修课共 12 门。 2.新能源材料与器件专业必须选修 5.5 学分。 1. There are 12 Specialized Non-restrictive Elective Courses. 2. Undergraduates in New Energy Materials and Devices specialty should obtain 5.5 credits.									

十、专业课程先修关系图



十一、课程一毕业要求支撑矩阵

序号	课程信息		毕业要求												
			1	2	3	4	5	6	7	8	9	10	11	12	13
	课程类别	课程名称													
1	通识教育必修课 Liberal Studies Compulsory Courses	思想道德与法治 The Ideological and Moral Cultivation and the Rule of Law	H						L		H				
2	通识教育必修课 Liberal Studies Compulsory Courses	中国近现代史纲要 Outline of Modern and Contemporary Chinese History	H						L		H				
3	通识教育必修课 Liberal Studies Compulsory Courses	马克思主义基本原理 Principles of Marxism	H						L		H				
4	通识教育必修课 Liberal Studies Compulsory Courses	毛泽东思想和中国特色社会主义理论体系概论 Mao Zedong Thoughts and Theory of the Socialism with Chinese Characteristics	H						L	M	H				
5	通识教育必修课 Liberal Studies Compulsory Courses	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	H						L		H				
6	通识教育必修课 Liberal Studies Compulsory Courses	形势与政策 1-7 The Current Situation and Policy(1-7)	H						L	M	H				
7	通识教育必修课 Liberal Studies Compulsory Courses	大学语文 College Chinese	L										H		
8	通识教育必修课 Liberal Studies Compulsory Courses	计算机基础（理工科） Fundamentals of Computer (for Science Specialties)		M	M		L	H							
9	通识教育必修课 Liberal Studies Compulsory Courses	Python 语言程序设计 Python Programming		M	M		L	H							
10	通识教育必修课 Liberal Studies Compulsory Courses	大学外语课程 College English											H		L
11	通识教育必修课 Liberal Studies Compulsory Courses	大学体育（一） Physical Education 1								H					

12	通识教育必修课 Liberal Studies Compulsory Courses	大学体育（二） Physical Education 2								H					
13	通识教育必修课 Liberal Studies Compulsory Courses	大学体育（三） Physical Education 3								H					
14	通识教育必修课 Liberal Studies Compulsory Courses	大学体育（四） Physical Education 4								H					
15	通识教育必修课 Liberal Studies Compulsory Courses	创新创业理论与实践 Theory &Practice of Innovation and Entrepreneurship								M			M	H	L
16	通识教育必修课 Liberal Studies Compulsory Courses	国家安全教育 National Security Education	H							H	L	M			
17	相关学科基础课 Related Disciplinary Foundation Courses	高等数学（二）-1（理） Advanced Mathematics(II) -1 (for Science Specialties)		H					L		L			M	L
18	相关学科基础课 Related Disciplinary Foundation Courses	高等数学（二）-2（理） Advanced Mathematics(II) -2 (for Science Specialties)		H					L		L			M	L
19	相关学科基础课 Related Disciplinary Foundation Courses	基础物理 I 及实验 Fundamental Physics I and Experiments		H		M	L		L		L				L
20	相关学科基础课 Related Disciplinary Foundation Courses	基础物理 II Fundamental Physics II		H					L		L				L
21	相关学科基础课 Related Disciplinary Foundation Courses	线性代数与概率 Linear Algebra and Probability		H					L		L				L
22	本学科基础课 Disciplinary Foundation Courses	无机化学 Inorganic Chemistry		H	H	H	H	H	L	L					M
23	本学科基础课 Disciplinary Foundation Courses	有机化学 Organic Chemistry		H	H	H			L	L					M
24	本学科基础课 Disciplinary Foundation Courses	实验室安全与规范 Laboratory Safety and Regulation		M	M	M	H	H	M	H	M				

25	本学科基础课 Disciplinary Foundation Courses	材料科学与工程专业导引 Introduction to Materials Science and Engineering	H		H	M			M	M	H				M
26	本学科基础课 Disciplinary Foundation Courses	工程制图 Engineering Drawing		H	M	M		H							
27	专业核心课程 Specialized Core Courses	物理化学 Physical Chemistry		H	H	M			L	L					M
28	专业核心课程 Specialized Core Courses	材料科学基础 Fundamentals of Materials Science		H	M	H	M	L		L	L				M
29	专业核心课程 Specialized Core Courses	材料表征技术 Material Characterization Techniques		H	H	M	M	L							
30	专业核心课程 Specialized Core Courses	无机化学实验 Experiments in Chemistry		M	M	L	H	M		L					
31	专业核心课程 Specialized Core Courses	有机化学实验 Experiments in Organic Chemistry		M	M	L	H	M		L					
32	专业核心课程 Specialized Core Courses	物理化学实验（含结构） Experiments in Physical /Structural Chemistry		M	M	L	H	M		L					
33	专业方向课程 Specialized Orientation Courses	固体物理学 Solid State Physics		M	M	H	L								
34	专业方向课程 Specialized Orientation Courses	半导体物理与器件 Semiconductor Physics and Device		M	M		H	L							M
35	专业方向课程 Specialized Orientation Courses	材料物理性能学 Physical Properties of Materials		H	M		H	M							L
36	专业方向课程 Specialized Orientation Courses	电工电子学基础 Fundamentals of Electrics and Electronics		M	M		M	M				L			
37	专业方向课程 Specialized Orientation Courses	高分子化学与物理 Polymer Chemistry and Physics		H	M		L								
38	专业方向课程 Specialized Orientation Courses	能源电化学 Energy Electrochemistry		H	M		M					L			

39	专业方向课程 Specialized Orientation Courses	能源存储材料与器件 Energy Storage Materials and Devices		H	H	H	H	M	M	M	M	L	L	M	L
40	专业方向课程 Specialized Orientation Courses	能源转换材料与器件 Energy Conversion Materials and Devices		H	H	H	H	M	M	M	M	L	L	M	L
41	专业方向课程 Specialized Orientation Courses	纳米材料学 Nanometer Materials Science		M	M		H	L	L						
42	专业方向课程 Specialized Orientation Courses	薄膜材料与制备技术 Thin Film Materials Preparation and Technology		H	M		H								L
43	专业方向课程 Specialized Orientation Courses	光电检测技术 Optoelectric Detection Technology		M			H	M							L
44	专业方向课程 Specialized Orientation Courses	光电子技术 Optoelectronic Technology		H	M		H	L							
45	专业方向课程 Specialized Orientation Courses	无机层状材料的制备与能源存储应用 Preparation of Inorganic Materials with Layered Structure and Energy Storage Applications		M	M		H	M							L
46	专业方向课程 Specialized Orientation Courses	储能用碳基纳米材料 Carbon Based Nanomaterials for Energy Storage		M	M		H	M							L
47	专业方向课程 Specialized Orientation Courses	化合物太阳能电池材料与器件 Compound Materials and Devices for Solar Cells		M	M		H	M							L
48	专业技能模块 Professional Skills Courses	新能源材料与器件综合实训 Comprehensive Training of New Energy Materials and Devices		H	H	H	H	M	M	L	M	M	M	L	L
49	专业技能模块 Professional Skills Courses	新能源材料制备与器件组装 New Energy Materials Preparation and Device Assembly		H	H	H	H	M	M	L	M	M	M	L	L
50	专业技能模块 Professional Skills Courses	微结构与物理性能实验 Experiments in Physical Properties and Micro-structure of Materials		M	H			M				L			

51	专业技能模块 Professional Skills Courses	新能源器件设计与制造工艺 Design and Fabrication Technology of New Energy Devices		H	H	H	H	M	M	L	M	M	M	L	L
52	专业技能模块 Professional Skills Courses	研究方法与学术论文写作 Research Approach and Academic Dissertation Writing				H	M								H
53	专业技能模块 Professional Skills Courses	新能源材料与器件专业英语 Professional English in New Energy Materials and Device		H						M					M
54	专业技能模块 Professional Skills Courses	企业管理 Enterprise Management		M				M	M	M	H	M	M	H	M
55	实践教学模块 Practice Work	军事理论与训练 Military Theory and Military Training		L	L	M		L	M		M	H	H		M
56	实践教学模块 Practice Work	必读书目阅读 Required Readings	M	H	M	M	L	M		M	M	M		L	H
57	实践教学模块 Practice Work	专业见习与实习 Professional Visits And Practice		H	H	H	H	M	M	M	M	H	M	L	M
58	实践教学模块 Practice Work	专业实践与社会调查 Professional Practice and Social Survey		H	M	H		M	H	H	H	H	H	H	H
59	实践教学模块 Practice Work	大学生职业生涯规划 College Students' Career Planning	H	M	L	M		M	M	M	H	L	M	M	H
60	实践教学模块 Practice Work	大学生求职指导与职场适应 Job Search Guidance and Workplace Adaptation for College Students	M	M	L	M		M	M	M	M	L	M	M	H
61	实践教学模块 Practice Work	科研训练 Scientific Research Training		H	H	M	H	H	L	H	M	H	M	L	M
62	实践教学模块 Practice Work	毕业论文（设计） Graduation Thesis		H	H	M	M	H	L	M	M	M	M	L	L
63	实践教学模块 Practice Work	大学生心理健康 Mental Health for College Students	M						L	M	M	M		L	H
64	实践教学模块 Practice Work	劳动教育 Labor Education	H									L		L	M

十二、课程简介

XII. Brief Introduction of Main Courses

I 相关学科基础课程 (Related Disciplinary Foundation Courses)

1. 课程名称：高等数学（二）——1（理）/高等数学（二）——2（理）

(1) 课程编码：0521005/0521006

(2) 课程简介：理工科《高等数学》是理工科专业学生必修的最重要的基础课程之一，他对学生良好的数学素质的形成及后续专业课程的学习起着至关重要的作用。学习周期两个学期，总学时 144 个，8 个学分，内容包括一元函数的极限、连续性，导数与微分，不定积分，定积分，常微分方程，空间解析几何，级数理论，多元函数的极限、连续性，多元函数的微分学、积分学。

1. Course Name: Advanced Mathematics(II)-1 (for Science Specialties) /Advanced Mathematics(II)- 2 (for Science Specialties)

(1) Course Code: 0521005/0521006

(2) Brief Introduction of the Course: *Advanced Mathematics* is one of the most important compulsory courses for students in science and engineering, which plays a crucial role in improving the quality of student mathematical conversations and studying the successive courses. The course runs for two terms, 144 class hours, 8 credits. The contents include the limit and continuity of single variable functions, derivative and differential, indefinite and definite integral, ordinary differential equations, spatial analytic geometry, series theory, the limit and continuity of a multivariable function, and derivative and differential of multivariable functions.

2. 课程名称：基础物理 I 及实验/基础物理 II

(1) 课程编码：3521005/3521006

(2) 课程简介：《基础物理》课程是高等学校各理工科专业学生的一门重要的基础必修课。本课程以物理学最基本的概念、理论为主体，内容包括运动学、牛顿定律及其内在随机性、动量守恒定律与能量守恒定律、角动量守恒定律、机械振动、机械波静电场、稳定磁场、电磁感应、麦克斯韦方程组和电磁波、量子物理学基础等。通过本课程的教学，使学生对大学物理的基本概念、基本理论、基本方法能够有比较全面和系统的认识，并具有初步应用的能力，为学生进一步学习打下必要的基础。

(3) 课程负责人：贾丽超

2. Course Name: Fundamental Physics I and Experiments (I)/Fundamental Physics II

(1) Course Code: 3521005/3521006

(2) Brief Introduction of the Course: *Fundamental Physics* is one of the most important compulsory courses for students in science and engineering, is the core of natural science and the foundation of technology innovation. This course mainly introduces the most basic concepts and theories of physics, studies of the basic structures and materials interaction and the most basic, the most common form of movement (mechanical, electromagnetic, micro motion and particle motion), the mutual transformation between them and science. This course is aimed to help students systematically understand the basic concepts, theories and the method of physics, to cultivate students comprehensive use of knowledge and ability, and lay the foundation for further study of materials and physics.

(3) Course Leaders: Lichao Jia

3. 课程名称：线性代数与概率

(1) 课程编码：3521002

(2) 课程简介：《线性代数与概率》课程是高等学校数学专业学生的一门重要的基础必修课。本课程以线性代数和概率论的基本概念、理论和方法为主体，内容包括矩阵运算与线性方程组、向量空间、特征值与特征向量、概率论的基本概念、随机变量及其分布、

随机变量的数字特征、大数定律和中心极限定理等。通过本课程的教学，使学生掌握线性代数与概率论的基本知识，培养他们的数学思维能力和解决实际问题的能力，为学生进一步学习其他数学课程和实际问题打下必要的基础。

3. Course Name: Linear Algebra and Probability

(1) Course Code: 3521002

(2) Brief Introduction of the Course: *Linear Algebra and Probability* is an important basic compulsory course for mathematics students in colleges and universities. This course focuses on the basic concepts, theories, and methods of linear algebra and probability theory, including matrix operations and linear equations, vector spaces, eigenvalues and eigenvectors, basic concepts of probability theory, random variables and their distributions, digital characteristics of random variables, the law of large numbers and the central limit theorem. Through this course, students can master the basic knowledge of linear algebra and probability theory, cultivate their mathematical thinking and problem-solving abilities, and lay the necessary foundation for further studying other mathematics courses and solving practical problems.

II 本学科基础课程 (Disciplinary Foundation Courses)

1. 课程名称：无机化学

(1) 课程编码：3522047

(2) 课程简介：《无机化学》是新能源材料与器件专业的第一门主干必修基础课。基于无机光电材料在新能源材料中的重要作用，本专业将该课程作为该专业最基础的课程给予强化。其内容包含基础化学原理，其介绍了原子结构与元素周期系、分子结构、配合物、化学平衡及其指导下的四大平衡、化学热力学基础、化学动力学基础等。

(3) 课程负责人：刘宗怀

1. Course Name: Inorganic Chemistry

(1) Course Code: 3522047

(2) Brief Introduction of the Course: *Inorganic Chemistry* is the first core compulsory basic course for the major of New Energy Materials and Devices. Based on the significant role of inorganic photoelectric materials in new energy materials, the major reinforces this course as the most fundamental one. It covers basic chemical principles, including atomic structure and the periodic table of elements, molecular structure, complexes, chemical equilibrium and the four major equilibria under its guidance, fundamentals of chemical thermodynamics, and fundamentals of chemical kinetics.

(3) Course Leaders: Zonghuai Liu

2. 课程名称：有机化学

(1) 课程编码：3522048

(2) 课程简介：《有机化学》是新能源材料与器件专业本科生的主干必修基础课程。内容主要包括有机化合物系统命名、立体化学、光谱等基本知识；各类有机化合物结构、性质及合成等；各种有机化学基本类型及机理；特殊有机物的结构、性质及合成等，尤其是杂环及多环芳烃化合物；生物分子的结构、性质和在自然界中生命体中的作用；有机化合物结构测定现代物理方法等。

(3) 课程负责人：陈新兵

2. Course Name: Organic Chemistry

(1) Course Code: 3522048

(2) Brief Introduction of the Course: *Organic Chemistry* course is a compulsory foundation course for undergraduates majoring in New Energy Materials and Devices. The course includes following contents. Systematic nomenclature of organic compounds; Basic knowledge of stereochemistry, spectroscopy, etc. Structure, properties and synthesis related to various organic compounds; Types and mechanisms of basic organic reaction; Structure, properties and synthesis

of special organic compounds, especially heterocycle compounds and polycyclic aromatic hydrocarbon. The structure, nature and function of biomolecules in living organisms in nature. The last section introduces the modern physical methods to determine the structure of organic compounds.

(3) Course Leaders: Xinbing Chen

3. 课程名称：实验室安全与规范

(1) 课程编码：3522029

(2) 课程简介：实验是自然科学研究最基本的方法。实验室已成为学生们学习、科研实践的重要场所之一。在实验中使用设备、玻璃仪器、电器、试剂等都有一定的潜在危险。没有科学规范的实验操作，将会大大增加发生触电、中毒、烫伤、着火和爆炸等意外事故概率。因此，掌握科学实验方法、熟悉实验室基本的安全规范，对于避免危险事故发生具有极其重要的意义。同时，了解与熟悉各种事故应急处置方法，减小更大伤害也具有特别重要意义。本课程主要包括：实验室安全防护；危险品；废弃物处置以及事故应急处理方法。同时，本课程将结合学院大型仪器平台，讲授现代仪器分析的实验技术与安全操作，并介绍国外高校化学实验室的安全与管理。本课程的学习能够增强学生的安全和环保意识，养成良好的安全习惯，掌握应急救援技能，有效降低实验室事故发生的概率。

(3) 课程负责人：胡道道

3. Course Name: Laboratory Safety and Regulation

(1) Course Code: 3522029

(2) Brief Introduction of the course: Experiment is the most basic method in natural scientific research. Laboratory has become one of the important places for students learning and practice in scientific research. There are some potential hazards in experimental process. The various accidents could take place if there are no scientific and standardized experimental operations. Therefore, it is very important to understand and grasp scientific experimental methods and safety specification in laboratory. Additionally, it is also significant to understand and to be familiar with handling methods of various emergencies for reducing the greater damages. In this course, laboratory safety protection, knowledge of dangerous reagents, waste disposal and treatment methods of accident emergency, etc. Additionally, according to our large-scale instrument platform, modern instruments are also introduced. This course is beneficial for students to enhance the safety and environmental awareness in laboratory.

(3) Course Leaders: Daodao Hu

4. 课程名称：材料科学与工程专业导引

(1) 课程编码：3522030

(2) 课程简介：《材料科学与工程专业引导》是材料化学、新能源材料与器件两个本科专业的一门必修专业课。主要包括四个方面：一是材料科学与工程学科简介。包括学科的形成与发展，材料分类及其在人类社会进程中的地位与作用；二是光电功能材料的基本原理及应用、发展现状与趋势；三是材料化学、新能源材料与器件专业介绍。通过分别解读两个专业培养计划，使学生熟悉两个专业的课程设置、培养目标；四是材料科学与工程学院学科简介。包括学科平台、师资队伍、硬件条件、学习环境等，使学生熟悉未来学习环境和资源。

(3) 课程负责人：曾京辉

4. Course Name: Introduction to Materials Science and Engineering

(1) Course Code: 3522030

(2) Brief introduction: "Introduction to Materials Science and Engineering" is majors a compulsory professional course for Materials Chemistry, New Energy Materials and Devices. The contents of this course mainly include four aspects: a. Brief introduction of the disciplinary

of Materials Science and Engineering, including the formation and development of the subject, materials classification and their roles in the human civilization; b. Brief introduce of basic principles and applications of photoelectric materials, current situation and trend of development; c. Brief introduce of specialties including Materials Chemistry, New Energy materials and Devices. Based on the interpretation of the two professional training plans, it is helpful for students to be familiar with difference and relation of two professions, professional learning methods; d. Introduction of School of Materials science and Engineering, including the discipline platform, teachers, hardware conditions, learning environment, to help students to be familiar with the school environment and resources.

(3) Course Leaders: Jinghui Zeng

5. 课程名称：工程制图

(1) 课程编码：3522056

(2) 课程简介：《工程制图》课程是一门工程学科的基础课，被誉为“工程界的语言”，它研究绘制和阅读工程图样的理论和方法，与生产实践密切相关。该课程主要内容包括画法几何和制图两部分。画法几何是制图的理论基础，主要研究各种投影法（主要是正投影法）的基本理论；制图是投影理论的运用，即运用投影法，绘制各种常见的工程图样。该课程的主要任务是培养学生绘图和读图的基本技能，并通过实践，培养他们的空间想象能力，为绘制符合国家制图标准的图样提供基础。

(3) 课程负责人：宁星铭

5. Course Name: Engineering Drawing

(1) Course Code: 3522056

(2) Brief Introduction of the Course: *Engineering Drawing* is a fundamental course in the field of engineering, known as the "language of the engineering world". It studies the theory and methods of drawing and reading engineering drawings, and is closely related to production practice. The main content of this course includes two parts: descriptive geometry and drawing. Descriptive geometry is the theoretical foundation of drawing, mainly studying the basic theories of various projection methods (mainly orthographic projection); Cartography is the application of projection theory, which uses projection method to draw various common engineering drawings. The main task of this course is to cultivate students' basic skills in drawing and reading, and through practice, to cultivate their spatial imagination ability, providing a foundation for drawing drawings that comply with national drawing standards.

(3) Course Leaders: Xingming Ning

(二) 专业课程模块 (Specialized Courses)

I 专业核心课程 (Specialized Core Courses)

1. 课程名称：物理化学

(1) 课程编码：3541035

(2) 课程简介：《物理化学》是本专业的一门主干必修基础课程。主要内容上册包括热力学第一定律、热力学第二定律、溶液、相平衡、化学平衡、统计热力学基础；下册包括电解质溶液、可逆电池电动势及其应用、电解和极化作用、化学动力学基础 (I) 和 (II)、界面物理化学、胶体与高分子溶液等。

(3) 课程负责人：雷志斌

1. Course Name: Physical Chemistry

(1) Course Code: 3541035

(2) Brief Introduction of the Course: *Physical Chemistry* is a compulsory course for students in School of Material Science and Engineering. The course is divided into two parts. Part One explains the fundamentals of the first law and second law of thermodynamics, phase diagrams,

chemical equilibrium, and statistical thermodynamics. Part Two emphasizes the fundamentals of equilibrium electrochemistry, chemical kinetics, processes at solid surfaces, colloid and polymer solutions, etc.

(3) Course Leaders: Zhibin Lei

2. 课程名称：材料科学基础

(1) 课程编码：3541036

(2) 课程简介：《材料科学基础》系新能源材料与器件专业的核心课程，属于专业基础课。本课程从材料科学与工程的基本原理出发，综合介绍各种材料的组成、结构、制备工艺、性能及应用的共性规律及金属材料、无机非金属材料 and 有机高分子材料的个性特点和多种组分复合体系的基本特征。内容包括物质结构基础、材料的组成与结构特点、材料的性能、材料制备与加工成型。通过本课程的学习使学生建立材料制备—加工—结构—性能关系的整体概念。

(3) 课程负责人：孙颀

2. Course Name: Fundamentals of Materials Science

(1) Course Code: 3541036

(2) Brief Introduction of the Course: *Fundamentals of Materials Science* is a core course of the major of New Energy Materials and Devices, also considering as a fundamental course. This course starts from the basic principles of materials science and engineering, comprehensively introducing the common laws of composition, structure, preparation process, performance, and application of various materials, as well as the individual characteristics of metals, inorganic materials, organic polymer materials and the basic characteristics of the related multi-component composite systems. The content includes the basis of material structure, composition and structural characteristics of materials, material properties as well as material preparation and processing. Through the study of this course, students will establish a holistic concept of the relationship between material preparation, processing, structure and performance.

(3) Course Leaders: Jie Sun

3. 课程名称：材料表征技术

(1) 课程编码：3541033

(2) 课程简介：《材料表征技术》是新能源材料与器件专业的一门专业必修课程。主要介绍材料组成、结构和形貌分析表征相关仪器的基本原理与应用。其中包括材料分析方法基础、X射线衍射分析方法、电子显微分析方法、光谱、电子能谱分析方法以及热分析方法等。介绍这些表征方法在金属材料，无机非金属材料，有机高分子材料和复合材料等方面的应用。

(3) 课程负责人：苟婧

3. Course Name: Material Characterization Techniques

(1) Course Code: 3541033

(2) Brief Introduction of the Course: *Material Characterization Techniques* is a compulsory course for New Energy Materials and Devices in School of Material Science and Engineering. Its main message is that the fundamentals and application of instruments characterizing the composition, structure and morphology of materials. It provides introduction to the analytical method of materials, such as X-ray diffraction, Electron microscope, spectrum, energy dispersive x-ray spectroscopy, thermogravimetric analysis. Moreover, it introduces the application of analytical method in metal materials, inorganic non-metal materials, organic polymer materials, and composite materials.

(3) Course Leaders: Jing Gou

4. 课程名称：无机化学实验

(1) 课程编码：3544015

(2) 课程简介：《无机化学实验》是材料化学、新能源材料与器件专业必修的、独立的基础实验课。教学内容着力于培养学生无机化学实验基本方法和基本技能。以性质实验加强学生对无机元素知识的理解，以合成实验和综合实验训练和巩固基本操作和灵活运用，培养学生正确选择无机化合物的合成方法、分离提纯及分析鉴定方法。学生通过实验活动，在加强理论知识理解及基本技能的同时，培养严谨的科学态度、化学反应观察能力、实验数据处理能力、理论与实践相结合能力。

(3) 课程负责人：石峰

4. Course Name: Experiments in Inorganic Chemistry

(1) Course Code: 3544015

(2) Brief Introduction of the Course: *Experiments in Chemistry* is a compulsory professional course for Materials Chemistry, New Energy Materials and Devices specialties. This course focuses on training students with basic methods and basic skills in inorganic chemistry. Based on experiments in elemental properties to enhance understanding of theories of inorganic chemistry; Through synthetic experiments and comprehensive experiments, the basic skills and application ability are enhanced, and selective abilities in synthesis methods, separation methods and identification methods. This course is helpful for students to forming rigorous scientific attitude, observation ability, data processing ability and combination of theory with practice.

(3) Course Leaders: Feng Shi

5. 课程名称：有机化学实验

(1) 课程编码：3544016

(2) 课程简介：《有机化学实验》，是一门新能源材料与器件专业必修课。基于新能源材料制备对有机化学的需求，本课程突出对学生有机化学综合实验能力的培养，本课程内容包括有机化学实验基本知识、基本方法和基本操作；典型有机合成相关装置和基本原理；典型化合物合成和制备方法；较复杂有机化合物的多步合成与分离；有机化合物的定性鉴定和波谱学分析。通过这些实验，着力培养有机化学合成的基础知识、基本方法和基本技能，使其在相关材料合成中发挥积极作用。

(3) 课程负责人：邢惠萍

5. Course Name: Experiment in Organic Chemistry

(1) Course Code: 3544016

(2) Brief Introduction of the Course: *Experiments in Organic Chemistry* is a compulsory course for students in New Energy Materials and Devices specialties. Based on the requirements of new energy materials in organic chemistry, this course focuses on training comprehensive ability of organic chemistry experiment. The contents of this course include the basic knowledge of organic chemistry experiment, basic methods and basic skills; the basic principles and applications of typical devices in organic synthesis; synthesis and preparation methods of typical compounds; methods in synthesis and separations of complex organic compounds; organic compounds qualitatively analyzed by spectroscopy methods. Through these experiments, knowledge, basic methods and basic skills related to organic synthesis are trained, which will play an active role in the relative materials synthesis.

(3) Course Leaders: Huiping Xing

6. 课程名称：物理化学实验（含结构）

(1) 课程编码：3544017

(2) 课程简介：基于物理化学在功能材料中的重要作用，物理化学实验被设为材料化学、新能源材料与器件专业必修课。该课程的主要目的是，使学生初步了解物理化学的研究方法，掌握物理化学的基本实验技术和技能，学会重要的物理化学性能测定，熟悉物理化学

实验现象的观察和记录，实验条件的判断和选择，实验数据的测量和处理，实验结果的分析 and 归纳等一套严谨的实验方法，从而加深对物理化学基本理论的理解，增强解决实际化学问题的能力。其内容包括热力学、电化学、动力学、表面化学、胶体化学、物质结构等方面有代表性的实验，同时又要将物理化学的重要实验方法和技术分散到各实验中去，力求使学生能得到全面的基础训练。

(3) 课程负责人：孙颀

6. Course Name: Experiments in Physical /Structural Chemistry

(1) Course Code: 3544017

(2) Brief Introduction of the Course: Based on the important role of Physical /Structural Chemistry in function materials, this course is set a compulsory course for students in Materials Chemistry, New Energy Materials and Devices specialties. The aim of the course is to enable students to preliminarily understand the research methods of Physical Chemistry; grasping basic experimental techniques and skills of Physical Chemistry; learning the determination methods of important properties related to Physical Chemistry, being familiar with observation and record in Physical Chemistry experiment, judgment and selection of experimental conditions, processing of the experimental data, the rigorous experimental method in the analysis and conclusion of experimental results. Through these experiments, the understanding of the basic theory of Physical Chemistry is enhanced, the ability to solve practical problems is improved. This course includes following contents: some representative experiments in chemical thermodynamics, electrochemistry, kinetics, surface chemistry, colloid chemistry, material structure. Additionally, some important experimental methods and techniques in Physical Chemistry are applied to various experiments, and all basic skills are roundly trained.

(3) Course Leaders: Jie Sun

II 专业方向课程 (Specialized Orientation Courses)

1. 课程名称：固体物理学

(1) 课程编码：3542094

(2) 课程简介：本课程为材料科学与工程学科本科生的核心课。主要内容包括固体物理的基本理论和基本知识，介绍晶体的结构和结合方式，以及固体的缺陷和表面性质；研究固体的热学、电学、光学和磁学等基本物理性质的普遍规律。课程的开设将使学生掌握晶体结构、晶格振动、成键及能带理论等基础内容。并了解金属电子论和半导体电子论解释电子热容量；金属的电导率；半导体中载流子和电导；p-n 结。最后介绍固体物理专题，内容包括固体中的缺陷；固体的表面性质；固体的磁性；固体的光学性质。

(3) 课程负责人：贾丽超

1. Course Name: Solid State Physics

(1) Course Code: 3542094

(2) Brief Introduction of the Course: *Solid State Physics* is the fundamental cause for materials science and engineering. It explains the basic theory and knowledge in solid state physics, including the structure of crystals and their compounds, defects and surface properties. It studies the basic physical properties and universal laws of thermal, electrical, optical, and magnetic properties in solids. It is intended for the student to master the lattice in crystals, bonding, crystal lattice vibrations and band theory. It then explains electronic heat capacity, electrical conductivity, carriers and conductivity in semiconductors, and p-n junction according to the electron theory of metals and semiconductors. Special topics in solid state physics, containing defects, surface properties, magnetic properties, and optical properties, will be introduced in conclusion.

(3) Course Leaders: Lichao Jia

2. 课程名称：半导体物理与器件

(1) 课程编码: 3542078

(2) 课程简介: 《半导体物理与器件》是整个半导体工业和微电子工业的基础, 对设计和开发基于半导体材料的功能化器件具有指导作用。本课程主要分为两部分: 半导体物理基础和典型的半导体器件。在半导体物理基础部分, 主要讲述半导体材料中平衡载流子的统计分布、半导体材料的掺杂对半导体性质的影响、载流子的输运及非平衡载流子的产生与复合过程。在半导体器件部分, 主要讲述 p-n 结、金属-半导体接触、场效应管等基本物理器件的构造和工作原理。该课程的主要任务是使学生理解半导体材料及相关器件的基本性质, 熟练掌握载流子的统计分布、半导体掺杂、载流子输运等半导体材料的特性, 熟悉半导体器件的原理和性能, 为设计、开发新型的半导体功能器件打下基础。

(3) 课程负责人: 杨周

2. Course Name: Semiconductor Physics and Devices

(1) Course Code: 3542078

(2) Brief Introduction of the Course: *Semiconductor Physics and Devices* has facilitated the development of semiconductor industry and modern electronics, and provides guidance for the design and fabrication of functional semiconductor devices. This course contains two parts: the basic principles of semiconductor physics and the typical semiconductor devices. The first part will illustrate the equilibrium distribution of carriers, material doping, carrier transport dynamics and the carrier generation-recombination dynamics. The second part will elucidate the structure and working principle of p-n junction, metal-semiconductor junction and MOSFET etc. It will help students to understand the basic principles of semiconductor materials and carrier transportation property. The students are expected to master equilibrium distribution of carriers, material doping, carrier transport dynamics and the carrier generation-recombination dynamics and be familiar with the working principle of typical semiconductor devices. The students are supposed to lay a solid foundation for future development of new semiconductor-based devices.

(3) Course Leaders: Zhou Yang

3. 课程名称: 材料物理性能学

(1) 课程编码: 3542067

(2) 课程简介: 《材料物理性能学》是新能源材料与器件专业的一门专业必修课程。其主要内容包括: 固体中的电子能量结构和状态, 材料的电、介电、光、热、磁、弹性和内耗(阻尼)性能及其发展, 阐述了各种性能的重要原理及微观机制、各种材料成分、组织结构与性能关系及主要制约规律。其特色是把金属材料、陶瓷材料和高聚物材料的物理性能做了扼要的对比, 以利于学生掌握材料物理性能的一般规律和特殊性。

(3) 课程负责人: 高斐

3. Course Name: Physical Properties of Materials

(1) Course Code: 3542067

(2) Brief Introduction of the Course: *Physical Properties of Materials* is a compulsory course for New Energy Materials and Devices Profession in School of Material Science and Engineering. It introduces and explains the fundamentals and development of materials related to physical properties of materials (electron energy structure and status, electrical, dielectric, light, heat, magnetic, elastic and internal friction (damping) properties). It provides introduction to the relationship of composition, structure and property of materials. It compares the physical property of metallic materials, ceramic material and polymer material, which benefits the students to grasp the general rule and particularity of physical properties of materials.

(3) Course Leaders: Fei Gao

4. 课程名称: 电工电子学基础

(1) 课程编码: 3542080

(2) 课程简介: 电工电子学基础是高等学校非电类专业少学时电工电子学课程。本

程包括电工学（电路的作用与组成部分、电路分析方法、电路的暂态分析、电容、电感、相位和交流阻抗）；模拟电路（半导体器件、基本放大电路、集成运算放大电路、电子电路中的反馈、直流稳压电源）和数字电路（门电路和组合逻辑电路、触发器和时序逻辑电路、存储器和可编程逻辑器件、模拟量和数字量转换）、电工电子学测量（数字仪表和虚拟数字仪表，数字仪表编程）等。

（3）课程负责人：王大鹏

4. Course Name: Fundamentals of Elector Techniques and Electronics

(1) Course Code: 3542080

(2) Brief Introduction of the Course: *Fundamentals of Elector Techniques and Electronics* is a course that requires less time for non-electrical majors in higher education institutions. This course includes electrical engineering (the role and components of circuits, circuit analysis methods, transient analysis of circuits, capacitance, inductance, phase, and AC impedance); Analog circuits (semiconductor devices, basic amplification circuits, integrated operational amplification circuits, feedback in electronic circuits, DC stabilized power supply) and digital circuits (gate circuits and combination logic circuits, flip flops and sequential logic circuits, memory and programmable logic devices, conversion of analog and digital quantities), electrical and electronic measurement (digital instruments and virtual digital instruments, digital instrument programming), etc.

（3）Course Leaders:Dapeng Wang

5. 课程名称：高分子化学与物理

(1) 课程编码：3542081

(2) 课程简介：《高分子化学与物理》是新能源材料与器件本科生必修课程。其主要内容包括高分子化学与高分子物理的基本概念；各种类型聚合反应的机理、动力学特征、影响因素及实施方法；聚合物的化学反应特征、类型和应用；聚合物的多层次结构特点及模型；高分子的分子运动特点及主要物理、机械性能的基本概念、基本理论和基本研究方法；高分子固体、溶液的性质及相应的表征方法；高分子的电、热及光学性质等内容。通过本课程学习，为学生进一步学习高分子相关内容奠定必要的基础。

（3）课程负责人：邓字巍

5. Course Name: Polymer Chemistry and Physics

(1) Course Code: 3542081

(2) Brief Introduction of the Course: *Polymer Chemistry and Physics* is a compulsory course for undergraduate students majoring in New Energy Materials and Devices. Its main content includes the basic concepts of polymer chemistry and polymer physics; The mechanisms, kinetic characteristics, influencing factors and implementation methods of various types of polymerization reactions; Chemical reaction characteristics, types, and applications of polymers; The multi-level structural characteristics and models of polymers; The basic concepts, theories, and research methods of the molecular motion characteristics and main physical and mechanical properties of polymers; The properties and corresponding characterization methods of polymer solids and solutions; The electrical, thermal, and optical properties of polymers. Through this course, students will lay a necessary foundation for further learning polymer related content.

（3）Course Leaders:Ziwei Deng

6. 课程名称：能源电化学

(1) 课程编码：3542082

(2) 课程简介：《能源电化学》是新能源材料与器件本科专业的一门专业方向课程。本课程旨在使学生掌握电化学基本理论（包括电化学热力学和电化学动力学）和电化学测试方法（包括电化学实验的基本知识，稳态电化学测试方法、暂态测试方法）。课程在系统讲述电化学基本原理的基础上，理论联系实际，重点突出电化学基本原理在材料科学中特

别是化学电源中的应用，反应电化学在材料科学的综合性，边缘性和前瞻性。

(3) 课程负责人：陈煜

6. Course Name: Energy Electrochemistry

(1) Course Code: 3542082

(2) Brief Introduction of the Course: *Energy Electrochemistry* is a specialized course for undergraduate students majoring in New Energy Materials and Devices. This course aims to enable students to master the basic theories of electrochemistry (including electrochemical thermodynamics and kinetics) and electrochemical testing methods (including basic knowledge of electrochemical experiments, steady-state electrochemical testing methods, and transient testing methods). On the basis of systematically explaining the basic principles of electrochemistry, the course combines theory with practice, emphasizing the application of electrochemical principles in materials science, especially in chemical power sources. The comprehensive, marginal and forward-looking nature of reactive electrochemistry in materials science will also be revealed.

(3) Course Leaders: Yu Chen

7. 课程名称：能源存储材料与器件

(1) 课程编码：3542083

(2) 课程简介：《能源存储材料与器件》是新能源材料与器件专业的一门专业方向课程。本课程旨在培养学生在能源存储技术领域的专业素养和技能的核心课程。该课程以能源存储技术的基本原理、材料、器件和应用为主线，系统地介绍了各种能源存储材料的物理性质、化学性质、制备方法和在能源存储领域的应用前景。课程内容包括铅酸蓄电池、锂离子电池、超级电容器等各类能源存储器件的基本原理、结构、性能和制造工艺，以及能源存储系统的设计、优化和管理等方面的知识。通过本课程的学习，学生将掌握能源存储技术的基本理论和实践技能，为将来从事能源存储技术的研究、开发和应用打下坚实的基础。

(3) 课程负责人：李琪

7. Course Name: Energy Storage Materials and Devices

(1) Course Code: 3542083

(2) Brief Introduction of the Course: *Energy Storage Materials and Devices* is a professional course in the field of new energy materials and devices. This course aims to cultivate students' professional competence and skills in the field of energy storage technology. This course focuses on the basic principles, materials, devices, and applications of energy storage technology, systematically introducing the physical and chemical properties, preparation methods, and application prospects of various energy storage materials in the field of energy storage. The course content includes the basic principles, structures, performance, and manufacturing processes of various energy storage devices such as lead-acid batteries, lithium-ion batteries, and supercapacitors, as well as knowledge of the design, optimization, and management of energy storage systems. Through the study of this course, students will master the basic theories and practical skills of energy storage technology, laying a solid foundation for future research, development, and application of energy storage technology.

(3) Course Leaders: Qi Li

8. 课程名称：能源转换材料与器件

(1) 课程编码：3542084

(2) 课程简介：《能源转换材料与器件》是一门涵盖能量转换技术及其应用的核心课程。本课程的主要内容包括各种能源转换技术的基本原理、材料、设备和应用，包括太阳能、风能、水能和地热能转换技术。课程将重点介绍材料科学在能量转换过程中的作用，如高效转换材料的设计、制备和性能优化。此外，本课程还将涵盖能量转换装置的基本原理、结构和特性，以及它们在可再生能源系统中的应用和优化。通过本课程的学习，学生将能

够理解和掌握能源转换技术的基本理论和实践技能，为未来能源转换技术研究、开发和应用奠定坚实的基础。

(3) 课程负责人：杨周

8. Course Name: Energy Conversion Materials and Devices

(1) Course Code: 3542084

(2) Brief Introduction of the Course: *Energy Conversion Materials and Devices* is a core course covering energy conversion technologies and their applications. The main content of this course includes the basic principles, materials, devices, and applications of various energy conversion technologies, including solar, wind, water, and geothermal energy conversion technologies. The course will focus on the role of materials science in energy conversion processes, such as the design, preparation, and performance optimization of high-efficiency conversion materials. Additionally, the course will cover the basic principles, structures, and properties of energy conversion devices, as well as their applications and optimizations in renewable energy systems. Through the study of this course, students will be able to understand and master the basic theory and practical skills of energy conversion technologies, laying a solid foundation for future research, development, and application in energy conversion technologies.

(3) Course Leaders: Zhou Yang

9. 课程名称：纳米材料学

(1) 课程编码：3542036

(2) 课程简介：《纳米材料学》是新能源材料与器件专业的一门专业方向课程。纳米技术和纳米材料科学是 20 世纪 80 年代末发展起来的新兴学科。由于纳米材料具有许多传统材料无法媲美的奇异特性和非凡的特殊功能，因此在各行各业中将有空前的应用前景，它将成为 21 世纪新技术革命的主导中心。本课程系统的介绍纳米材料和纳米结构。其中包括：纳米科技的基本概念和内涵，纳米材料的研究对象和发展历史，团簇、纳米颗粒、碳纳米管、纳米线、纳米带、纳米电缆、纳米片、纳米方块等纳米结构单元的结构与制备，纳米微粒的基本理论，纳米微粒的结构与物理化学特性。

(3) 课程负责人：杨合情

9. Course Name: Nano-structured Materials

(1) Course Code: 3542036

(2) Brief Introduction of the Course: *Nano-structured Materials* is a selective course for New Energy Materials and Devices Profession in School of Materials Science and Engineering. Nano-technologies or Nano-materials science is a discipline developed in the 1980s. Because Nano-materials have many remarkable special functions comparable to the traditional materials, it will have unprecedented prospect and become leading centers of the new technological revolution in 21st century. This course covers a systematic introduction of Nano-materials and Nano-structures. It is divided into three parts. The first part gives an introduction of the concept and development history of nanotechnology and Nano-materials. The second part emphasizes the structure, properties and preparation of Nano-structural unit such as clusters, Nano-particles, carbon Nano-tubes, Nano-wires, Nano-patch, Nano-square, Nano-cables, etc. The last part shows the fundamentals of nano-materials.

(3) Course Leaders: Heqing Yang

10. 课程名称：薄膜材料与制备技术

(1) 课程编码：3542046

(2) 课程简介：薄膜材料与制备技术的应用范围极为广泛，从大规模集成电路、平板显示器、信息记录与存储、传感器、固体照明、太阳能电池到材料的表面改性等，涉及高新技术产业的各个领域。本课程主要分为两部分：薄膜材料和薄膜器件。薄膜材料部分主要讲述薄膜制备技术、薄膜生长与薄膜结构、薄膜的性质及分析方法、薄膜的表面改性及

薄膜材料的分类、性质及应用。薄膜器件部分主要讲述集成电路、传感器、存储器、晶体管、激光器、显示与照明器件及太阳能电池等薄膜器件的原理、结构及应用。该课程的主要任务是使学生掌握薄膜材料与器件的相关基础知识，为以后在相关领域的学习和研究打下基础。

(3) 课程负责人：王强

10. Course Name: Thin Film Materials and Technology

(1) Course Code: 3542046

(2) Brief Introduction of the Course: Thin film materials and technology have a wide range of applications in the high technology industry, such as large-scale integrated circuits, flat panel displays, information recording and storage, sensors, solid state lighting, solar cells, and the surface modification of materials. This course contains two parts: thin film materials and thin film devices. The first part illustrates thin film preparation techniques, the growth and structure of thin films, the properties and characterization of thin films, the surface modification of thin films, and the classifications, properties, and applications of thin film materials. The second part elucidates the principles, structures, and applications of thin film devices, such as integrated circuits, sensors, memories, transistors, lasers, display and lighting devices, and solar cells. This course aims to make the students master the elementary knowledge of thin film materials and devices, laying a solid foundation for future study and research in related fields.

(3) Course Leaders: Qiang Wang

11. 课程名称：光电检测技术

(1) 课程编码：3542086

(2) 课程简介：《光电检测技术》是一门实用性较强的技术应用基础课，本课程主要讲述光电检测理论基础知识以及光电检测的结构组成、设计思路和应用特点。叙述了光电检测过程中常用的光源、各种性能的探测器和光外差检测技术。主要内容包括光电检测过程中涉及的基础知识和基本定律、光电检测系统中常用光源的工作原理和特性特征、以光电导效应和光伏效应为基础的光敏电阻，光电二极管，光电三极管等器件的工作原理和特性参数、真空光电器件和真空摄像器件、红外辐射和红外探测器件、光导纤维的结构特性和传光原理、光纤传感器的结构和应用、太赫兹波的产生，检测和应用技术及其发展现状等知识内容。通过本课程的学习，使学生了解和掌握光电转换的基本原理及光电检测技术所必需的各种知识，了解和掌握常用光电测量方法及常用测量仪器的使用，具备进行各种基本光电测量所需技能和设计光电检测电路的能力。

(3) 课程负责人：王大鹏

11. Course Name: Optoelectric Detection Technology

(1) Course Code: 3542086

(2) Brief Introduction of the Course: *Optoelectric Detection Technology* is a basic technical course for practical applications, and this course focuses on the basic theory of photoelectric detection and photoelectric detection of the composition of the structure, design ideas and application characteristics. In this course, the commonly used light sources, various performance detectors, and optical heterodyne detection technology are described. The main contents include the photoelectric detection process involves the basic knowledge and basic law, the working principle and characteristics of commonly used light source in the photoelectric detection system, photoconductive effect and photovoltaic effect based photosensitive resistance, photodiode, photoelectric triode parameters, the working principle and characteristics of vacuum devices and vacuum devices, photoelectric camera infrared radiation and infrared detection device, the optical fiber structure characteristics and transmission principle, structure and application of optical fiber sensors, THz wave generation, detection and application of the technology and development of knowledge. The course intends to make student understand the basic principle of photoelectric conversion and all the necessary knowledge of photoelectric detection technology, grasp the

commonly used photoelectric measuring method and common measuring instrument, and train the ability for the design and measurement of photoelectric detection circuit.

(3) Course Leaders: Dapeng Wang

12. 课程名称：光电子技术

(1) 课程编码：3542087

(2) 课程简介：光电子技术是现代高科技工业的基础，涉及光显示、光存储、激光、光伏等领域，是未来信息和太阳能产业的核心技术。本课程主要包括光学基础、光和物质作用原理和光电子器件的制备。在光学基础部分将主要讲授光的本质、光的波动性描述方法-麦克斯韦方程组、光的传播。在光和物质作用原理中主要讲授物质的能级能带结构、物质的光吸收和发射过程、光-电和电-光转换原理。光电子器件中主要讲授光电探测器、太阳能电池、LED 及激光等器件结构及这些器件的制备工艺。该课程的主要任务是使学生理解光和物质作用的基本原理、光电子器件的工作原理，熟练掌握光电子器件的结构和设计制备工艺，为设计、开发新型的光电子器件打下基础。

(3) 课程负责人：万仁刚

12. Course Name: Optoelectronic Technology

(1) Course Code: 3542087

(2) Brief Introduction of the Course: Optoelectronics is the foundation of modern high technologies, including display, optical storage, laser, photovoltaics and so on. It is the core technology of the future information and solar cell industry. This course contains three parts: the basic of optics, the interaction of light and matter, and the fabrication of optoelectronic devices. The first part will illustrate the nature of light, Maxwells equations, and the propagation of light. The second part will prelect the energy level and energy band of matters, light absorption and emission processes, and the conversion between light and electricity. In the last part, the structures and fabrication of optoelectronic devices including photodetector, solar cell, LED and laser will be introduced. The students are expected to master the principles of light-matter interaction and optoelectronic devices, and be familiar with the structures and fabrication processes of optoelectronic devices, forming a solid foundation for future development of new optoelectronic devices.

(3) Course Leaders: Rengang Wang

13. 课程名称：无机层状材料的制备与能源存储

(1) 课程编码：3542089

(2) 课程简介：无机层状材料的制备与能源存储课程是一门介绍无机层状材料的合成、性质和应用，以及其在能源存储领域的应用前景的课程。该课程将重点介绍无机层状材料的制备方法、结构特点和性能优化，以及其在锂离子电池、超级电容器等能源存储器件中的应用。课程将通过实验和实践环节，让学生了解无机层状材料的合成和表征方法，掌握其性能测试和优化技术，并了解能源存储器件的设计和制造过程。通过本课程的学习，学生将能够掌握无机层状材料的制备技术和能源存储器件的应用，为将来从事相关领域的研究、开发和应用打下坚实的基础。

(3) 课程负责人：刘宗怀

13. Course Name: Preparation of Inorganic Materials with Layered Structure and Energy Storage

(1) Course Code: 3542089

(2) Brief Introduction of the Course: *Preparation of Inorganic Materials with Layered Structure and Energy Storage* is a course introducing the synthesis, properties, and applications of inorganic layered materials, as well as their application prospects in the field of energy storage. This course will focus on the preparation methods, structural characteristics, and performance optimization of inorganic layered materials, as well as their applications in energy storage devices

such as lithium-ion batteries and supercapacitors. Through experiments and practical sessions, students will gain an understanding of the synthesis and characterization methods of inorganic layered materials, master their performance testing and optimization techniques, and learn about the design and manufacturing processes of energy storage devices. Through this course, students will be able to master the preparation techniques of inorganic layered materials and the applications of energy storage devices, laying a solid foundation for future research, development, and application in related fields.

(3) Course Leaders: Zonghuai Liu

14. 课程名称：储能用碳基纳米材料

(1) 课程编码：3542090

(2) 课程简介：储能用碳基纳米材料课程是一门介绍碳基纳米材料在储能领域的应用和研究的课程。该课程将介绍碳基纳米材料的种类、制备方法和性能特点，以及其在电化学储能器件（如锂离子电池、超级电容器等）中的应用。课程将重点讲解碳基纳米材料在储能过程中的作用机制、性能优化和改性方法，以及相关的电极材料设计、制备和表征技术。此外，课程还将介绍储能用碳基纳米材料的研究前沿和发展趋势，以及其在新能源领域的应用前景。通过实验和实践环节，学生将有机会亲身操作和体验碳基纳米材料的制备和表征过程，加深对理论知识的理解和应用。本课程旨在培养学生对储能用碳基纳米材料的研究兴趣和应用能力，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人：雷志斌

14. Course Name: Carbon-based Nanomaterials for Energy Storage

(1) Course Code: 3542090

(2) Brief Introduction of the Course: *Carbon-based Nanomaterials for Energy Storage* is a course introducing the applications and research of carbon-based nanomaterials in the field of energy storage. This course will introduce the types, preparation methods, and performance characteristics of carbon-based nanomaterials, as well as their applications in electrochemical energy storage devices such as lithium-ion batteries and supercapacitors. The course will focus on the mechanism of action, performance optimization, and modification methods of carbon-based nanomaterials in energy storage processes, as well as related electrode material design, preparation, and characterization techniques. Additionally, the course will introduce the research frontiers and development trends of carbon-based nanomaterials for energy storage, as well as their application prospects in the field of new energy. Through experiments and practical sessions, students will have the opportunity to personally operate and experience the preparation and characterization processes of carbon-based nanomaterials, deepening their understanding and application of theoretical knowledge. This course aims to cultivate students' research interest and application capabilities in carbon-based nanomaterials for energy storage, providing support for their research and development work in related fields.

(3) Course Leaders: Zhibin Lei

15. 课程名称：化合物太阳能电池材料与器件

(1) 课程编码：3542091

(2) 课程简介：化合物太阳能电池材料与器件课程是一门专注于化合物太阳能电池的原理、材料、器件结构和性能的课程。该课程将介绍太阳能电池的基本原理、光电转换过程以及太阳能电池的效率与性能参数。在此基础上，课程将深入探讨化合物太阳能电池的特殊性质，包括吸光材料、异质结构、电荷传输和收集等。此外，课程还将涉及化合物太阳能电池的材料合成、器件制备技术以及优化方法。通过实验和实践环节，学生将有机会探索化合物太阳能电池的实际应用和前沿研究，并培养解决实际问题的能力。本课程旨在培养学生对化合物太阳能电池领域的兴趣和专业基础知识，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人: 赵奎

15. Course Name: Carbon-based Nanomaterials for Energy Storage

(1) Course Code: 3542091

(2) Brief Introduction of the Course: *Compound Solar Cell Materials and Devices* is a course dedicated to the principles, materials, device structures, and properties of compound solar cells. This course will introduce the basic principles of solar cells, the photoelectric conversion process, and the efficiency and performance parameters of solar cells. On this basis, the course will delve into the special properties of compound solar cells, including absorption materials, heterojunction structures, charge transport and collection, and more. Additionally, the course will cover material synthesis, device preparation techniques, and optimization methods for compound solar cells. Through experiments and practical sessions, students will have the opportunity to explore the practical applications and cutting-edge research of compound solar cells, and cultivate their ability to solve practical problems. This course aims to develop students' interest and expertise in the field of compound solar cells, providing support for their research and development work in related fields.

(3) Course Leaders: Kui Zhao

III 专业拓展课程简介 (Specialized Development Courses)

1. 课程名称: 科学教育经典文献选读

(1) 课程代码: 3543054

(2) 课程简介: 《科学教育经典文献选读》是一门专业选修课。主要内容包括四个方面: 一是国内外高质量科学教育期刊与文献检索方法介绍; 二是文献阅读方法介绍, 帮助学生掌握不同类型科学教育文献的篇章结构、阅读步骤和关键信息提取; 三是国内外经典文献与最新科学教育文献阅读和主题梳理, 旨在引导学生了解科学教育研究的最新进展与发展趋势, 并学会围绕特定主题进行文献综述; 四是基于文献综述的问题提出, 旨在培养学生用批判性精神阅读已有研究并创造性地提出研究问题与解决思路。

(3) 课程负责人: 郭习佩

1. Course Name: Reading Classical Literature in Science Education

(1) Course Code: 3543054

(2) Brief Introduction of the Course: “Reading Classical Literature in Science Education” is a professional elective course. The main contents include four aspects: ①the introduction of domestic & foreign high-quality science education journals and literature search methods; ②the introduction of literature reading methods to help students master the chapter structure, reading steps, and key information extraction of different types of science education literature; ③the science education literature reading and theme combing. It aims to guide students to understand the latest progress and trend of science education research, further learn to conduct literature review around specific topics; ④the problem formulation based on literature review, which aims to cultivate students to read the existing research in a critical spirit and creatively put forward research problems and solution ideas.

(3) Course Leaders: Xipei Guo

2. 课程名称: 现代化学专题

(1) 课程代码: 3543055

(2) 课程简介: 《现代化学专题》是一门针对科学教育专业学生开设的课程, 旨在深入探讨现代化学的前沿领域和重要概念。本课程涵盖了化学领域的多个方面, 包括但不限于化学结构与性质、化学键与分子构型、化学反应动力学、催化剂与反应机制、材料化学与纳米技术等。学生将通过理论学习、实验探究以及案例分析等方式, 全面了解化学领域的最新进展和研究动态, 培养其扎实的化学基础、科学思维和实验操作能力。

(3) 课程负责人: 李建锋

2.Course Name: Special Topics in Modern Chemistry

(1) Course Code: 3543055

(2) Brief Introduction of the Course: Special Topics in Modern Chemistry is a course designed for students majoring in science education, aiming to delve into the frontier areas and important concepts of modern chemistry. This course covers various aspects of chemistry, including but not limited to chemical structure and properties, chemical bonding and molecular configuration, chemical reaction kinetics, catalysts and reaction mechanisms, materials chemistry and nanotechnology, etc. Through theoretical study, experimental exploration, and case analysis, students will comprehensively understand the latest developments and research trends in the field of chemistry, cultivate their solid foundation in chemistry, scientific thinking, and practical laboratory skills.

(3) Course Leaders:Jianfeng Li

3. 课程名称: 现代物理专题

(1) 课程代码: 3543056

(2) 课程简介: 这门课是高等学校工科专业的一门研究自然科学和工程技术的基础课程。本课程包括振动与波(单摆和复摆、双簧管音色、薄板控制噪声、驻波)、光学(激光陀螺仪、光的相干性、光栅原理)、热学(铀浓缩原理、真空度、熵与绝热)、量子物理(地球温暖、恒星命运预测)、质点力学(阿特伍德机作用、汽车驾乘人安全力学、动量迁移)、刚体(物体极限转速、转速与受力模型、空速管系统)、相对论(狭义相对论中佯谬问题、相对论与导航系统、时空的形状)、电磁场(大气中的电现象、场致发射显微镜、无线充电、磁透镜的聚焦原理)。

(3) 课程负责人: 王大鹏

3. Course Name: Special Topics in Modern Physics

(1) Course code: 3543056

(2) Brief introduction of the course: It is a fundamental course in the study of natural sciences and engineering technology for engineering majors in higher education institutions. This course includes vibration and waves (pendulum and compound pendulum, oboe sound, thin plate controlled noise, standing waves), optics (laser gyroscope, coherence of light, grating principle), thermodynamics (uranium enrichment principle, vacuum degree, entropy and adiabation), quantum physics (Earth warmth, stellar fate prediction), particle mechanics (Atwood machine effect, safety mechanics for drivers and passengers, momentum transfer), rigid bodies (object limit speed, speed and force model, airspeed tube system), relativity (paradox problem in special relativity, relativity and navigation system, shape of time and space), and electromagnetic fields (electrical phenomena in the atmosphere, field emission microscopy, wireless charging, the focusing principle of magnetic lenses).

(3) Course Leaders:Dapeng Wang

4. 课程名称: 稀土发光材料

(1) 课程编码: 3543032

(2) 课程简介: 《稀土发光材料》是一门专业拓展课程,本课程旨在使学生掌握稀土离子发光的基础知识和基本原理,其由以下两方面内容组成:一、发光的基本原理和机制,包括激发态吸收、能量传递、辐射跃迁、无辐射跃迁等。二、发光材料的制备及其应用:稀土上转换材料及其发光机理、长余辉材料、电致发光材料等。课程在系统讲述稀土发光材料机理的基础上,理论联系实际,重点突出稀土发光材料在材料科学中特别是在生物医学及太阳能电池领域的应用,反映稀土发光材料在材料科学的综合性,边缘性和前瞻性。

(3) 课程负责人: 石峰

4. Course Name: Rare Earth Luminescent Materials

(1) Course Code: 3543032

(2) Brief Introduction of the Course: *Rare Earth Luminescent Materials* is one specialized development course. It mainly includes two parts: a) The basic principle of luminescence and mechanisms: excited state absorption, energy transfer, radiative transition, nonradioactive transition and so on. b) The preparation of luminescent materials and their applications: rare earth conversion materials and luminescence mechanisms, long persistence phosphors, electroluminescent materials. This course aims to master relevant fundamental knowledge and basic theory of rare earth luminescent materials. Linking theory with practice, it is emphasized on the practical applications of the fundamental theory of rare earth luminescent materials in materials science, especially in biomedicine and solar cell, presenting the comprehensiveness, marginality and perceptiveness of rare earth luminescent materials.

(3) Course Leaders: Feng Shi

5. 课程名称：传感材料与技术

(1) 课程编码：3543040

(2) 课程简介：纳米传感技术是纳米材料和传统传感技术交叉渗透而形成的一个新领域，它在航天、机械、仪器仪表、汽车制造、油气勘探、电子工程及医疗器械行业都有广泛用途，被欧盟评为对未来影响最大的六项前沿技术之一。本课程主要介绍纳米敏感材料与传感技术的基本概念、分子识别元件及其生物和化学反应基础。重点介绍电导型半导体氧化物纳米传感器、电化学传感器、纳米结构分子印迹化学/生物微纳传感器、电导型 DNA 及其复合纳米材料传感器、纳米材料化学发光传感器的原理。

(3) 课程负责人：贾丽超

5. Course Name: Materials and Technologies of Sensors

(1) Course Code: 3543040

(2) Brief Introduction of the Course : Nanosensor technology is a new emerging interdisciplinary of nanomaterials and traditional sensing technology. It has been widely used in space, machinery, instrument, automobile manufacturing, oil and gas exploration, electronic engineering and medical instrument industry. This course introduces the basic concepts of nanomaterials and sensing technology, molecular recognition components and their reaction basis of biology and chemistry. This course is mainly focus on the principle of conductivity type semiconductor oxide nanosensor, electrochemical sensor, nanostructured molecular imprinted chemical/biosensor, conductivity DNA and its composite nanomaterial sensor, nanomaterial chemiluminescence sensor.

(3) Course Leaders: Lichao Jia

6. 课程名称：胶体化学与界面

(1) 课程编码：3543035

(2) 课程简介：胶体化学与界面课程是一门研究胶体和界面现象的化学学科。该课程将介绍胶体化学与界面科学的基本概念、原理和方法，包括分散体系、表面活性剂、胶体稳定性、界面吸附等。此外，课程还将深入探讨各种实际应用，如涂料、化妆品、石油工业、生物医学等领域的胶体和界面现象。通过实验和实践环节，学生将有机会探索胶体和界面的制备、表征和性能测试过程，培养解决实际问题的能力。本课程旨在培养学生对胶体化学与界面科学的兴趣和专业基础知识，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人：沈淑坤

6. Course Name: Colloid Chemistry and Interface

(1) Course Code: 3543035

(2) Brief Introduction of the Course: *Colloid Chemistry and Interfacial Science* is a branch of chemistry that studies colloid and interface phenomena. This course will introduce the basic concepts, principles, and methods of colloid chemistry and interfacial science, including

dispersion systems, surfactants, colloid stability, and interfacial adsorption. Additionally, the course will delve into various practical applications, such as coatings, cosmetics, the petroleum industry, biomedicine, and other fields involving colloid and interface phenomena. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of colloids and interfaces, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of colloid chemistry and interfacial science, providing support for their research and development work in related fields.

(3) Course Leaders: Shukun Shen

7. 课程名称：光催化材料与技术

(1) 课程编码：3543052

(2) 课程简介：光催化材料与技术课程是一门介绍光催化材料及其在能源、环境等领域应用的课程。该课程将重点介绍光催化材料的原理、制备、性能和应用，包括光催化材料的基本性质、光催化反应机制、光催化材料的合成与改性等方面的知识。此外，课程还将深入探讨光催化技术在分解水制氢、污染物降解、太阳能转换等领域的应用，以及面临的挑战和未来的发展方向。通过实验和实践环节，学生将有机会探索光催化材料的制备、表征和性能测试过程，培养解决实际问题的能力。本课程旨在培养学生对光催化材料与技术的兴趣和专业基础知识，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人：闫俊青

7. Course Name: Photocatalytic Materials and Technology

(1) Course Code: 3543052

(2) Brief Introduction of the Course: *Photocatalytic Materials and Technology* is a course that introduces photocatalytic materials and their applications in energy, environment, and other fields. This course will focus on the principles, preparation, properties, and applications of photocatalytic materials, including basic properties of photocatalytic materials, photocatalytic reaction mechanisms, synthesis and modification of photocatalytic materials. Additionally, the course will delve into the applications of photocatalytic technologies in areas such as water splitting for hydrogen production, pollutant degradation, solar energy conversion, as well as challenges and future perspective. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of photocatalytic materials, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of photocatalytic materials and technology, providing support for their research and development work in related fields.

(3) Course Leaders: Junqing Yan

8. 课程名称：有机光电材料与器件导论

(1) 课程编码：3543041

(2) 课程简介：《有机光电材料与器件导论》旨在使学生了解有机光电材料与器件这一新兴领域，并熟悉相关基础知识与基本理论。主要内容包括有机（包括小分子和聚合物）半导体的基本知识、有机光电材料的分子结构、导电与发光机理、有机光电器件的分类与工作原理以及有机光电材料在有机发光二极管和发光电化学池、有机太阳能电池、有机场效应晶体管、有机存储器、有机生物化学传感器、有机光泵浦激光器以及有机非线性光学材料等方面的应用。

(3) 课程负责人：胡鉴勇

8. Course Name: Introduction to Organic Optoelectronic Materials and Devices

(1) Course Code: 3543041

(2) Brief Introduction of the Course: This course is intended to introduce the new field of organic optoelectronic materials and devices to students and acquaint them with relevant

fundamental knowledge and basic theory. The course includes the foundation knowledge of organic semiconductors (small molecules and polymers), the molecular structure of organic optoelectronic materials, conductive and light-emitting mechanism, classification and the principles of diverse organic optoelectronic devices, and the applications of organic optoelectronic materials in the devices, such as organic light-emitting diodes, emitting electrochemical cells, organic solar cells, organic field-effect transistors, organic memories, organic biochemical sensors, organic optical pumped lasers, and organic non-linear optical materials, etc.

(3) Course Leaders: Jianyong Hu

9. 课程名称：材料科学前沿进展

(1) 课程代码：3543057

(2) 课程简介：《材料科学前沿进展》是高等学校材料学专业基础课程之一。本课程结合材料与人类文明发展历史，介绍包括现代功能玻璃、功能陶瓷、纳米材料、金属材料、高分子材料、生物医用材料、能源材料、催化材料、光电材料、碳材料等不同前沿材料。通过本课程学习，学生将了解材料如何影响我们生活，新材料的概况、制备生产及应用，以及材料科学的未来及发展方向。

(3) 课程负责人：向万春

9. Course Name: Frontiers of material Science

(1) Course code: 3543057

(2) Brief introduction. Frontiers of material Science is one of the fundamental courses for students majoring in materials. Combining materials with the evolution of human civilization, this course contains modern functional glass, functional ceramics, nanomaterials, metal, polymers, biomedical materials, energy materials, catalytic materials, optoelectronic materials, carbon materials, etc. Through learning this course, students can know how materials affect our daily lives, the updated information of different materials, and their manufacturing and applications. Students can also know the future of the development of material science.

(3) Course Leaders: Wanchun Xiang

10. 课程名称：材料的力学性能

(1) 课程编码：3543036

(2) 课程简介：《材料的力学性能》是一门专业拓展课程。本课程主要介绍材料在力、能量、环境和时间单独或复合作用下，材料力学行为的响应规律、物理本质、评定方法、测试方法和工程应用。所涉及的内容主要有四部分：材料的基本力学性能，包括弹性、塑性，形变强化、强度、韧性和硬度等；断裂的抗力及其表征，主要包括断裂韧性、脆断的微观机制、缺口件的断裂和冲击能量作用下的断裂；与时间有关的失效机理和抗力，主要有疲劳、蠕变、应力腐蚀和氢脆、摩擦与磨损及接触疲劳等。

(3) 课程负责人：孙颀

10. Course Name: Mechanical Properties of Materials

(1) Course Code: 3543036

(2) Brief Introduction of the Course: *Mechanical Properties of Materials* is a professional development course. This course mainly introduces the response law, physical nature, evaluation method, test method and engineering application of mechanical behavior of materials under the action of force, energy, environment and time alone or in combination. Four main parts are involved in this course: the basic mechanical properties of the material, including elasticity, plasticity, deformation strengthening, strength, toughness and hardness; the resistance of the fracture and its characterization, including fracture toughness, microscopic mechanism of brittle fracture, fracture of the notched piece and under impact energy; time-dependent failure mechanism and resistance, mainly including fatigue, creep, stress corrosion and hydrogen embrittlement, friction, wear and contact fatigue.

(3) Course Leaders: Jie Sun

11. 课程名称：材料的相变原理

(1) 课程编码：3543037

(2) 课程简介：《材料的相变原理》是一门专业拓展课程。本课程是《材料科学基础》中凝固和相图理论的拓展和延伸，主要以材料相变的基本原理为出发点，从材料相变过程的热力学、动力学和晶体学角度论述各类典型材料相变过程中的基本规律，并对相变研究的前沿领域进行简要介绍和展望。本课程的主要内容包括：① 材料相变的分类和基本规律（相变热力学、动力学和晶体学）；② 液-固相变的基本理论（凝固、熔化和过热）；③ 固态相变的基本理论（扩散型相变、无扩散型相变和二级相变）；④ 纳米材料相变简介。

(3) 课程负责人：孙颀

11. Course Name: Phase Transformation Mechanisms of Materials

(1) Course Code: 3543037

(2) Brief Introduction of the Course: *Phase Transformation Mechanisms of Materials* is a professional development course. This course is an extension of the theory of solidification and phase diagram in the course of "Fundamentals of Materials Science". It mainly takes the basic principle of material phase transition as the starting point, discussing the basic laws of various typical phase transformations from the perspectives of thermodynamics, dynamics and crystallography. Moreover, brief introduction and prospective on the frontier research field of phase transformation are also involved in this course. The main contents include: ① Classification and basic laws of phase transition of materials (phase transition thermodynamics, kinetics and crystallography); ② Basic theory of liquid-solid phase transition (solidification, melting and superheating); ③ Basic theory of solid state phase transition (diffusion phase transition, non-diffusion phase transition and secondary phase transition); ④ Introduction to phase transition in nanomaterials.

(3) Course Leaders: Jie Sun

12. 课程名称：二维原子晶体材料与器件

(1) 课程编码：3543031

(2) 课程简介：《二维原子晶体材料与器件》是一门专业拓展课。本课程旨在使学生了解二维原子晶体材料与器件这一前沿领域，并熟悉相关基础知识与基本理论，激发学生科学研究兴趣。课程主要内容包括二维原子晶体材料；二维原子晶体材料的种类和制备方法、结构和性质；二维原子晶体材料光电器件的种类与工作原理；二维原子晶体材料在光电探测、场效应晶体管、存储器件、逻辑电路和传感等电子原器件中的应用；二维原子晶体材料的发展前景、问题与挑战。

(3) 课程负责人：徐华

12. Course Name: Two-dimensional Atomic Crystal and Device

(1) Course Code: 3543031

(2) Brief Introduction of the Course: *Two-dimensional Atomic Crystal and Device* is one professional development courses. This course is intended to introduce the frontier field of two-dimensional atomic crystal materials and devices to students and acquaint them with relevant fundamental knowledge and basic theory, and excite their interest to scientific research. The course includes the foundation knowledge of two-dimensional atomic crystal materials; the classification, preparation, property and preparation of two-dimensional atomic crystal materials; classification and the principles of diverse two-dimensional atomic crystal optoelectronic devices, and the applications of two-dimensional atomic crystal optoelectronic materials in the devices, such as photodetector, field-effect transistors, memory, logical circuit, sensor; the prospect, problem and challenge of the two-dimensional atomic crystal materials.

(3) Course Leaders: Hua Xu

(三) 专业技能模块 (Professional Skills Courses)

必修课 (Compulsory Courses)

1. 课程名称: 新能源材料与器件综合实训

(1) 课程编码: 3545010

(2) 课程简介: 《新能源材料与器件综合实训》是新能源材料与器件专业本科生的必修课。该实验是在《微结构与物理性能实验》《新能源材料制备与器件组装》等专业实验基础上, 开设的综合性实验。课程内容包括太阳能光伏发电系统、光催化分解水制氢实验、锂离子电池组装工艺、有机发光二极管等相关的四个方面实验。该课程是以组装器件及评价性能为目标, 实现涵盖从原材料制备到功能化器件组装与性能评价等整个过程。通过学习本实验, 使学生亲历新能源材料制备与应用整个过程, 提高学生综合运用所学知识 with 技能的能力, 深刻理解材料组成及结构对性能的影响、器件组成工艺在发挥材料功能中的重要性。同时, 利用所学理论知识和技能实现实际应用是本实验的最大特点, 该特点对激发学生的专业学习积极性发挥重要作用。

(3) 课程负责人: 陈沛

1. Course Name: Comprehensive Experiments in New Energy Materials and Devices

(1) Course Code: 3545010

(2) Brief Introduction of the Course: *Comprehensive Experiments in New Energy Materials and Devices* is a compulsory course for New Energy Materials and Devices Profession. This course is a professional experiment after finish of the experiments on "Microstructure and Physical Properties" and "Preparation and Characterization of New Energy Materials". This course includes four parts of photovoltaics, lithium battery, super-capacitors and organic light-emitting diodes. The experimental contents mainly focused on mounted devices and evaluation of performances. Through these experiments, the students can experience on the whole process from materials synthesis to the device fabrications, and enhance the ability of students in comprehensive applications of learned knowledge and skills, and understand the role of device mounting in function of materials. Additionally, the marked characteristic of this course is to apply theory and skills in practice. the characteristics of active learning to stimulate students' professional play an important role, and this feature plays an important role in stimulating enthusiasm of professional learning for students.

(3) Course Leaders: Pei Chen

2. 课程名称: 新能源材料制备与器件组装

(1) 课程编码: 3546007

(2) 课程简介: 《新能源材料制备与器件组装》是新能源材料与器件专业本科生的必修课。该课程是在相关理论课学习基础上进行的专业实验。本课程包含光伏材料的制备与性能测试、锂离子材料制备与性能测试, 超电器电极材料制备与性能测试、液晶材料制备与性能测试以及太阳能光催化有机物降解等五个部分。通过本实验, 使学生掌握与光伏材料与器件、锂离子电池及超级电容器、有机光电材料与器件等相关的关键材料制备、材料组成及结构表征、材料物理性质测试、器件性能评价等方法与技术, 深化对新能源材料及应用相关原理及理论的认知。本课程开设 12 个单元实验, 共 90 学时。

(3) 课程负责人: 杨周

2. Course Name: Preparation and Characterization of New Energy Materials

(1) Course Code: 3546007

(2) Brief Introduction of the Course: *Preparation and device assembly of New Energy Materials* is a compulsory course for New Energy Materials and Devices Profession. This course is a professional experiment after study of relative theory courses. This course includes preparations and characterizations related to photovoltaic materials, lithium-ion battery, ultracapacitor, organic light emitting device, and photocatalytic dye degradation. Through the

experiments, students can grasp the preparation and characterization methods of new energy materials. These experiments are favorable for students not only to understand basic principles and theories related to structures and characterizations of new energy materials but also to enhance their interest in studying specialty. There are 12 experiments in this course, and spending 90 hours.

(3) Course Leaders: Zhou Yang

3. 课程名称：微结构与物理性能实验

(1) 课程编码：3544014

(2) 课程简介：《微结构与性能表征实验》是材料化学专业的一门专业必修课程。主要包括利用扫描电镜、透射电镜、X 射线衍射、拉曼光谱和物理吸附仪等对纳米材料、介孔材料和陶瓷材料的组成、形貌、尺寸以及晶体结构进行表征分析，确定其微结构。同时，还开展纳米材料、介孔材料和陶瓷材料的光学性能、导电性能、磁学性能、铁电与压电性能等的测试实验。使学生掌握材料结构表征以及物理性能测试方法与原理，了解相关仪器的使用方法。

(3) 课程负责人：苟婧

3. Course Name: Experiments in Micro-structure and Properties of Materials

(1) Course Code: 3544014

(2) Brief Introduction of the Course: *Experiments in Micro-structure and Properties of Materials* is a compulsory course for chemistry material majors. The aim of this course is to let the students know the principle and method of characterizing the structure and physical properties of materials, as well as the operation method of the related instruments. The composition, morphology, size and the structure of crystal are characterized using techniques of scanning electron microscope, transmission electron microscope, Raman spectrum and nitrogen physisorption, etc. The properties of materials (i.e., Nano-materials, mesoporous materials and ceramic materials) would be analyzed, for example, optical properties, conductivity, magnetics, ferroelectric and piezoelectric properties.

(3) Course Leaders: Jing Gou

4. 课程名称：新能源器件设计与制造工艺

(1) 课程编码：3546005

(2) 课程简介：该课程由以下四部分组成。

(a) 科研实践项目（2 学分）：学生在学期间，须在导师指导下，申请并主持国家级、省级、校级大学生创新性项目、材料学子创新基金、勤助科研项目等。在项目支持下，进入导师的实验室进行科研训练并顺利完成项目者，可获得 2 个学分。参加国家级项目的前三人认定相同学分，非国家级项目前两人认定相同学分；

(b) 企业高管讲座（1 学分）：在学期间，学生参加不少于 5 次的企业高管讲座报告，报告结束后，撰写 500 字左右的讲座内容及心得体会；

(c) 毕业论文（设计）准备阶段（1 学分）：学生毕业论文（设计）的调研准备阶段。

(3) 课程负责人：孙颀

4. Course Name: Design and Fabrication Technology of New Energy Devices

(1) Course Code: 3546006

(2) Brief Introduction of the Course: This course consists of the following four parts:

(a) Research Practice Project (2 credits): During the semester, students must apply for and host national, provincial and university level innovative projects for college students, "students in materials science" innovation funds and research assistance projects under the guidance of their supervisors. Under the support of the project, those who enter the supervisor's laboratory for scientific research training and successfully complete the project can earn 2 credits. The first three participants in national level projects are recognized for the same credits, while the first two

participants in non-national level projects are recognized for the same credits;

(b) Corporate Executive Lecture (1 credit): During the semester, students participate in no less than 5 corporate executive lecture reports. After the reports are completed, students should write about 500 words of lecture content and reflections;

(c) Graduation thesis (design) preparation stage (1 credit): The research preparation stage for students' graduation thesis (design).

(3) Course Leaders: Jie Sun

5. 课程名称：研究方法与学术论文写作

(1) 课程编码：3541006

(2) 课程简介：《研究方法与学术论文写作》指导是本科生的一门必修课。通过该课程学习，使学生较全面地了解科学研究的一般方法以及提高运用这些方法能力的途径。掌握多种形式学术论文的一般写作规范，提高学生学术论文写作能力，为将来撰写不同形式学术论文打下一定的基础，以适应研究型人才培养需求。为达到此目的，该课程将主要涉及两个方面的内容：一是研究方法：主要包括科学方法论、近代科学研究方法特点、复杂性科学研究方法论纲和典型科学研究方法解析等内容。二是学术论文写作：主要包括学术论文的一般形式和特点、学术论文各部分的写作要求与写作方法和开题报告与答辩报告的一般要求等内容。

(3) 课程负责人：胡道道

5. Course Name: Research Approach and Academic Dissertation Writing

(1) Course Code: 3541006

(2) Brief Introduction of the Course: *Research Approach and Academic Dissertation Writing* is a compulsory course for the major of New Energy Materials and Devices. One aim of this course is to let the students know the methods of research as well as improve their ability in applying those methods. The other aim is to let the student master the writing standard of scientific paper, improving the writing ability of students. To meet the needs above, the contents of this course are divided into two sections. One section concern with research method, including scientific methodology, the outline of complex scientific methodology, as well as the analysis of representative scientific methodology. The other section is related to composition of scientific paper, containing the form and characteristic of scientific paper, the writing requirement and the method of scientific paper, as well as the standard of opening and replying report.

(3) Course Leaders: Daodao Hu

6. 新能源材料与器件专业英语

(1) 课程编码：3541025

(2) 课程简介：该课程采用全英文授课。考虑到高中学生的专业化学基础不强，而研究生阶段又需要大量专业英语的特点，从基础出发，如原子、分子、元素基本原理和概念，扩展到材料分类，材料制备，器件制备及其原理等。课程的主要内容包括新能源材料与器件导论，专业基础英语，新能源材料制备，新能源器件原理与制备等。通过本课程的学习使学生初步掌握新能源材料与器件的专业英语，能够阅读本专业英文文献，为研究生和出国深造打下专业英语基础。

(3) 课程负责人：高斐

6. Course Name: Specialty English-New energy materials and devices

(1) Course Code: 3541025

(2) Brief Introduction of the Course: This course will be conducted by English. In view of the poor specialty English of high school students and high requirements for specialty English in graduate students' characteristics. We start from the foundation, such as atoms, molecules, elements of the basic principles and concepts, extended to the material classification, material preparation, device preparation and principle. The main contents of the course include new

energy materials and device introduction, the basic English, new energy materials preparation, new energy device principle and preparation. Through this course's study, students can master the specialty English for new energy materials and devices. They can read the specialty English literature. The study of this course can lay a foundation for their future study and even go abroad.

(3) Course Leaders: Fei Gao

7. 课程名称：企业管理

(1) 课程编码：3541045

(2) 课程简介：企业管理课程是一门研究企业运营、战略、组织、人力资源等管理领域的课程。该课程将介绍企业管理的基本概念、理论和实践，包括企业战略管理、组织设计与组织文化、人力资源管理、市场营销管理等方面的知识。此外，课程还将深入探讨企业创新、变革管理、领导力发展等现代企业管理中的热点问题，以及如何应对全球化、数字化等趋势带来的挑战。通过案例分析、实践项目和团队合作等方式，学生将有机会了解企业实际运营中的问题和解决方案，培养解决实际问题的能力。本课程旨在培养学生对企业管理的兴趣和专业知識，为他们在未来的职业发展提供支持。

(3) 课程负责人：郭玉晶

7. Course Name: Enterprise Management

(1) Course Code: 3541025

(2) Brief Introduction of the Course: *Enterprise Management* is a course that studies the management areas of enterprise operations, strategies, organizations, human resources, etc. This course will introduce the basic concepts, theories, and practices of enterprise management, including knowledge of strategic management, organizational design and organizational culture, human resource management, marketing management, etc. Additionally, the course will delve into hot topics in modern enterprise management, such as enterprise innovation, change management, leadership development, as well as how to respond to challenges brought by trends like globalization and digitalization. Through case analysis, practical projects, and teamwork, students will have the opportunity to understand the problems and solutions in actual enterprise operations, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in enterprise management, providing support for their future career development.

(3) Course Leaders: Yujing Guo

(四) 实践教学模块 (Professional Skills Courses)

1. 课程名称：专业见习与实习

(1) 课程编码：3550032

(2) 课程简介：《专业见习与实习》是根据本专业特点在企业、研究机构进行参观与实践的教学活动。本课程将根据新能源材料与器件专业特点有选择地在功能材料生产企业和研究机构进行为期3—4个星期的参观与实践，旨在学生了解企业生产与管理机制、产品开发与市场对接、规模化生产实际、专业知识与生产实践关系等。

(3) 课程负责人：孙颀

1. Course Name: Professional Visits and Practice

(1) Course Code: 3550032

(2) Brief Introduction of the Course: *Professional Visits and Practice* is a practice course in enterprises and institutes which is engaged in functional material production and investigation. Students should undertake 3-4 weeks of this professional practice. The aim of this course is to make students understand production process and management, exploitation of products, large-scale production, and relation between knowledge and practice in enterprises.

(3) Course Leaders: Jie Sun

2. 课程名称：专业实践与社会调查

(1) 课程编码：3550021

(2) 课程简介：专业实践是学生学习实践的一个很重要环节，通过专业实践，使学生受到一次系统而深刻的专业思想教育，每位学生在做好专业实践的同时，结合专业实践的实际，有目的地进行一些专题调查，写出有一定水平的调研报告，增强其从事本职工作的责任心，提高学生综合运用所学专业知识、理论知识及基本技能的水平，培养其从事相关工作的能力。

(3) 课程负责人：孙颀

2. Course Name : Professional Practice and Social Survey

(1) Course Code: 3550021

(2) Brief Introduction of the Course: *Professional Practice and Social Survey (PPSS)* is the most important integral part of learning practices, and students can get a systematic and profound specialized ideological education. Each student makes a destination for some special investigation combining with the actual professional practice, and writes a certain level of research report, which can enhance their work sense of responsibility and improve the students to use their professional knowledge, basic skill level and cultivate working ability.

(3) Course Leaders: Jie Sun

3. 课程名称：大学生职业生涯规划

(1) 课程编码：3850003

(2) 课程简介：大学生职业生涯规划课程是一门旨在帮助学生进行职业生涯规划，提高职业发展能力的课程。该课程将介绍职业生涯规划的基本概念、理论和方法，包括自我认知、职业探索、目标设定、行动计划等方面的知识。此外，课程还将深入探讨职业发展的策略和技巧，如求职技巧、职业素养提升、职场人际关系处理等。通过案例分析、实践项目和角色扮演等方式，学生将有机会了解不同行业的职业发展路径和要求，培养解决实际问题的能力。本课程旨在帮助学生更好地了解自己的兴趣、优势和潜力，为未来的职业发展打下坚实的基础。

(3) 课程负责人：孙颀

3. Course Name: College Students' Career Planning

(1) Course Code: 3850003

(2) Brief Introduction of the Course: *College Students' Career Planning* is a course designed to help students plan their careers and improve their career development abilities. This course will introduce the basic concepts, theories, and methods of career planning, including knowledge of self-awareness, career exploration, goal setting, action planning, etc. Additionally, the course will delve into career development strategies and skills, such as job search techniques, professional quality improvement, and workplace interpersonal relationship handling. Through case analysis, practical projects, and role-playing, students will have the opportunity to understand the career development paths and requirements of different industries, cultivating their ability to solve practical problems. This course aims to help students better understand their interests, strengths, and potential, laying a solid foundation for their future career development.

(3) Course Leaders: Jie Sun

4. 课程名称：大学生求职指导与职场适应

(1) 课程编码：3850002

(2) 课程简介：大学生职业生涯规划课程是一门旨在帮助学生进行职业生涯规划，提高职业发展能力的课程。该课程将介绍职业生涯规划的基本概念、理论和方法，包括自我认知、职业探索、目标设定、行动计划等方面的知识。此外，课程还将深入探讨职业发展的策略和技巧，如求职技巧、职业素养提升、职场人际关系处理等。通过案例分析、实践

项目和角色扮演等方式，学生将有机会了解不同行业的职业发展路径和要求，培养解决实际问题的能力。本课程旨在帮助学生更好地了解自己的兴趣、优势和潜力，为未来的职业发展打下坚实的基础。

(3) 课程负责人：孙颀

4. Course Name: Job Search Guidance and Workplace Adaptation for College Students

(1) Course Code: 3850002

(2) Brief Introduction of the Course: *Job Search Guidance and Workplace Adaptation for College Students* is a course designed to help students smoothly transition into the workplace and improve their job search and workplace adaptability. This course will introduce the basic job search process and methods, including resume writing, interview skills, career choice, etc. Additionally, the course will delve into workplace culture and rules, as well as how to establish good interpersonal relationships, effective communication, problem-solving, and stress management skills in the workplace. Through simulated interviews, role-playing, and case analysis, students will have the opportunity to practically experience the job search process, improving their practical operating abilities. This course aims to help students smoothly integrate into the workplace, realize the transition from students to professionals, and enhance their professional competitiveness and sustainable development capabilities.

(3) Course Leaders: Jie Sun

5. 课程名称：科研训练

(1) 课程编码：3550022

(2) 课程简介：科研方法训练是材料科学与工程学院在本科生培养计划中设立的必修实践环节，体现在学生从入学到毕业的各个阶段和各个环节中，其中本门课程重点包括以下几个方面：(1) 通过专业综合性、设计性、创新性实验有目的地培养学生自己设计实验和动手能力。(2) 通过野外实习、专业实习和生产实践培养学生理论联系实践和解决实际问题的能力；(3) 通过参加每周的学术报告和讨论会等学术活动培养学生科学素养；(4) 通过主持或参与国家级、校级和院系级的各种科研项目开展科研实践。通过四年的学习和科研训练，能够在老师的指导下设计课题，完成实验，并写出具有一定质量的学术论文；学生在毕业时将具有一定创新意识 and 创新能力、有一定参与实验和实践的能力以及分析解决问题的能力，为今后独立开展科学研究打下基础。

(3) 课程负责人：孙颀

5. Course Name: Scientific Research Training

(1) Course Code: 3550022

(2) Brief Introduction of the Course: *Scientific Research Training* is established in the School of Material Sciences and Engineering in the undergraduate program of compulsory practice, reflected in all stages of students from admission to graduation and a variety of links. This course covers the following aspects: (a) to train students abilities by designing integrated and innovative experiments; (b) to solve practical problems by fieldwork, professional practice and practice of cultivating student link theory with practice and ability; (c) to develop students scientific literacy by participating in academic symposiums and weekly seminars and other academic activities, and (d) hosting or participating national, school or department-level scientific research and development projects. Through four years of study and research training, subject to design under the guidance of the teacher, finished the experiment, write with a certain quality of academic papers and students at graduation will have a sense of innovation and innovation ability, must participate in the experiment and practice of ability and the ability to analyze and solve problems. lay the foundation for future scientific research independently.

(3) Course Leaders: Jie Sun

6. 课程名称：毕业论文（设计）

(1) 课程编码：3550033

(2) 课程简介：本科毕业论文是获得学士学位的必要条件，要求学生在老师的指导下

发现或提出科学问题，进行文献资料检索，阅读文献，写出开题报告，设计针对所研究问题的实验方案，并在指定的时间内完成实验、数据采集和统计分析和统计工作，在此基础上写出学位论文，最后通过院系组织的答辩委员会的论文答辩。通过毕业论文培养学生应用所学专业知识和技能解决实际问题、综合应用知识和各种工具的能力以及文字及学术表达、团队协作、学术表达以及创新能力。

(3) 课程负责人：孙颀

6. Course Name: Graduation Thesis

(1) Course Code: 3550033

(2) Brief Introduction of the Course: A bachelor's thesis is a necessary condition for obtaining a bachelor's degree. Students are required to discover or raise scientific questions under the guidance of a supervisor. Students should conduct literature searches, read literature, write a proposal, design an experimental plan for the research problem and complete the experiment, data collection and statistical analysis work within the specified time. Based on this, a thesis is written and finally defended by the defense committee organized by the department. Through graduation thesis, students are trained to apply their professional knowledge and skills to solve practical problems, comprehensively apply knowledge and various tools, as well as their abilities in writing and academic expression, teamwork, academic expression, and innovation.

(3) Course Leaders: Jie Sun

7. 课程名称：大学生心理健康

(1) 课程编码：3950001

(2) 课程简介：大学生心理健康课程是一门旨在提高大学生心理素质、增强心理健康意识、培养健康心理行为的课程。该课程将介绍心理健康的基本概念、理论和标准，包括心理问题的识别与应对、心理调适与压力管理、情绪调节与情感培养等方面的知识。此外，课程还将深入探讨大学生常见的心理困惑和挑战，如学业压力、人际关系、自我认知等，并提供有效的心理干预和支持。通过心理测试、案例分析、心理训练等方式，学生将有机会了解自己的心理状态和需求，学习掌握心理调节的方法和技巧。本课程旨在帮助大学生建立健康的心态和生活方式，提高他们的心理健康水平和生活质量。

(3) 课程负责人：孙颀

7. Course Name: Mental Health for College Students

(1) Course Code: 3950001

(2) Brief Introduction of the Course: *Mental Health for College Students* is a course designed to improve college students' psychological quality, enhance their awareness of mental health, and cultivate healthy psychological behaviors. This course will introduce the basic concepts, theories, and standards of mental health, including knowledge of identifying and coping with psychological problems, psychological adjustment and stress management, emotion regulation and cultivation, etc. Additionally, the course will delve into common psychological confusions and challenges faced by college students, such as academic stress, interpersonal relationships, self-awareness, etc., and provide effective psychological interventions and support. Through psychological tests, case analysis, psychological training, and other methods, students will have the opportunity to understand their own psychological state and needs, and learn to master the methods and techniques of psychological adjustment. This course aims to help college students establish a healthy mindset and lifestyle, improving their mental health level and quality of life.

(3) Course Leaders: Jie Sun

8. 课程名称：劳动教育

(1) 课程编码：2050002

(2) 课程简介：劳动教育课程是一门旨在培养学生正确的劳动观念、劳动态度和劳动习惯的课程。该课程将介绍劳动的价值和意义，以及劳动与个人、社会和国家发展的关系。通过理论学习、实践操作和团队合作等方式，学生将了解不同行业的劳动特点和要求，掌

握基本的劳动技能和方法。此外，课程还将注重培养学生的创新思维、解决问题和适应变化的能力，提高他们的综合素质。本课程旨在引导学生树立正确的劳动观念，培养他们成为有理想信念、有道德品质、有文化知识和有实践能力的劳动者。

(3) 课程负责人：孙颀

8. Course Name: Labor Education

(1) Course Code: 2050002

(2) Brief Introduction of the Course: *Labor Education* is a course designed to cultivate students' correct labor concepts, labor attitudes, and labor habits. This course will introduce the value and significance of labor, as well as the relationship between labor and personal, social, and national development. Through theoretical learning, practical operations, and teamwork, students will understand the labor characteristics and requirements of different industries, master basic labor skills and methods. Additionally, the course will focus on cultivating students' innovative thinking, problem-solving, and adaptability to changes, improving their overall quality. This course aims to guide students to establish correct labor concepts, and cultivate them into workers with ideal beliefs, moral qualities, cultural knowledge, and practical abilities.

(3) Course Leaders: Jie Sun

新能源材料与器件专业修读指南

一、指导性教学计划

第一学期			第二学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711031	思想道德与法治	3	1711033	马克思主义基本原理	3
1711022	中国近现代史纲要	3	0211012	大学语文	2
1211044	计算机基础（理工科）	2	1211056	Python 语言程序设计	3
0411061	大学外语（一）	2	0411062	大学外语（二）	2
1011039	大学体育（一）	1	1011040	大学体育（二）	1
2011002	国家安全教育	1	0521006	高等数学（二）—2（理）	4
0521005	高等数学（二）—1（理）	4	3521005	基础物理 I 及实验	3.5
3522047	无机化学	4	3522048	有机化学	4
3522029	实验室安全与规范	0.5	3544016	有机化学实验	2
3522030	材料科学与工程专业导引	0.5	3850004	大学生职业生涯规划	0.5
3544015	无机化学实验	2	2650102	军事理论与训练	2
合计	必修 23 学分		合计	必修 28.5 学分	
“形势与政策”为通识教育必修课，第 1-7 学期上课，共 2 学分。			在第 2-6 学期中，须修读通识教育选修课 12 学分，每学期最多选修 2 门课程。		
第三学期			第四学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711034	毛泽东思想和中国特色社会主义理论体系概论	3	1711035	习近平新时代中国特色社会主义思想概论	3
0411063	大学外语（三）	2	0411064	大学外语（四）	2
1011041	大学体育（三）	1	1011042	大学体育（四）	1
1611045	创新创业理论与实践	1	3522056	工程制图	1
3521006	基础物理 II	2.5	专业方向课程		
3521002	线性代数与概率	3	3542080	电工电子学基础	2.5
3541035	物理化学	4	3542081	高分子化学与物理	3
3544017	物理化学实验（含结构）	2	3522082	能源电化学	2
3541045	企业管理	1			
合计	必修 19.5 学分。		合计	必修 7 学分，专业方向课程 7.5 学分，选修 3 学分。	
在第 3-6 学期，每学期需开展不同形式的科研训练，共计 1 学分。			在 4-6 学期中，须完成专业方向课共计 23 学分。		
第五学期			第六学期		
课程号	课程名称	学分	课程号	课程名称	学分
3541037	材料科学基础	4	3545010	新能源材料与器件综合实训	2
3546007	新能源材料制备与器件组装	2	3550022	科研训练	1

3544014	微结构与物理性能实验	1.5	3850005	大学生求职指导与职场适应	0.5
3541033	材料表征技术	4			
专业方向课程			专业方向课程		
3542094	固体物理学	3	3541078	半导体物理与器件	2.5
3542083	能源存储材料与器件	2.5	3542067	材料物理性能学	2.5
3543085	有机光电材料与器件导论	1.5	3542084	能源转换材料与器件	2.5
3542090	储能用碳基纳米材料	1.5	3542036	纳米材料学	1.5
3542091	化合物太阳能电池材料与器件	1.5	3542046	薄膜材料与制备技术	1.5
			3543086	光电检测技术	1.5
			3541087	光电子技术	2.5
			3542089	无机层状材料的制备与能源存储	1.5
专业拓展课程			专业拓展课程		
3543041	有机光电材料与器件导论	1.5	3543031	二维原子晶体材料与器件	1.5
3543052	光催化材料与技术	1.5	3543036	材料的力学性能	1.5
3543035	胶体化学与界面	1.5	3543037	材料的相变原理	1.5
3543040	传感材料与技术	1.5	3543057	材料科学前沿进展	1.5
3543056	现代物理专题	1.5			
3543055	现代化学专题	1.5			
3543054	科学教育经典文献选读	1.5			
3543032	稀土发光材料	1.5			
合计	必修 11.5 学分，专业方向课程 10 学分，专业拓展课程 12 学分。		合计	必修 4 学分，专业方向课程 17.5 学分，专业拓展课程 6 学分。	
			(1) 到本学期末应完成通识教育选修课 12 学分的修读。 (2) 到本学期末应完成专业方向课程 23 学分和专业拓展课程 5.5 学分的修读。		
第七学期			第八学期		
课程号	课程名称	学分	课程号	课程名称	学分
3546005	新能源器件设计与制造工艺	4	3550033	毕业论文（设计）	4
3541006	研究方法与学术论文写作	1			
3541025	新能源材料与器件专业英语	1			
3550032	专业见习与实习	4			
合计	必修 12 学分		合计	必修 4 学分	
			(1) 完成毕业论文（学校会对毕业论文进行查重、盲审和答辩，一般安排在第 10-14 教学周）； (2) 本学期止，总学分应不得少于 155 学分； (3) 本学期第 17 教学周开始办理离校手续。		

二、修读指导和说明

1. 新能源材料与器件专业毕业前须修读至少 155 学分，请特别注意各类选修课学分的修读，具体要求可参照本专业“课程设置及学分、学时比例”。

2. 本专业设置了常规培养型和科学研究型等培养路径，其中，常规培养型的专业方向课程主修各类新能源材料与器件的基本理论和技术应用，注重对学生理论知识面的扩充以及实际动手能力的培养。科学研究型除常规型中必选的专业方向课外，还需先修部分研究生课程，注重对科学研究思维和前沿研究方向的敏感性的培养。学生可根据自身实际情况，选择其中一种路径进行学习。

3. 通识教育选修课修读说明

通识教育选修课分为人文社会科学、自然科学与技术、艺术与美育、生命与健康、教师教育 5 个系列。学生在校期间（建议第 2-6 学期）必须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

4. 国际交流预备课程修读说明

拟参加出国出境交换交流学习，并需要与我校进行学分互认项目的学生须修读 2 学分“国际交流预备课程”。项目包括交换学生项目、双学位联合培养项目、访学项目、暑期短期交流项目及其他需要进行学分互认的项目。具体规定见《国际交流预备课程学分认定细则》（师教〔2017〕3 号）。

5. 本科生国际暑期学校修读说明

本科生国际暑期学校课程是国际交流预备课程的重要组成部分，修读本科生国际暑期学校课程所得学分记入通识教育选修课中的国际交流预备课程学分。

每年暑假期间（第 1-2 周），学校邀请海外知名大学外籍教师为我校全校本科生开设通识类全英语课程（6 次讲座，3 次沙龙），为同学们创造与外籍教师面对面交流互动的平台。

同学们可在每个春季学期关注国际暑期学校相关动态，并在指定时间内在教务系统中进行选课。

6. 实践模块修读说明

（1）必读书目阅读：根据《陕西师范大学关于全面提高本科教学质量的实施意见》文件要求，本科生在校期间本科生大学四年期间须阅读不少于 5 大类共 48 本的课外书籍，建议每个月阅读课外书籍至少 1 本，达到阅读数量与质量要求的学生，方可毕业。

（2）专业见习与实习：专业见习从第 1 学期至第 6 学期均可进行，形式为统一组织去相关企业、科研机构参观、学习，或邀请校外企业机构负责人、专家来校讲座；专业实习一般不少于 8 周，安排在第 7 或第 8 学期，一般为集中实习，学院统一组织学生前往企业或科研机构进行专业实习，并于实习结束后形成实习报告、成果。专业见习与实习合计 4 学分。

（3）专业实践与社会调查：《专业实践与社会调查》为学生结合实习、实践过程，有目的地进行一些专题调查，写出有一定水平的调研报告。学院根据专业特点和课程需要，

组织学生利用课外时间开展专业实践与社会调查，结合专业相关知识，形成与专业领域相关的成果，每个学生至少完成 2 篇专业实践与社会调查报告，经学院考核合格，计 1 学分。

（4）毕业论文（设计）：参照《材料科学与工程学院毕业设计（论文）工作实施细则（试行）》执行。

科学教育专业简介

Introduction to the Specialty of Science Education

科学教育专业（师范），学制4年，专业属性为师范专业。本专业面向全国培养具有坚定理想信念和高尚道德情操，具备良好人文与科学素养，具有国际化视野和科学思维能力，能适应新时代科学教育发展需求，掌握扎实科学教育相关的教育思想、教学理论、教学方法、专业基础知识与技能，能从事基础科学教育教学的优秀中小学人民教师、教育管理者及未来人民教育家。

Science Education (Teacher-training) is a teacher-training major with a program duration of four years. Facing the whole country, this major aims to cultivate students with firm ideals and beliefs and noble moral integrity, good humanistic and scientific literacy, international vision and scientific thinking ability, who are able to adapt to the development needs of science education in the new era, and master solid educational ideas, teaching theories, teaching methods, professional basic knowledge and skills related to science education, towards becoming excellent people's teachers for primary and secondary schools, educational administrators and future educators engaging in basic science education and teaching.

科学教育专业培养方案

Training Program of the Specialty of Science Education

一、培养目标

I. Educational Objectives

1. 目标定位

本专业面向全国培养德智体美劳全面发展，具有坚定理想信念和高尚道德情操，具备良好人文与科学素养，具有国际化视野和科学思维能力，掌握扎实科学教育相关的教育思想、教学理论、教学方法、专业基础知识与技能，能适应新时代科学教育发展需求，能从事基础科学教育教学的优秀中小学人民教师、教育管理者及未来人民教育家。

本专业旨在培养愿意为教育事业付出终身、能从事科学教育教学的未来教师和管理人员。通过培养，学生对从事科学教育事业产生浓厚的兴趣和高远的追求；具备扎实科学教育理论基础与教学实践能力；具备对现代化教与学环境设计、课程资源开发与利用、教学过程管理与评价的能力；具备从事科学教育的教学设计、教学实践与教学研究能力；具备终身学习及教学水平持续提升的能力；具备良好的沟通、协调、管理、竞争和合作能力。

1. Objective Orientation

Facing the whole country, this major aims to cultivate students with firm ideals and beliefs and noble moral integrity, good humanistic and scientific literacy, international vision and scientific thinking ability, who are able to adapt to the development needs of science education in the new era, and master solid educational ideas, teaching theories, teaching methods, professional basic knowledge and skills related to science education, towards adapting to the development needs of science education in the new era, and becoming excellent people's teachers for primary and secondary schools, educational administrators and future educators engaging in basic science education and teaching.

This major aims to cultivate future teachers and administrators who are willing to devote themselves to the field of education and are capable of engaging in teaching science education. Through training, students will have a strong interest in science education and a lofty pursuit of a career in science education; have a solid theoretical foundation of science education and the ability to practice teaching; have the ability to design modern teaching and learning environment, develop and utilize curricular resources, and manage and evaluate the teaching process; have the ability to engage in teaching design, teaching practice and teaching research in science education; have the ability of lifelong learning and continuous improvement of the teaching level; and have good ability in communication, coordination, management, competition and cooperation.

2. 目标内涵

本专业毕业后 5 年左右的学生，应当：

2.1 思想素质：践行社会主义核心价值观，落实立德树人根本任务，热爱科学教育工作，对教师职业具有强烈的认同感，主动承担工作职责和应尽义务，能够成为有理想信念、有道德情操、有扎实学识、有仁爱之心的“四有”好老师。

2.2 专业能力：能综合运用科学教育基本理论、方法和相关技能，结合学校的实际环境和需要，开展科学课程教学及科学教育教学研究，并能为学校的科学学科建设、教师的跨学科教学能力提升提供指导服务，能够利用现代技术手段宣传和普及科学知识。

2.3 职业发展能力：把握国内外科学教育领域的发展趋势，能跟踪本领域的前沿进展，不断更新教育教学理念，提升职业发展能力，探索学校科学教育基本模式和创新发展的新途径。

2. Objective Connotation

Students who have graduated from this major for about 5 years should have:

2.1 Ideological Quality: Practice the socialist core values, implement the fundamental task of strengthening moral education and cultivating people, love science education work, have a strong sense of identity for the teaching profession, take the initiative to assume the job responsibilities and obligations, and can become a good teacher with lofty ideals and beliefs, moral integrity, solid knowledge, and a heart of benevolence.

2.2 Professional Competence: Be able to make comprehensive use of the basic theories, methods and relevant skills of science education, carry out science curriculum teaching and research on science education and teaching in the light of the actual environment and needs of the school, and to provide guidance services for the construction of science disciplines in the school and the enhancement of the teachers' interdisciplinary teaching abilities, and can make use of the modern technological means to publicize and popularize scientific knowledge.

2.3 Career Development Ability: Grasp the development trend in the field of science education at home and abroad, be able to follow the cutting-edge progress in the field, constantly update the concept of education and teaching, enhance the career development ability, and explore the basic model of science education and new ways of innovation and development in the school.

3. 目标评价

3.1 依据国家形势和教育政策的变化，及时对培养目标进行修订。紧随时代发展，借助政府主管部门、学校管理部门以及中小学相关部门的力量，把握人才需求方向，培养符合国家基础教育改革发展需求的科学教师。

3.2 以学年为单位，建立稳定的培养目标修订机制。依照培养目标，对人才就业情况与表现进行持续调研，并邀请领域内的专家对培养体系进行论证。以国内外科学教育发展基本趋势、区域经济社会发展现实需求、科学教育发展现状以及各利益相关方的客观需求为基础，通过座谈、问卷调查、文件查找的方式对专业人才培养目标与社会发展现实的满意度进行评价。

3.3 建立培养方案修订追踪机制。每年对学生表现情况、不同课程毕业要求的支撑情况进行分析，做好实时记录和重点分析；通过收集用人单位、学生、高校教师、学生家长的意见和建议，了解培养方案的优势和不足，建立档案，不断进行优化。

3. Objective Evaluation

3.1 The training objectives are revised in a timely manner according to the changes in the national situation and educational policies. Follow the development of the times, use the help of government authorities, school management and the relevant departments of primary and secondary schools, grasp the direction of the demand for talents and train science teachers who meet the needs of national basic education reform and development.

3.2 Establish a stable mechanism for revising training objectives on an academic year basis. According to the training objectives, the employment situation and performance of graduated students are continuously investigated, and experts in the field are invited to examine the training system. Based on the basic trend of the development of science education at home and abroad, the actual needs of regional economic and social development, the current situation of science

education development and the objective needs of various stakeholders, the satisfaction of professional talent training objectives and social development reality was evaluated by means of discussion, questionnaire survey and document search.

3.3 Establish a tracking mechanism for the revision of training program. Analyze the performance of students and the support of graduation requirements of different courses every year, and make real-time records and key analysis. Through collecting the opinions and suggestions of employers, students, college teachers, and parents of students, understand the advantages and disadvantages of the training program, establish files, and make constant optimization.

二、毕业要求

II. Graduation Requirements

本专业学生在修读年限 4-6 年内，修满教学计划规定的学分，并达到以下基本要求后，方可毕业：

毕业要求 1 【师德规范】

1.1 践行社会主义核心价值观，增进对中国特色社会主义的思想认同、政治认同、理论认同和情感认同；

1.2 贯彻党的教育方针、政策，以立德树人为己任，立志成为有理想信念、有道德情操、有扎实学识、有仁爱之心的“四有”好老师；

1.3 具有依法执教意识，遵守《中小学教师职业道德规范》及《新时代中小学教师职业行为十项准则》。

毕业要求 2 【教育情怀】

2.1 坚定从教信念，认同科学教师工作的意义和专业性，具有积极的情感、端正的态度、正确的价值观；

2.2 具有人文底蕴和科学精神，尊重学生人格，富有爱心、责任心、事业心，工作细心、耐心；

2.3 全身心投入教育教学工作，做学生锤炼品格、学习知识、创新思维、奉献祖国的引路人。

毕业要求 3 【学科素养】

3.1 系统扎实掌握科学学科基本知识、基本原理及基本技能，理解科学本质，深度掌握科学学科核心素养内涵；

3.2 掌握物质科学、生命科学、地球与宇宙科学以及工程设计等领域的基本概念并灵活运用，能整合成科学学科教学知识；

3.3 能够综合应用学科知识分析和解决科学教学与研究的相关问题；

毕业要求 4 【教学能力】

4.1 具备良好的师范技能，能够“以学生为中心”进行各种教学研究活动；

4.2 全面了解最新基础教育科学课程标准的内容，完成相关专业知识学习；

4.3 熟练掌握科学教育的教学知识和教学基本技能，并能对教学进行反思；

4.4 能够把思想教育与科学知识教育相融合，并具有一定的创新实践能力。

毕业要求 5 【班级指导】

5.1 坚持育人为本、德育为先，掌握中小学德育原理与方法，掌握班级组织与建设的工作规律与基本方法；

5.2 能够掌握学生的心理特点，做好教学班级的组织、管理工作；

5.3 掌握集体建设、班级教育活动组织等班级常规工作要点，做好学校社团或兴趣班级

的建设、组织和管理工作；

5.4 能够在班主任工作中，参与德育和心理健康教育等教育活动的组织和指导。

毕业要求 6 【综合育人】

6.1 了解学生身心发展和养成教育规律，具备全程育人和立体育人意识；

6.2 理解学科育人价值，掌握科学学科育人方法和途径，能够有机结合科学教学进行育人活动；

6.3 能够发挥科学教育专业优势，完成综合育人的组织管理和宣传等工作；

6.4 能积极参与组织主题教育和社团活动，引导和教育学生正确认识科学、认识自然、认识社会。

毕业要求 7 【学会反思】

7.1 具有终身学习与专业发展意识，主动学习学科前沿知识与教育教学新理论；

7.2 了解国内外科学教育发展动态，根据时代和教育发展需求，进行学习和职业生涯规划；

7.3 能够批判性思维，从学生学习、课程教学、教学研究、个人发展等方面不断进行自我反思，学会分析和解决教育教学问题。

毕业要求 8 【沟通合作】

8.1 充分理解学习共同体在教育教学工作中的重要作用，乐于分享教学实践经验；

8.2 掌握沟通交流技能，能顺利有效地与学生、家长、同事等展开交流和研讨；

8.3 具有团队协作精神，善于进行互助合作学习，积极参与各种科学学科活动；

8.4 熟悉中小学常见的教研活动，能够结合自身成长需要参与教研活动。

Students of this major can graduate only after completing the credits specified in the teaching plan within 4-6 years and meeting the following basic requirements:

Graduation Requirement 1 [Code of Professional Ethics]

1.1 Practice core socialist values and enhance ideological, political, theoretical and emotional identity with socialism with Chinese characteristics;

1.2 Carry out the party's educational principles and policies, take strengthening moral education and cultivating people as responsibility, and aspire to be a good teacher with lofty ideals and beliefs, moral integrity, solid knowledge and a heart of benevolence;

1.3 Have the consciousness of teaching according to law, abide by the "Code of Professional Ethics for Primary and Secondary School Teachers" and "Ten Guidelines for Professional Behavior of Primary and Secondary School Teachers in the New Era".

Graduation Requirement 2 [Educational Sentiments]

2.1 Have strong beliefs in teaching, recognize the significance and professionalism of science teachers' work, have positive emotions, correct attitude and correct values;

2.2 Have humanistic heritage and scientific spirit, respect for students' personality, caring, responsible, enterprising, working carefully and patiently;

2.3 Devote oneself to education and teaching work, and be a guide for students to refine their character, learn knowledge, think creatively and dedicate themselves to the motherland.

Graduation Requirement 3 [Discipline Literacy]

3.1 Systematically master the basic knowledge, basic principles and basic skills of scientific disciplines, understand the nature of science, and deeply master the connotation of core literacy of scientific disciplines;

3.2 Master the basic concepts of materials science, life science, earth and space science, engineering design and other fields and apply them flexibly, and can integrate them into the teaching knowledge of science subjects;

3.3 Be able to comprehensively apply subject knowledge to analyze and solve related problems in science teaching and research;

Graduation Requirement 4 [Teaching Ability]

4.1 Have good teacher skills and be able to carry out various "student-centered" teaching and research activities;

4.2 Fully understand the content of the latest basic education science curriculum standards, and complete the relevant professional knowledge learning;

4.3 Be proficient in teaching knowledge and basic teaching skills of science education, and able to reflect on teaching;

4.4 Be able to integrate ideological education with scientific knowledge education, and have a certain ability to innovate and practice.

Graduation Requirements 5 [Class Guidance]

5.1 Adhere to the "people-oriented, moral education first" principle, know the principles and methods of moral education in primary and secondary schools, and know the working rules and basic methods of class organization and construction;

5.2 Be able to master the psychological characteristics of students and do a good job in the organization and management in teaching classes;

5.3 Master the key points of class routine work such as collective construction and organization of educational activities of the class, and do a good job in the construction, organization and management of school societies and clubs or interest classes;

5.4 Be able to participate in the organization and guidance of moral and mental health education and other educational activities in the head teacher's work.

Graduation Requirement 6 [Comprehensive Education]

6.1 Understand the law of students' physical and mental development and formative education, and have the awareness of whole-process education and three-dimensional education;

6.2 Understand the value of discipline education in educating students, master the methods and approaches of science discipline education, and be able to carry out education activities organically combined with science teaching;

6.3 Be able to give full play to the professional advantages of science education and complete the organization, management and publicity of comprehensive education;

6.4 Capable of actively participating in the organization of thematic education and student society and club activities, guide and educate students to correctly understand science, nature and society.

Graduation Requirement 7 [Learn to reflect]

7.1 Have a sense of lifelong learning and professional development, and actively learn cutting-edge knowledge and new theories of education and teaching;

7.2 Understand the development trends of science education at home and abroad, and carry out study and make career plans according to the needs of the times and education development;

7.3 Capable of critical thinking, continuous self-reflection from the aspects of student learning, curriculum teaching, teaching research and personal development, and learning to

analyze and solve educational and teaching problems.

Graduation Requirement 8 [Communication and Cooperation]

8.1 Fully understand the important role of the learning community in education and teaching, and be willing to share teaching experience;

8.2 Master communication skills and be able to communicate and discuss with students, parents and colleagues smoothly and effectively;

8.3 Have the spirit of teamwork, good at mutual assistance and cooperative learning, and actively participate in various scientific discipline activities;

8.4 Be familiar with common teaching and research activities in primary and secondary schools, and be able to participate in teaching and research activities according to their own growth needs.

三、主干学科

III. Core Disciplines

教育学、心理学、化学、物理学、生物学、地理学

Education, Psychology, Chemistry, Physics, Biology, Geography

四、主干课程

IV. Main Courses

大学物理及实验、大学化学及实验、普通生物学及实验、自然地理学及实验、科学教育专业导论、自然科学导论、科学教育研究方法、科学实验、科学课程标准与教材分析、科学课程教学论、现代教育技术（网络教学）、教育学基础、心理学基础等

College Physics and Experiments, General Chemistry and Experiments, General Biology Experiments, Natural Geography and Experiments, Introduction to Science Education, Introduction to Natural Science, Methods of Science Education Research, Scientific Experiment, Analysis of Science Curriculum Standards and Textbooks, Teaching Theory of Science Curriculum, Contemporary Educational Technology (Online Course), Foundation of Education, the Basis of Psychology

五、学制及授予学位

V. Schooling System & Degree Granting

学制 4 年

Four Years

教育学学士

Bachelor of Education

六、学分要求

VI. Total Credits

153 学分

153 Credits

七、课程设置及学分比例

VII. Course Settings and Percentage of Credits

课 程 类 别 Course Catalogue		学 分 及 比 例 Credits and Percentage			
		学 分 Cre.	小 计 Sub-Total	占总学分比例 Percentage in Total Credits	小 计 Sub-Total
通识教育模块 Liberal Studies	通识教育必修课 Liberal Studies Compulsory	38	50	24.84%	32.68%

Courses	Courses				
	通识教育选修课 Liberal Studies Elective Courses	12		7.84%	
学科基础模块 Disciplinary Foundation Courses	相关学科基础课 Related Disciplinary Foundation Courses	8	11	5.23%	7.19%
	本学科基础课 Disciplinary Foundation Courses	3		1.96%	
专业课程模块 Specialized Courses	专业必修课 Specialized Compulsory Courses	30	56	19.61%	36.60%
	专业限定选修课 Specialized Restrictive Elective Courses	20		13.07%	
	专业任意选修课 Specialized Non-restrictive Elective Courses	6		3.92%	
教师教育模块 Teacher-training Courses	公共必修课 General Compulsory Courses	9	14	5.88%	9.15%
	学科必修课 Disciplinary Compulsory Courses	5		3.27%	
	选修课 Elective Courses	2		已纳入通识教育选修课	
实践教学模块 Practice Work	必修课 Compulsory Courses	22	22	14.38%	14.38%
合计 Total		153		100%	
说明 Notes	1. 专业必修课（包括学科基础课程和专业必修课）共 14 门，其中双语课程 1 门，全英语课程 0 门。 2. 专业选修课共 33 门，其中专业限选课程 20 门；专业任选课程 12 门。学生应从专业限选课程中至少选修 20 学分，从专业任选课程中至少选修 6 学分。 3. 实验课程共 10 门，其中独立开设的实验课 2 门，既有理论又有实验的课程 8 门，含综合性、设计性实验的课程 6 门，占实验课程总数的 60%。 4. 本专业学科专业课程包括学科基础模块课程、专业课程模块课程和教师教育模块、实践教学模块中的学科专业课程，其学分占总学分比例为 52.9 %。 5. 本专业实践教学内容包括实践教学模块和其他课程模块中的实践教学内容，实践教学环节学分占总学分的比例为 30.7 %。 1. There are 14 specialized compulsory courses, including 1 bilingual course and 0 English course. 2. There are 34 specialized elective courses in total including 21 restrictive elective courses and 13 professional non-restrictive elective courses. Undergraduates should obtain 20 credits in total by taking elective courses and 6 credits by taking professional optional courses. 3. There are 10 experimental courses in total including 2 independent experimental courses, 8 theoretical and experimental courses, 6 comprehensive and designable experimental courses which is 60% of the total experimental courses. 4. Specialized courses of the subject include disciplinary foundation courses, specialized core courses, specialized orientation courses, specialized development courses, professional courses, specialized courses of practice work, taking up 52.9% of the total credits. 5. Practice work includes the courses of the specific module of practice work and those practice work within the courses of other modules, taking up 30.7% of the total credits.				

八、科学教育专业本科教学计划表

VIII. Teaching Scheme for Science Education Undergraduate Candidates

(一) 通识教育模块 (50 学分)

(I) Liberal Studies Courses (50 credits)

1. 通识教育必修课 (38 学分)

1. Liberal Studies Compulsory Courses (38 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
1711031	思想道德与法治 The Ideological and Moral Cultivation and the Rule of Law	1	3	63	45	18	3	考试 Exam.	马院	
1711022	中国近现代史纲要 Outline of Modern and Contemporary Chinese History	1	3	63	45	18	3	考试 Exam.		
1711033	马克思主义基本原理 Principles of Marxism	2	3	63	45	18	3	考试 Exam.		
1711034	毛泽东思想和中国特色社会主义理论体系 概论 Mao Zedong Thoughts and Theory of the Socialism with Chinese Characteristics	3	3	63	45	18	3	考试 Exam.		
1711035	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	4	3	63	45	18	3	考试 Exam.		
1711005- 1711011	形势与政策 1-7 The Current Situation and Policy (1-7)	1-7	2					考查 Quiz		
0211012	大学语文 College Chinese	2	2	36	36		2	考试 Exam.	文学院	混合式
1211044	计算机基础 (理工科) Fundamentals of Computer (for Science Specialties)	1	2	45	27	18	2	考试 Exam.	计科院	
1211056	Python 语言程序设计 (理工科) Python Programming (for Science Specialties)	2	3	72	36	36	2	考试 Exam.		

0411061-04 11064	大学外语（一）—（四） College English	1-4	8				4	考试 Exam.	外院	
1011039	大学体育（一） Physical Education 1	1	1	36		36		考试 Exam.	体院	
1011040	大学体育（二） Physical Education 2	2	1	36		36		考试 Exam.		
1011041	大学体育（三） Physical Education 3	3	1	36		36		考试 Exam.		
1011042	大学体育（四） Physical Education 4	4	1	36		36		考试 Exam.		
1611045	创新创业理论与实践 Theory &Practice of Innovation and Entrepreneurship	3	1	27	9	18	1.5	考查 Quiz	国商学院	混合式
2011002	国家安全教育 National Security Education	1/2	1	18	18			考试 Exam.	国安院	混合式

2. 通识教育选修课（12 学分）

2. Liberal Studies Elective Courses（12 credits）

通识教育选修课共 12 学分，详见《陕西师范大学通识教育选修课课程方案》，具体课程清单以各学期发布的通知为准。在校期间须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。具体要求如下：

为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；

所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；

非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；

体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；

师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

Undergraduates will obtain 12 credits by taking liberal studies elective courses, see *Liberal Studies Elective Courses Scheme of Shaanxi Normal University*.

（二）学科基础模块（11 学分）

(II) Disciplinary Foundation Courses (11 credits)

1. 相关学科基础课 (8 学分)

1. Related Disciplinary Foundation Courses (8 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
0521005	高等数学(二) —1 (理) Advanced Mathematics 1 (for Science Specialties)	1	4		72		4	考试 Exam.	数统院	
0521006	高等数学(二) —2 (理) Advanced Mathematics 2 (for Science Specialties)	2	4		72		4	考试 Exam.	数统院	

2. 本学科基础课 (3 学分)

2. Disciplinary Foundation Courses (3 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3522057	科学教育专业导论 Introduction to Science Education	1	0.5	8	8	0	2	考查	材料学院/现代 教学技术 教育部重点 实验室	
3522058	自然科学导论 Introduction to Natural Science	1	2	36	36	0	2	考试	材料学院	
3522029	实验室安全与规范 Laboratory Safety and Regulation	1	0.5	8	8	0	2	考查	材料学院	

(三) 专业课程模块 (56 学分)

(III) Specialized Courses (56 credits)

1. 专业必修课 (30 学分)

1. Specialized Compulsory Courses (30 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3541054	大学化学（上） College Chemistry (I)	1	3	54	54	0	3	考试	材料学院	
3541047	大学化学（下）及实验 College Chemistry (II) and Experiments	2	4	90	54	36	5	考试	材料学院	
3541048	大学物理（上） College Physics (I)	2	3	54	54	0	3	考试	材料学院	
3541049	大学物理（下）及实验 College Physics (II) and Experiments	3	4	90	54	36	5	考试	材料学院	
3541050	普通生物学及实验 General Biology and Experiments	3	5	108	72	36	6	考试	生科院	
3541051	科学教育研究方法 Methods of Science Education Research	3	2	36	36	0	2	考试	材料学院/现代教学技术教育部重点实验室	混合式
3541052	自然地理学及实验 Natural Geography and Experiments	4	4	90	54	36	4	考试	地科院	
3545005	科学实验（一） Scientific Experiment (I)	4	1	36	0	36	4	考试	材料学院	含劳动教育
3545006	科学实验（二） Scientific Experiment (II)	5	2	72	0	72	8	考试	材料学院	含劳动教育
3541053	科学教育专业英语 The Academic English Course for Science Education Major	5	1	18	18	0	2	考试	材料学院	双语
3541006	研究方法与学术论文写作 Research Approach and Academic Dissertation Writing	6	1	18	18	0	2	考试	材料学院	混合式

2. 专业限定选修课（20 学分）

2. Specialized Restrictive Elective Courses (20 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
常规培养系列课程： Courses of Conventional Series:										
3542096	科技史与科技哲学 History and Philosophy of Science and Technology	3	2	36	36	0	2	考查	材料学院	
3542097	化学与生活 Chemistry and Life	3	2	36	36	0	2	考查	材料学院	
3542098	科普学概论 Introduction to Science Popularization	3	2	36	36	0	2	考查	材料学院	
3542099	师范生创新教学思维与实践 Normal Students' Creative Teaching Thinking and Learning Practice	4	2	36	36	0	2	考查	教育学部	
3542100	科学技术与社会 Science, Technology and Society	4	2	36	36	0	2	考查	材料学院	
3542101	新材料概论 Introduction to Advanced Materials	4	2	36	36	0	2	考查	材料学院	
3542102	生态学概论 Introduction to Ecology	5	2	36	36	0	2	考查	生科院	
3542103	脑科学概论 Introduction to Brain Science	5	2	36	36	0	2	考查	生科院	
3542104	工程技术概论 Introduction to Engineering Technology	5	2	36	36	0	2	考查	材料学院	
3542105	地球概论 Introduction to Earth Science	5	2	36	36	0	2	考查	地科院	
3542106	仿生学导论 The Introduction of Bionics	5	2	36	36	0	2	考查	材料学院	
3542108	营养与健康 Nutrition and Health	5	2	36	36	0	2	考查	材料学院	
3542109	环境科学概论 Introduction to Environmental Science	6	2	36	36	0	2	考查	地科院	
3542110	电工学基础 Fundamentals of Electrical Engineering	6	2	36	36	0	2	考查	材料学院	
3542111	人工智能与教育 The Education of Artificial Intelligence	6	2	36	36	0	2	考查	材料学院	

3542112	工程制图 Engineering Drawing	6	2	36	36	0	2	考查	材料学院	
3542113	跨学科教学实践 The Practice of Interdisciplinary Teaching and Learning	6	2	36	36	0	2	考查	材料学院	
融合创新系列课程: Courses of Innovational Series:										
3542114	科技创客教育与实践 The Education and Practice of Technological Makers	5	2	54	36	18	3	考查	材料学院	含劳动教育
3546011	科学教育专业创新创业实训 Innovation and Entrepreneurship Training for Science Education Major	6	2	62	8	54	2	考查	材料学院	含劳动教育
3546012	科学实验设计实训 Practical Training in the Design of Scientific Experiments	6	4			12 周		考查	材料学院	含劳动教育
3542096	科技史与科技哲学 History and Philosophy of Science and Technology	3	2	36	36		2	考查	材料学院	
3542097	化学与生活 Chemistry and Life	3	2	36	36		2	考查	材料学院	
3542098	科普学概论 Introduction to Science Popularization	3	2	36	36		2	考查	材料学院	
3542099	师范生创新教学思维与实践 Normal Students' Creative Teaching Thinking and Learning Practice	4	2	36	36		2	考查	教育学部	
3542100	科学技术与社会 Science, Technology and Society	4	2	36	36		2	考查	材料学院	
3542102	生态学概论 Introduction to Ecology	5	2	36	36		2	考查	地科院	
3542103	脑科学概论 Introduction to Brain Science	5	2	36	36		2	考查	生科院	
3542104	工程技术概论 Introduction to Engineering Technology	5	2	36	36		2	考查	材料学院	
说明 Notes	1. 专业方向课程分为常规型和融合创新型两类课程，其中常规型包含 17 门课程，融合创新型包含 11 门课程。 2. 科学教育专业必须选修够 20 学分。 1. The specialized restrictive elective courses are divided into two types: conventional and innovational series. The conventional series includes 17 courses, while the innovational series includes 11 courses. 2. Undergraduates in Science Education specialty should obtain 20 credits.									

3. 专业任意选修课 (6 学分)

3. Specialized Non-restrictive Elective Courses (6 credits)

详见学院专业任意选修课。

See Specialized Non-restrictive Elective Courses of School of Materials Science and Engineering.

(四) 教师教育模块 (14 学分)

(IV) Teacher-training Courses (14 credits)

1. 公共必修课 (9 学分)

1. General Compulsory Courses (9 credits)

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
2431028	心理学基础 The Basis of Psychology	3	1	18	18		2	考试 Exam.	心理学院	
2431029	儿童发展 Child Development	3	1	18	18		2	考试 Exam.	心理学院	
2431056	中小学生学习与认知 Cognition and Learning of Primary and Middle School Students	4	1	18	18		2	考试 Exam.	心理学院	
1521027	教育学基础 Foundation of Education	4	1.5	36	18	18	2	考试 Exam.	教育学部	
2431058	中小学生心理辅导 Psychological Guidance for Primary and Middle School Students	4	1	18	18		2	考试 Exam.	心理学院	
1531129	现代教育技术 (网络教学) Contemporary Educational Technology (Online Course)	5	1	18	18		1	考试 Exam.	教育学部	
1531184	教师专业发展与职业道德 Teacher's Professional Development & Professional Ethics	5	1.5	36	18	18	2	考试 Exam.	教育学部	
1531171	德育与班级管理 Moral Education and Class Management	6	1	18	18		2	考查 Quiz	教育学部	

2. 学科必修课（5 学分）

2. Disciplinary Compulsory Courses（5 credits）

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
3531001	科学课程标准与教材分析 Analysis of Science Curriculum Standards and Textbooks	5	1	18	18	0	2	考试	材料学院/现代教学技术教育部重点实验室	
3531002	科学课程教学论 Teaching Theory of Science Curriculum	6	2	36	36	0	2	考试	材料学院/现代教学技术教育部重点实验室	
3531003	科学教学设计与实施 Design and Implementation of Science Teaching	6	2	36	36	0	2	考试	材料学院/现代教学技术教育部重点实验室	

3. 选修课（见通识教育选修课程“教师教育”系列）

3. Elective Courses（See Teacher-training Series of Liberal Studies Elective Courses）

（五）实践教学模块（22 学分）

（V）Practice Work（22 credits）

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
2650102	军事理论与训练 Military Theory and Military Training	1-2	2					考查 Quiz	军事教研室	
3550028	教师教学基本技能训练 Training of Teachers' Basic Teaching Skills		1					考查 Quiz		
3550017	必读书目阅读 Required Readings		1					考查 Quiz		

3550018	科学教育专业教学技能训练 Training of Science Education Teaching Skills	6	1					考试 Exam.		
3550034	教育见习 School Visits	1-6	1					考查 Quiz		
3550035	教育实习 Teaching Practice	7	5					考查 Quiz		
3550036	教育研习 Teaching Research Learning	1-7	1					考查 Quiz		
3550037	教育实践与社会调查 Professional Practice and Social Survey		1					考查 Quiz		
3850004	大学生职业生涯规划 College Students' Career Planning	2	0.5	18	10	9	2	考查 Quiz	招就处	
3850005	大学生求职指导与职场适应 Job Search Guidance and Workplace Adaptation for College Students	6	0.5	18	10	9	2	考查 Quiz	招就处	
3550033	毕业论文（设计） Graduation Thesis	7-8	4					考查 Quiz	材料学院	
3950001	大学生心理健康 Mental Health for College Students		2					考查 Quiz	学工部	混合式
2050002	劳动教育 Labor Education		2	36	18	18		考查 Quiz	公共艺术中心	

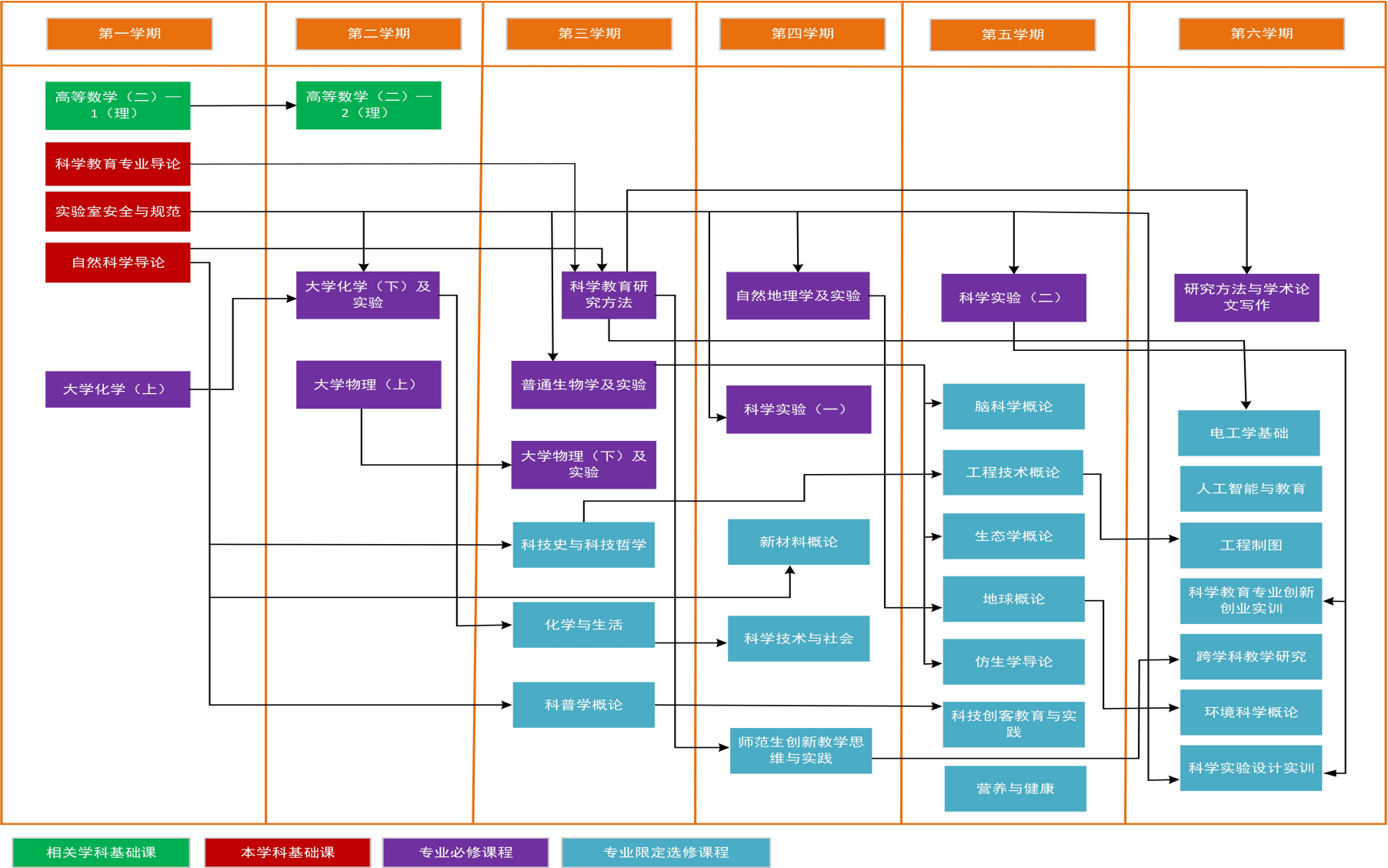
九、材料科学与工程学院专业任意选修课

IX. Specialized Non-restrictive Elective Courses of School of Materials Science and Engineering

课程编码 Courses Code	课程名称 Courses Name	开课学期 Semester	学分 Cre.	总学时 Hrs.	讲授学时 Teaching Hrs.	实验/实践学时 Experiment/ Training Hrs.	周学时 Weekly Hrs.	考核方式 Evaluation	开课单位 Course Department	备注 Notes
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3543054	科学教育经典文献选读 Reading Classical Literature in Science Education	5	1.5	28	28		2	考查 Quiz.	材料学院	
3543055	现代化学专题 Special Topics in Modern Chemistry	5	1.5	28	28		2	考查 Quiz.		
3543056	现代物理专题 Special Topics in Modern Physics	5	1.5	28	28		2	考查 Quiz.		
3543032	稀土发光材料 Rare Earth Luminescent Materials	5	1.5	28	28		2	考查 Quiz.		
3543040	传感材料与技术 Materials and Technologies of Sensors	5	1.5	28	28		2	考查 Quiz.		
3543035	胶体化学与界面 Colloid Chemistry and Interface	5	1.5	28	28		2	考查 Quiz.		
3543052	光催化材料与技术 Photocatalytic Materials and Technology	5	1.5	28	28		2	考查 Quiz.		
3543041	有机光电材料与器件导论 Introduction of Organic Optoelectronic Materials and Devices	5	1.5	28	28		2	考查 Quiz.		
3543057	材料科学前沿进展 Frontiers of material Science	6	1.5	28	28		2	考查 Quiz.		
3543031	二维原子晶体材料与器件 Two-dimensional Atomic Crystal and Device	6	1.5	28	28		2	考查 Quiz.		
3543036	材料的力学性能 Mechanical Properties of Materials	6	1.5	28	28		2	考查 Quiz.		
3543037	材料的相变原理 Phase Transformation Mechanisms of Materials	6	1.5	28	28		2	考查 Quiz.		
说明 Notes	1. 材料科学与工程学院专业任意选修课共 12 门。 2. 科学教育专业必须选修 6 学分。 1. There are 12 Specialized Non-restrictive Elective Courses. 2. Undergraduates in Science Education specialty should obtain 6 credits.									

十、专业课程先修关系图



十一、课程—毕业要求支撑矩阵

序号	课程信息		毕业要求							
			1	2	3	4	5	6	7	8
	课程类别	课程名称								
1	通识教育必修课	思想道德与法治	H	H			M			
2		中国近现代史纲要	H	M						
3		马克思主义基本原理	H	H						
4		毛泽东思想和中国特色社会主义理论体系概论	H	M						
5		习近平新时代中国特色社会主义思想概论	H	H						
6		形势与政策 1-7	H	M			M			
7		大学语文		M	H					
8		计算机基础（理工科）			H	M				
9		Python 语言程序设计（理工科）			H	M				
10		大学外语（一）—（四）			H					M
11		大学体育（一）							M	H
12		大学体育（二）							M	H
13		大学体育（三）							M	H
14		大学体育（四）							M	H
15		创新创业理论与实践			M			M	H	H
16		国家安全教育	H	H						

17	相关学科基础课	高等数学（二）－1（理）			H	L				
18		高等数学（二）－2（理）			H	L				
19	本学科基础课	科学教育专业导论	M	M	H	M		H	M	
20		实验室安全与规范	M	M	H	H		M		
21		自然科学导论	L	L	H	M		H	M	
22	专业必修课	大学化学（上）	M	M	H	H		M	L	
23		大学化学（下）及实验	M	M	H	H		M	L	
24		大学物理（上）	L	M	H	H		M	M	
25		大学物理（下）及实验	L	M	H	H		M	M	
26		普通生物学及实验			H			L	M	
27		自然地理学及实验			H			L	M	
28		科学实验（一）			H			M	M	
29		科学实验（二）	H	H	M	H		M	H	M
30		科学教育研究方法	H	M	M	H	M	M	M	M
31		科学教育专业英语	H	H	H	H	M	L		
32		研究方法与学术论文写作	M	H	M				H	
33		科技史与科技哲学			H			M	H	M
34		师范生创新教学思维与实践			H	M		M		M
35		化学与生活	L	M	H	H		M	L	
36		科普学概论	M	M	H	M		M	M	L

37		科学技术与社会	M	M	H	H		M	L	
38		生态学概论			H			M		
39		脑科学概论			H			M		
40		工程技术概论	M	M	H	H		M	L	
41		环境科学概论			H			M	M	
42		地球概论			H			M	M	
43		仿生学导论	L	L	H	H		M	L	
44		营养与健康		H	H	M		M		
45		电工学基础	L	L	H	L		L		
46		人工智能与教育	L	L	H	H		M	L	
47		工程制图	M	M	H	H		M	L	L
48		跨学科教学实践		M	H	H		M	M	M
49		新材料概论	M	H	H	L	L	M	L	L
50		科学教育专业创新创业实训	L	L	H	H	M	L		M
51		科学实验设计实训			H	L		H	M	
52		科技创客教育与实践	L	L	H	H		M	L	
53	教师教育公共必修课	心理学基础		M			M	H	H	L
54		儿童发展		H			M	H	H	M
55		中小学生认知与学习		H		H	H	H	H	M
56		教育学基础	H	H		H	H	H	H	M

57		中小学生心理辅导		H			H	H	H	M
58		现代教育技术（网络教学）			M	H	H	H		
59		教师专业发展与职业道德	H	H		H	H	H	M	H
60		德育与班级管理	H	H		H	H	H	M	H
61	教师教育学 科必修课	科学课程标准与教材分析			H	H	M	M	H	
62		科学课程教学论			H	H	M	M	H	
63		科学课程教学设计			H	H	M	M		
65	实践教学	军事理论与训练					L	H	H	M
66		教师教学基本技能训练	M			H	H	H		M
67		必读书目阅读		M	H			L		H
68		科学教育专业教学技能训练	M		H	H	H	H		M
69		教育见习	H	H		H	H	H	M	M
70		教育实习	H	H		H	H	H	H	M
71		教育研习	H	H		H	H	H	H	M
72		教育实践与社会调查	H	M		H	M			M
73		大学生职业生涯规划	H				M			H
74		大学生求职指导与职场适应	H	M			M			M
75		毕业论文（设计）	H		H		M			H
76		大学生心理健康	H	H			M	H	H	M
77		劳动教育	H	M			M	M	H	M

十二、课程简介

XII. Brief Introduction of Main Courses

(一) 学科基础模块 (Disciplinary Foundation Courses)

1. 课程名称：高等数学（二）——1（理）/高等数学（二）——2（理）

(1) 课程编码：0521005/0521006

(2) 课程简介：理工科《高等数学》是理工科专业学生必修的最重要的基础课程之一，他对学生良好的数学素质的形成及后续专业课程的学习起着至关重要的作用。学习周期两个学期，总学时 144 个，8 个学分，内容包括一元函数的极限、连续性，导数与微分，不定积分，定积分，常微分方程，空间解析几何，级数理论，多元函数的极限、连续性，多元函数的微分学、积分学。

1.Course Name: Advanced Mathematics(II)-1 (for Science Specialties)/Advanced Mathematics (II)- 2 (for Science Specialties)

(1) Course Code: 0521005/0521006

(2) Brief Introduction of the Course: *Advanced Mathematics* is one of the most important compulsory courses for students in science and engineering, which plays a crucial role in improving the quality of student mathematical conversations and studying the successive courses. The course runs for two terms, 144 class hours, 8 credits. The contents include the limit and continuity of single variable functions, derivative and differential, indefinite and definite integral, ordinary differential equations, spatial analytic geometry, series theory, the limit and continuity of a multivariable function, and derivative and differential of multivariable functions.

2. 课程名称： 科学教育专业导论

(1) 课程编码：3522057

(2) 课程简介：《科学教育专业导论》是科学教育本科专业的一门必修专业课。主要内容包括四个方面：一是科学教育专业简介。包括科学教育的核心价值、学科内涵与基本特征。二是科学教育的发展历程与改革趋势介绍，使学生了解科学教育产生的历史背景与现实需求。三是我国中小学科学课程体系介绍，包括科目设置、培养目标、课程内容、教学方法、教学评价等，使学生对我国的科学教育有整体了解。四是基于中小学科学教师专业素养分析，介绍科学教育专业课程的内容与培养目标，使学生明白学习不同课程的重要性。

(3) 课程负责人：胡卫平

2. Course Name: Introduction to Science Education

(1) Course Code: 3522057

(2) Brief Introduction of the course: "Introduction to Science Education" is majors a compulsory professional course for science education. The content of this course mainly includes four aspects: ①brief introduction to the science education profession, including the core values, disciplinary content, and basic characteristics of science education; ②an introduction to the development history and reform trend of science education, so that students can understand the historical background and realistic needs of science education; ③an introduction to the system of science curriculum in primary and secondary schools, involving subject settings, training goals, curriculum content, teaching methods, and teaching evaluation, allowing students to have a comprehensive understanding of science education in our country; ④based on the analysis of the professional quality of science teachers, the content and cultivation objectives of science education professional courses are introduced so that students can understand the importance of learning different courses.

(3) Course Leaders: Weiping Hu

3. 课程名称：自然科学导论

(1) 课程编码：3522058

(2) 课程简介：自然科学导论旨在介绍自然科学的基本概念和原理，以及科学研究的方法和思维方式。该课程包括物理学、化学、生物学、地球科学等学科，其目的是使学生了解自然现象的本质和规律，从而使其能够开展科学研究和解决实际问题。通过学习自然科学导论，能够更好地理解自然现象和科学研究的本质，并在实际工作和生活中运用科学的思维方式解决问题。

(3) 课程负责人：胡道道

3. Course Name: Introduction to Natural Science

(1) Course Code: 3522058

(2) Brief Introduction of the course: Introduction to Natural Science aims to introduce the basic concepts and principles of natural science, as well as the methods and ways of thinking in scientific research. This class includes disciplines such as physics, chemistry, biology, and earth sciences, with the aim of enabling students to understand the essence and laws of natural phenomena, thereby enabling them to conduct scientific research and solve practical problems. By studying the Introduction to Natural Science, students can better understand the essence of natural phenomena and scientific research, and apply scientific thinking methods to solve problems in practical work and life.

(3) Course Leaders: Daodao Hu

4. 课程名称：实验室安全与规范

(1) 课程编码：3522029

(2) 课程简介：实验是自然科学研究最基本的方法。实验室已成为学生们学习、科研实践的重要场所之一。在实验中使用设备、玻璃仪器、电器、试剂等都有一定的潜在危险。没有科学规范的实验操作，将会大大增加发生触电、中毒、烫伤、着火和爆炸等意外事故几率。因此，掌握科学实验方法、熟悉实验室基本的安全规范，对于避免危险事故发生具有极其重要的意义。同时，了解与熟悉各种事故应急处置方法，减小更大伤害也具有特别重要意义。本课程主要内容包括：实验室安全防护；危险品；废弃物处置以及事故应急处理方法。同时，本课程将结合学院大型仪器平台，讲授现代仪器分析的实验技术与安全操作，并介绍国外高校化学实验室的安全与管理。本课程的学习能够增强学生的安全和环保意识，养成良好的安全习惯，掌握应急救援技能，有效降低实验室事故发生的概率。

(3) 课程负责人：胡道道

4. Course Name: Laboratory Safety and Regulation

(1) Course Code: 3522029

(2) Brief Introduction of the course: Experiment is the most basic method in natural scientific research. Laboratory has become one of the important places for students learning and practice in scientific research. There are some potential hazards in experimental process. The various accidents could take place if there is no scientific and standardized experimental operations. Therefore, it is very important to understand and grasp scientific experimental methods and safety specification in laboratory. Additionally, it is also significant to understand and to be familiar with handling methods of various emergencies for reducing the greater damages. In this course, laboratory safety protection, knowledge of dangerous reagents, waste disposal and treatment methods of accident emergency, etc. Additionally, according to our large-scale instrument platform, modern instruments are also introduced. This course is beneficial for students to enhance the safety and environmental awareness in laboratory.

(3) Course Leaders: Daodao Hu

(二) 专业课程模块 (Specialized Courses)

I 专业必修课程简介 (Specialized Compulsory Courses)

1. 课程名称: 大学化学(上)/大学化学(下)及实验

(1) 课程编码: 3541054/3541047

(2) 课程简介: 《大学化学》课程是高等学校理工类专业学生的一门重要的基础必修课。本课程将学习现代化学的基本概念和原理, 课程内容包括无机化学、分析化学、物理化学和有机化学的基础知识。这些内容互相渗透, 紧密联系, 组成大学化学课程整体。通过本课程的学习, 使得学生具备应用基础化学知识阐明科学关联化学现象及观点能力。同时, 学生可以比较全面掌握化学的基本理论和框架, 深入了解物质化学变化的规律, 并能初步运用化学的理论、观点和方法来分析和解决问题。

(3) 课程负责人: 刘宗怀

1. CourseName: College Chemistry (I)/ College Chemistry (II) and Experiments

(1) Course Code: 3541054/3541047

(2) Brief Introduction of the Course: College Chemistry is one of the most important compulsory courses for students in science and engineering at college. This course will learn the basic concepts and principles of modern chemistry, including the basic knowledge of inorganic chemistry, analytical chemistry, physical chemistry, and organic chemistry. These contents are interrelated and closely related, forming the overall chemistry curriculum. Through the study of this course, students will have the ability to apply basic chemical knowledge to elucidate scientifically related chemical phenomena and viewpoints. At the same time, students can comprehensively grasp the basic theories and frameworks of chemistry, deeply understand the laws of material chemical changes, and be able to preliminarily apply the theories, viewpoints, and methods of chemistry to analyze and solve problems.

(3) Course Leaders: Zonghuai Liu

2.课程名称: 大学物理(上)/大学物理(下)及实验

(1) 课程编码: 3541048/3541049

(2) 课程简介: 《大学物理》课程是高等学校各理工科专业学生的一门重要的基础必修课。本课程以物理学最基本的概念、理论为主体, 内容包括运动学、牛顿定律及其内在随机性、动量守恒定律与能量守恒定律、角动量守恒定律、机械振动、机械波静电场、稳定磁场、电磁感应、麦克斯韦方程组和电磁波、量子物理学基础等。通过本课程的教学, 使学生对大学物理的基本概念、基本理论、基本方法能够有比较全面和系统的认识, 并具有初步应用的能力, 为学生进一步学习打下必要的基础。

(3) 课程负责人: 贾丽超

2. CourseName: College Physics (I)/College Physics (II) and Experiments

(1) Course Code: 3521003/3521004

(2) Brief Introduction of the Course: College Physics is one of the most important compulsory courses for students in science and engineering, is the core of natural science and the foundation of technology innovation. This course mainly introduces the most basic concepts and theories of physics, studies of the basic structures and materials interaction and the most basic, the most common form of movement (mechanical, electromagnetic, micro motion and particle motion), the mutual transformation between them and science. This course is aimed to help students systematically understand the basic concepts, theories and the method of physics, to cultivate students' comprehensive use of knowledge and ability, and lay the foundation for further study of materials and physics.

(3) Course Leaders: Lichao Jia

3. 课程名称：普通生物学及实验

(1) 课程编码：3541050

(2) 课程简介：生物科学是当今众多科学领域中发展最为迅速的学科，面对知识的快速层递深化，新的知识领域和学科的不断涌现，科学研究成果知识化非常必要。普通生物学是一门综合性生物科学，从微观上系统介绍和认知生命的基本现象、基本规律和原理，从宏观上阐明生命进化趋势与环境的相互关系，为学生获取生命科学基础知识和后续专业学习奠定基础。课程将包括生物体的基本结构与功能，生物营养代谢与繁殖，生物多样性和环境，遗传、变异与进化，生命科学进展五个板块，将涉及细胞，组织、器官和系统，生物营养与代谢，生物的繁殖与发育，生物类群，生物与环境，遗传与变异，生物的起源与进化，以及生命科学研究的热点领域等内容。普通生物学实验从微生物、分子生物学、动植物和人类及生态学的层面设计实验教学体系，实验内容包括花的结构解剖观察、昆虫分类与标本制作、生态学与群落多样性调查、血型测定等，涵盖了个体与生态层面最基本的主要研究技术与方法。本课程的实验项目包括教师讲解、实验操作两部分。讲解部分着重从实验设计和技术应用层面介绍实验背景，有助于学生理解实验内容，培养学生科研思维能力；实验操作部分以微距近景的方式呈现完整的实验流程，使学生进一步理解实验设计，掌握操作细节。

(3) 课程负责人：马丽滨

3. CourseName: General Biology and Experiments

(1) Course Code: 3541050

(2) Brief Introduction of the Course: Biological sciences is currently one of the fastest-growing disciplines among numerous scientific fields. Faced with the rapid and deepening layers of knowledge, as well as the continuous emergence of new fields and disciplines, it is essential to translate the latest science and technology into textbook knowledge. Biology is a comprehensive biological science that systematically introduces and comprehends the basic phenomena, laws, and principles of life at the micro level, and explains the trends of life evolution and its relationship with the environment at the macro level. It lays the foundation for students to acquire basic knowledge of life science and pursue subsequent professional studies. The curriculum will include five sections: the basic structure and function of organisms, biological nutrition metabolism and reproduction, biodiversity and the environment, genetics, variation and evolution, and advances in life science. It will cover topics such as cells, tissues, organs, and systems; biological nutrition and metabolism; reproduction and development of organisms; biological taxa; biology and the environment; genetics and variation; the origin and evolution of life; as well as hot topics in life sciences. The experiments in Biology are designed at the levels of microbiology, molecular biology, zoology, botany, human biology, and ecology. The experimental contents include observation of flower structure anatomy, insect classification and specimen preparation, ecological surveys and community diversity investigation, blood typing, etc., covering the most basic major research techniques and methods at both individual and ecological levels. The experimental projects of this course consist of two parts: teacher explanation and experimental operation. The explanatory part focuses on introducing the experimental background from the perspective of experimental design and technical application, which helps students understand the experimental content and cultivates their scientific thinking skills. The experimental operation part presents the complete experimental process in a macroscopic and close-up manner, allowing students to further understand the experimental design and grasp operational details.

(3) Course Leaders: Libin Ma

4. 课程名称：科学教育研究方法

(1) 课程代码：3541051

(2) 课程简介：《科学教育研究方法》是科学教育本科专业的一门必修专业课。主要内容包括五个方面：一是科学教育研究概述与原则。包括科学教育研究的基本概念、重要意义、学术规范与学术伦理。二是科学教育研究的基本方法，包括观察法、调查研究法、个案研究法等多种不同类型的方法及其应用。三是科学教育研究的数据收集与整理，包括数据收集的原则与步骤、数据处理的方法与技巧、数据质量的评估。四是科学教育研究设计，包括学会发现并明确教育问题、提出研究假设、运用适当的方法设计研究方案、实施教育研究并对过程进行自我监控。五是论文撰写，旨在让学生学会将研究的过程和结果撰写为科学研究的报告或学术论文，具备科学教育研究报告撰写的能力。

(3) 课程负责人：胡卫平

4. Course Name: Methods of Science Education Research

(1) Course Code: 3541051

(2) Brief Introduction of the Course: “Methods of Science Education Research” is majors a compulsory professional course for science education. The main contents include five aspects: ①overview and principles of science education research. It includes the basic concepts, importance, academic norms and academic ethics of science education research; ②the basic methods of science education research, including many different types of methods and their applications, such as observation method, survey research method, case study method, and so on; ③data collection and organization in science education research, including principles and steps of data collection, methods and techniques of data processing, as well as assessment of data quality; ④science education research design, including learning to identify and clarify educational problems, formulate research hypotheses, design research programs using appropriate methods, implement educational research and self-monitor the process; ⑤thesis writing, which aims to enable students to learn to write the process and results of the research as a report or academic paper of scientific research.

(3) Course Leaders: Weiping Hu

5. 课程名称：自然地理学及实验

(1) 课程编码：3541052

(2) 课程简介：自然地理学是由地质、地貌、水文、气象、土壤、植物等要素组成的复杂的地理环境综合体。综合自然地理学是研究这一地理环境综合体的形成、发展和地域分异规律的科学。它一方面要研究各要素自身的特征、动态和发展规律，另一方面还着眼于研究综合体内各要素间的互相影响、互相制约。本课程的学习将为认识自然环境规律并合理开发利用资源、保护生态环境，进行数字化地球研究提供自然地理基本理论和知识支持。

(3) 课程负责人：史兴民

5. Course Name: Natural Geography and Experiments

(1) Course Code: 3541052

(2) Brief Introduction of the Course: Natural geography is a complex geographic environment composed of elements such as geology, landforms, hydrology, meteorology, soils, and vegetation. Comprehensive natural geography is the science that studies the formation, development, and spatial differentiation laws of this geographic environment. On the one hand, it studies the characteristics, dynamics, and development laws of each element itself; on the other hand, it focuses on the study of the mutual influences and constraints among the elements within the system. This course will provide basic theories and knowledge of physical geography to

understand the laws of the natural environment, develop and utilize resources rationally, protect the ecological environment, and conduct digital earth research.

(3) Course Leaders: Xingmin Shi

6. 课程名称：科学实验（一）

(1) 课程编码：3545005

(2) 课程简介：科学实验是科学教育专业中一门重要的实践课程，旨在通过系统的实验训练，培养学生的实验设计、操作、分析和创新能力，以及科学探究精神和科学素养。课程内容贴近生活，以生活现象为依托激发学生的探究精神和求知欲。该课程包括基础实验和综合性实验两部分。基础实验主要涵盖物理学、化学、生物学等基础科学领域的实验技能，如基本测量技术、实验数据处理、简易实验仪器使用等。综合性实验则更注重跨学科知识的融合，通过设计学科交叉的实验项目，让学生在实操中学会如何综合运用多学科知识解决实际问题。课程内容主要包括：1. 实验技能训练，涉及实验基本操作、实验仪器使用、实验安全规范等训练，使学生具备基本的实验操作能力。2. 实验设计方法，涉及对照实验、随机实验、重复实验等常用的实验设计方法，让学生掌握实验设计的基本原则和方法。3. 数据处理与分析，涉及实验数据的收集、整理、处理和分析方法，培养学生运用统计学和数据分析方法的能力。4. 实验报告编写，涉及包括实验目的、原理、步骤、结果和讨论等部分的实验报告撰写方法，提高学生的书面表达能力。5. 探究性与创新性，涉及探究性实验和创新性项目等内容，主要培养学生的创新精神和实践能力。6. 跨学科融合，涉及科学实验课程与其他学科课程相结合的实验内容，如地理、数学、化学、生物、物理等方面实现跨学科的融合和互补。

(3) 课程负责人：张尊听

6. Course Name: Scientific experiment (I)

(1) Course Code: 3545005

(2) Brief Introduction of the Course: Scientific experiment is an important practical course in the major of science education, which aims to cultivate students' ability of experiment design, operation, analysis, and innovation, as well as the spirit of scientific inquiry and scientific literacy through systematic experimental training. The course content is close to life and stimulates students' spirit of inquiry and thirst for knowledge based on the phenomenon in daily life. This course consists of two parts: basic experiment and comprehensive experiment. Basic experiments mainly cover experimental skills in physics, chemistry, biology, and other basic scientific fields, such as basic measurement techniques, experimental data processing, simple experimental instrument use, etc. Comprehensive experiments pay more attention to the integration of interdisciplinary knowledge. Through the design of interdisciplinary experimental projects, students can learn how to comprehensively use multidisciplinary knowledge to solve practical problems in practical operation. The course content mainly includes: 1. Experimental skills training: which including basic experimental operation, the use of experimental instruments, experimental safety standards and other aspects of training, so that students have the basic experimental operation ability. 2. Experimental design methods: Introduce the commonly used experimental design methods, such as controlled experiment, randomized experiment, repeated experiment, etc., so that students can master the basic principles and methods of experimental design. 3. Data processing and analysis: Teach students how to collect, organize, process, and analyze experimental data, and cultivate students' ability to use statistics and data analysis methods. 4. Preparation of experiment report: Instruct students how to write experiment report, including experiment purpose, principle, procedure, result and discussion, etc., to improve students' written expression ability. 5. Exploratory and innovative: Students are encouraged to carry out exploratory experiments and innovative projects to cultivate their innovative spirit and

practical ability. 6. Interdisciplinary integration: Science experiment courses can be combined with other disciplines, such as geography, mathematics, chemistry, biology, physics, etc., to achieve interdisciplinary integration and complementarity.

(3) Course Leaders: Zunting Zhang

7. 课程名称：科学实验（二）

(1) 课程代码：3545006

(2) 课程简介：科学实验二是高等学校科学教育专业多学时实践课程，它是在学生完成《科学实验（一）》学习后，进一步拓宽科学视野、提升实验技能的重要课程。本课程包括物质科学（声学、光学、力学、热学、电学、微观粒子和化学变化）、地球与宇宙（恒星、行星、卫星、星系、星座、宇宙、地形、气候、地图和地球）、生命科学（细胞、动物、植物、微生物、基因、遗传与变异、生命的起源和演化）和工程技术（杠杆、滑轮、轮轴、斜面、桥梁工程和建筑）四大科学领域中的经典科学实验等。

(3) 课程负责人：王强

7. Course Name: Science experiment II

(1) Course Code: 3545006

(2) Brief Introduction of the Course: Science Experiment II is a practical course featuring multiple class hours, which is designed for the undergraduates majoring in science education. It serves as an important course to further expand undergraduates' scientific horizons and enhance their experimental skills after completing the study of "Science Experiment I". This course encompasses classic scientific experiments from four major scientific fields: material science (including acoustics, optics, mechanics, thermodynamics, electricity, microscopic particles, and chemical reactions), earth and universe (covering stars, planets, satellites, galaxies, constellations, the universe, terrain, climate, maps, and the Earth), life science (featuring cells, animals, plants, microorganisms, genes, inheritance and variation, the origin and evolution of life), and engineering technology (involving levers, pulleys, axles, inclined planes, bridge engineering, and architecture).

(3) Course Leaders: Qiang Wang

8. 课程名称：科学教育专业英语

(1) 课程编码：3541053

(2) 课程简介：《科学教育专业英语》是面向科学教育专业本科生开设的专业必修课程。本课程教学内容主要涉及基础物理、化学、生物学专业英语词汇、专业学术用语，熟悉专业外文书刊常见的长句和复杂句等句型及专业知识的特殊表达方法，拓宽学生的专业词汇量和阅读量，掌握英汉互译技巧，使学生具备能读能写专业方面的英文资料的能力。为学生顺利阅读和正确理解与专业知识相关的英语文献，尤其是物理、化学、生物学等基础文献，打下坚实的基础。

(3) 课程负责人：罗雨佳

8. Course Name: The Academic English Course for Science Education Major

(1) Course Code: 3541053

(2) Brief Introduction of the Course: The Academic English Course for Science Education Major is a compulsory course designed for undergraduate students majoring in Science Education. The course curriculum primarily focuses on English academic terminology basic physics, chemistry, and biology vocabulary, as well as specialized. It aims to familiarize students with common complex sentence structures found in professional foreign publications and specialized expressions of knowledge. The course aims to broaden students' professional vocabulary and reading comprehension, as well as master translation skills. It aims to equip students with the

ability to read and write professional English essays. This course aims to lay a solid foundation for students to read and understand English literature related to their field of study, particularly foundational literature in physics, chemistry, biology, etc.

(3) Course Leaders: Yujia Luo

9. 课程名称：研究方法与学术论文写作

(1) 课程编码：3541006

(2) 课程简介：《研究方法与学术论文写作》指导是本科生的一门必修课。通过该课程学习，使学生较全面地了解科学研究的一般方法以及提高运用这些方法能力的途径。掌握多种形式学术论文的一般写作规范，提高学生学术论文写作能力，为将来撰写不同形式学术论文打下一定的基础，以适应研究型人才培养需求。为达到此目的，该课程将主要涉及两个方面的内容：一是研究方法：主要包括科学方法论、近代科学研究方法特点、复杂性科学研究方法论纲和典型科学研究方法解析等内容。二是学术论文写作：主要包括学术论文的一般形式和特点、学术论文各部分的写作要求与写作方法和开题报告与答辩报告的一般要求等内容。

(3) 课程负责人：胡道道

9. Course Name: Research Approach and Academic Dissertation Writing

(1) Course Code: 3541006

(2) Brief Introduction of the Course: *Research Approach and Academic Dissertation Writing* is a compulsory course for chemistry material majors. One aim of this course is to let the students know the methods of research as well as improve their ability in applying those methods. The other aim is to let the student master the writing standard of scientific paper, improving the writing ability of students. To meet the needs above, the contents of this course are divided into two sections. One section concerns with research method, including scientific methodology, the outline of complex scientific methodology, as well as the analysis of representative scientific methodology. The other section is related to composition of scientific paper, containing the form and characteristic of scientific paper, the writing requirement and the method of scientific paper, as well as the standard of opening and replying report.

(3) Course Leaders: Daodao Hu

II 专业限定选修课程简介 (Specialized Restrictive Elective Courses)

1. 课程名称：科技史与科技哲学

(1) 课程编码：3542096

(2) 课程简介：是高等学校师范类科学教育专业的课程。本课程包括科学通史（西方科学简史、中国科学简史）和科学技术哲学（科学哲学、技术与工程哲学、科学技术与社会），通过系统地介绍人类五千年科技发展的历史脉络拓宽学生的视野，基于科学发展中的基本规律梳理引导学生树立马克思主义的科学技术观，培养创新意识与科学精神，为不断提高科学素养和增强服务社会的能力打下坚实基础。

(3) 课程负责人：金普军

1. Course Name: History and Philosophy of Science and Technology

(1) Course Code: 3542096

(2) Brief Introduction of the Course: History and Philosophy of Science and Technology is designed for a limited teaching hour that contains two sections, such as the general history of science and the philosophy of science and technology. The general history of science introduces the brief history of western and Chinese science in order to broaden the students' horizons. The philosophy of science and technology focus on the philosophy of science, technology philosophy

and engineering philosophy, science and technology and society for guiding students to establish Marxist scientific and technological concepts, cultivating their innovative consciousness and scientific spirit. The aim of this cause is to improve students' scientific literacy and enhancing their ability to serve the society.

(3) Course Leaders: Pujun Jin

2. 课程名称：化学与生活

(1) 课程编码：3542097

(2) 课程简介：《化学与生活》是面向科学教育专业本科生开设的课程。本课程包括化学与生命（生命的化学基础、细胞、遗传与基因）；化学与环境（大气污染、水体污染、固体污染、室内污染及其控制方法）；化学与能源（传统的化石能源，太阳能、氢能、核能、生物质能等新能源）；化学与材料（金属材料、无机非金属材料、有机高分子材料、复合材料、纳米材料等新材料）；绿色化学（研究背景、定义、研究进展）等。本课程旨在让学生获得与生活相关的化学知识，并引导学生认识和理解生活中的化学现象，关注社会和生活化学问题，提高基本的科学素养。同时，增强学生分析、解释生活中化学问题的能力，提高学生的综合素质。

(3) 课程负责人：何贝

2.Course Name: Chemistry and Life

(1) Course Code: 3542097

(2) Brief Introduction of the Course: Chemistry and Life is designed for undergraduate students majoring in science education. It contains five sections, Chemistry and Life, Chemistry and Environment, Chemistry and Energy, Chemistry and Materials and Green Chemistry. Chemistry and Life introduces the chemical foundations of life, cells, heritage and genes. Chemistry and Environment introduces air pollution, water pollution, solid pollution, indoor pollution and their control methods. Chemistry and Energy introduces the development of energy, including traditional fossil fuels and new energy sources such as solar energy, hydrogen energy, nuclear energy and biomass energy. Chemistry and Materials introduces the development of materials, including metal materials, inorganic non-metallic materials, organic polymer materials, composite materials and other new materials such as nanomaterials. Green Chemistry introduces its research background, definition and research progress. This course aims to enable students to acquire chemistry knowledge related to daily life, guide them to recognize and understand chemical phenomena and pay attention to chemical issues in society and life, improving their basic scientific literacy. Meanwhile, it also enhances students' ability to analyze and explain chemical problems in daily life, improving their comprehensive quality.

(3) Course Leaders: Bei He

3. 课程名称：科普学概论

(1) 课程编码：3542098

(2) 课程简介：是高等学校科学教育专业必修课。本课程包括：绪论、中国科普的发展历程、科普的功能、科普学的结构体系、科普的背景分析、科普的任务与内容、科普的载体、科普的实践形式、科普的对象分类、科普的主体、科普受众的心理学基础、科普产生效果的基本机制以及科普效果的评价探索等。

(3) 课程负责人：邢惠萍

3.Course Name: Introduction to Science Popularization

(1) Course Code: 3542098

(2) Brief Introduction of the Course: Introduction to Science Popularization is a compulsory course for science education students at higher education institutions. Its contents include:

Introduction, Development History of Science Popularization in China, Function of Science Popularization, Structural System of Science Popularization, Background Analysis of Science Popularization, Tasks and Contents of Science Popularization, Carriers of Science Popularization, Practical Forms of Science Popularization, Object Classification of Science Popularization, Main Body of Science Popularization, Psychological Basis of Science Popularization Audience, Basic Mechanism of Science Popularization Effect, and Exploration of Science Popularization Effect Evaluation.

(3) Course Leaders: Huiping Xing

4. 课程名称：师范生创新教学思维与实践

(1) 课程编码：3542099

(2) 课程简介：主要讲授当前信息技术在教育应用中的理论与实践，包括技术在教育中应用的理论指导，以及技术在教育中应用的实践支持，除了介绍教育中应用的各种信息技术的特点与使用外，重点介绍在教学中使用技术策略，为教师在教学中使用技术提供实例参考。

(3) 课程负责人：葛文双

4.Course Name: Normal Students' Creative Teaching Thinking and Learning Practice

(1) Course Code: 1542206

(2) Brief Introduction of the Course: This course is mainly about the current application of information technology in education theories and practice, including the theoretical applications in education and the practical supports of technology education. Besides, this course introduces the characteristics and various IT application in the education, focuses on the use of technology strategies in teaching, and provides examples of references for teachers to use technology in teaching.

(3) Course Leaders: Wenshuang Ge

5. 课程名称：科学技术与社会

(1) 课程编码：3542100

(2) 课程简介：科学技术与社会属于科学教育专业的限定选修课程。本课程包括科学共同体、科学家的社会责任、科研伦理、科技争论、产业革命、科学技术与经济知识、科学技术与社会文化、科技政策学（组织、开发、转让和评价）、科学技术与社会发展规划等。

(3) 课程负责人：李琪

5.Course Name: Science, Technology and Society

(1) Course Code: 3542100

(2) Brief Introduction of the Course: Science, Technology and Society is assigned to one of the specialized restrictive elective courses for science education undergraduate candidates. This course covers the scientific communities, social responsibilities of scientists, scientific ethics, technological disputes, industrial revolution, science technology and economical knowledge, science technology and social culture, science and technology policy (organization, development, transfer, and evaluation), science technology and development program of society, etc.

(3) Course Leaders: Qi Li

6. 课程名称：新材料概论

(1) 课程编码：3542101

(2) 课程简介：是高等学校非材料类专业的概述课程和材料科学与工程专业的导论课程。本课程主要为材料科学与工程的综合，内容包括金属材料，无机非金属材料，高分子

材料的概述和制备。还包括复合材料，半导体和电介质材料，磁性材料，超导材料，新能源材料，生物材料，包括生物材料的分类和应用及新发展，以及环境净化材料，机敏材料和形状记忆材料，超高温材料，热防护材料，和纳米材料等。

(3) 课程负责人：曾京辉

6.Course Name: Introduction to Advanced Materials

(1) Course Code: 3542101

(2) Brief Introduction of the Course: It is designed as an overview course for non materials majors and an introduction course for materials science and engineering majors in higher education institutions. This course mainly provides an overview of materials science and engineering, including an overview and preparation of metal materials, inorganic non-metallic materials, and polymer materials. It also includes composite materials, semiconductor and dielectric materials, magnetic materials, superconducting materials, new energy materials, biomaterials, including the classification and application of biomaterials and new developments, as well as environmental purification materials, smart materials and shape memory materials, ultra-high temperature materials, thermal protection materials, and nanomaterials.

(3) Course Leaders:Jinghui Zeng

7. 课程名称：生态学概论

(1) 课程编码：3542102

(2) 课程简介：生态学概论是面向科学教育专业开设的一门基础课程，本课程的主要内容包括以下几个方面：生态学的基本概念，生态系统的组成与结构，生态系统的功能与稳定性，生物多样性及其保护，人类活动对生态系统的影响，生态保护与可持续发展。

(3) 课程负责人：郭华

7. Course Name: Introduction to Ecology

(1) Course Code: 3542102

(2) Brief Introduction of the Course: Introduction to Ecology is a fundamental curriculum designed for students majoring in Science Education. The main content of this course includes the following aspects: basic concepts of ecology, composition, and structure of ecosystems, functions and stability of ecosystems, biodiversity and its conservation, human impacts on ecosystems, ecological conservation, and sustainable development.

(3) Course Leaders: Hua Guo

8. 课程名称：脑科学概论

(1) 课程编码：3542103

(2) 课程简介：脑科学是研究脑的结构和功能的科学。主要包括脑的形态及结构、脑的分区及功能、脑细胞及其工作原理、脑神经及网络、脑的进化与发育、脑的生理机能等。脑科学旨在揭示大脑产生感知、情感、意识、思维、语言、学习记忆等高级功能的物质基础和神经网络及他们的工作原理。通过学习该课程，使学生能够在认识脑（了解大脑的一般知识）、保护脑（了解脑疾患及其防治）、创造脑（以人工智能技术为导向的类脑研究）三个方面获得知识，并指导学生职后从事科学教育时，针对受教育群体脑生长发育规律开展精准的个性化教学。

(3) 课程负责人：贾蕊

8. Course Name: Introduction to Brain Science

(1) Course Code: 3542103

(2) Brief Introduction of the Course: Introduction to Brain Science is the scientific study of the structure and function of the brain. It primarily includes aspects such as brain morphology and structure, brain partitioning and function, brain cells and their working mechanism, brain nerves

and networks, brain evolution and development, and brain physiological functions. Introduction to Brain Science aims to reveal the material basis and neural networks underlying advanced functions of the brain, such as perception, emotion, consciousness, thinking, language, learning, and memory. By studying this course, students can acquire knowledge in three aspects: understanding the brain (understanding general knowledge about the brain), protecting the brain (understanding brain diseases and their prevention and treatment), and creating the brain (conducting brain research guided by artificial intelligence technology). This course will also guide students to engage in precise personalized teaching tailored to the brain growth and development laws of the educated group when they are involved in scientific education in their careers.

(3) Course Leaders: Rui Jia

9. 课程名称：工程技术概论

(1) 课程编码：3542104

(2) 课程简介：本课程旨在培养和提升高等学校学生的工程素质。本课程包括科学、技术与工程的基本概念、特征及其相互关系；工程技术、工程技术研究、工程技术人员和工程技术方法的基本概念，工程技术创造活动的一般程序；工程技术选题、预测、评估、方案设计、试验、实施和工程技术创造发明方法，系统工程及其研究方法；科学创新、技术创新与工程创新的概念、特点和创新过程，创造性解决问题的理论与方法；现代工程技术人员内涵、素质特征及培养；典型案例分析，工程技术研究的一般过程等。

(3) 课程负责人：万金涛

9. Course Name: Introduction to Engineering Technology

(1) Course Code: 3542104

(2) Brief Introduction of the Course: This course aims to cultivate and enhance the engineering literacy of college students. The sector one discusses basic concepts, characteristics, and interrelationships among science, technology, and engineering. The sector two focuses upon fundamental concepts of engineering technology, research, personnel and methods, general procedures for engineering technology creation activities including topic selection, prediction, evaluation, scheme design, experimentation, implementation, and engineering technology invention methods, and system engineering and related research methods. The sector three mainly delves into concepts, characteristics, and innovation processes of scientific innovation, technological innovation, and engineering innovation, as well as the theories and methods for creative problem-solving. The sector four discusses connotation, quality characteristics, and cultivation of modern engineering technical talents, and finally by providing some classic case studies demonstrates the general process for engineering technology research.

(3) Course Leaders: Jintao Wan

10. 课程名称：地球概论

(1) 课程编码：3542105

(2) 课程简介：地球概论主要介绍的是行星地球整体的基础知识或自然地理环境的全球性背景知识。其内容可概括为两个方面，即地球的物理学和地球的天文学。前者主要阐述的是地球的形状、大小、物质组成、结构特征以及物理性质等。后者主要阐述的是地球的宇宙环境、地球的运动及其地理意义，以及地球和其他天体的关系等。

(3) 课程负责人：王蕊

10. Course Name: Introduction to Earth Science

(1) Course Code: 3542105

(2) Brief Introduction of the Course: Introduction to Earth Science primarily covers fundamental knowledge of the planet Earth as a whole or global background knowledge of the

natural geographical environment. Its content can be summarized into two aspects: Earth's physics and Earth's astronomy. The former mainly explains the shape, size, material composition, structural characteristics, and physical properties of the Earth. The latter mainly discusses the cosmic environment of the Earth, its movements and geographical significance, as well as its relationship with other celestial bodies.

(3) Course Leaders: Rui Wang

11. 课程名称：仿生学导论

(1) 课程编码：3542106

(2) 课程简介：《仿生学导论》是一门介绍仿生学基本概念、原理、应用和发展趋势的课程。仿生学是一门新兴交叉学科，它利用自然界生物体的形态、结构、功能、信息控制等优异的特性，模仿生物系统的原理，或者从其生存的复杂环境中获得灵感，来解决人类需求。课程的主要内容包括仿生学的基本概念、生物系统的特性和原理、仿生学的应用领域、仿生设计与创新等。在《仿生学导论》课程中，学生将了解仿生学的定义、发展历程和研究内容，学习如何从生物系统中提取灵感，并将其应用于工程技术和现代设计中。课程还将探讨仿生学在各个领域的应用，如航空航天、机械工程、生物医学、建筑设计等，通过案例分析，让学生了解仿生学在解决实际问题中的重要作用。此外，课程还将注重培养学生的创新思维和实践能力，通过组织仿生设计实践、项目研究和团队合作等活动，提高学生的动手能力和解决问题的能力。

(3) 课程负责人：邓字巍

11. Course Name: The Introduction of Bionics

(1) Course Code: 3542106

(2) Brief Introduction of the Course: Introduction to Bionics is a course that introduces the basic concepts, principles, applications, and trends in bionics. Bionics is an emerging interdisciplinary discipline that utilizes the excellent characteristics of natural organisms, such as form, structure, function, and information control, to mimic the principles of biological systems or draw inspiration from the complex environments in which they exist to address human needs. The main contents of the course include basic concepts of bionics, characteristics and principles of biological systems, application areas of bionics, and bionic design and innovation. In the Introduction to Bionics course, students will learn about the definition, history and research of bionics, and learn how to take inspiration from biological systems and apply it to engineering and modern design. The course will also explore the application of bionics in various fields, such as aerospace, mechanical engineering, biomedicine, architectural design, etc. Through case studies, students will understand the important role of bionics in solving practical problems. In addition, the course will focus on cultivating students' innovative thinking and practical ability, and improve their hands-on ability and problem-solving ability by organizing activities such as bionic design practice, project research and teamwork.

(3) Course Leaders: Ziwei Deng

12. 课程名称：营养与健康

(1) 课程编码：3542108

(2) 课程简介：随着经济的发展，我国居民的生活水平显著提高，在吃饱吃好的基础上，要吃得 healthier，更有营养。本课程主要介绍营养学的基本概念，营养与健康的关系以及人体的基本生理知识。主要内容包括：人体所需的七大类营养素的化学结构、主要生理功能、食物来源、人体每天的参考摄入量等；主要食物种类包括谷物类、薯类、豆类、坚果类、蔬菜水果类、畜禽肉类、水产品类、蛋类、乳制品类的营养价值；营养与疾病特别是一些慢性、高发性疾病如高血糖、高血压、高血脂、癌症等的关系。内容简单，适合无

营养学基础、但希望了解一般的营养学知识，改善日常膳食质量的人选修。希望通过对这门课程的学习，可以帮助选修本课程的同学建立良好的健康饮食习惯，建立科学饮食观念，做到均衡营养、注重膳食平衡，从而起到营养与健康宣传教育的目的。

(3) 课程负责人：陈立

12. Course Name: Nutrition and Health

(1) Course Code: 3542108

(2) Brief Introduction of the Course: With the development of the economy, the living standards of our country's residents have improved significantly. On the basis of eating well and eating well, they must eat healthier and more nutritiously. This course mainly introduces the basic concepts of nutrition, the relationship between nutrition and health, and basic physiological knowledge of the human body. The main content includes: the chemical structure, main physiological functions, food sources, daily reference intake of the seven major types of nutrients required by the human body, etc.; the main food types include cereals, potatoes, beans, nuts, vegetables and fruits. The nutritional value of meat, livestock and poultry, aquatic products, eggs, and dairy products; the relationship between nutrition and diseases, especially some chronic and high-risk diseases such as hyperglycemia, hypertension, hyperlipidemia, cancer, etc. The content is simple and suitable for people who have no foundation in nutrition but want to understand general nutrition knowledge and improve the quality of their daily diet. It is hoped that the study of this course can help students who choose this course to establish good healthy eating habits, establish scientific dietary concepts, achieve balanced nutrition, and pay attention to dietary balance, thereby serving the purpose of nutrition and health publicity and education.

(3) Course Leaders: Li Chen

13. 课程名称：环境科学概论

(1) 课程编码：3542109

(2) 课程简介：环境科学概论以人类生态系统的基本原理为基础，阐述环境问题的发生、发展；探讨人类活动所引起的大气、水、土壤、生物的污染、污染物在环境中的迁移转化规律；介绍环境质量评价、城市环境、区域环境，以及人口、资源、能源与环境等问题。通过介绍环境问题的概貌，以及环境的基本知识和原理，对学生进行环境教育，使其掌握环境知识，增强其环境保护意识，以达到保护、改善和创造美好环境来满足社会迅速发展需要的目的。

(3) 课程负责人：卢新卫

13. Course Name: Introduction to Environmental Science

(1) Course Code: 3542109

(2) Brief Introduction of the Course: Introduction to Environmental Science is based on the fundamental principles of the human ecological system, elucidating the occurrence and development of environmental issues. It explores the pollution of the atmosphere, water, soil, and organisms caused by human activities, as well as the laws of the migration and transformation of pollutants in the environment. It introduces environmental quality assessment, urban environment, regional environment, as well as population, resources, energy, and environmental issues. By providing an overview of environmental issues, along with basic knowledge and principles of the environment, environmental education is imparted to students, enabling them to grasp environmental knowledge, enhance their environmental awareness, and achieve the goal of protecting, improving, and creating a better environment to meet the needs of rapid social development.

(3) Course Leaders: Xinwei Lu

14. 课程名称：电工学基础

(1) 课程编码: 3542110

(2) 课程简介: 是高等学校工科非电类专业的一门电工学技术基础课。本课程包括电学(电路的作用与组成部分、电路模型、电流和电压的关联参考方向、吸收和提供功率、电源与信号源、电感和电容元件、基尔霍夫定律、电路的等效变换、支路电流分析法、结点电压分析法、叠加原理、等效电源定理)、模拟电路(半导体的基本知识、PN结、半导体二极管、半导体三极管、基本放大电路、集成运算放大器、放大电路中的反馈、集成运算放大器的线性与非线性应用)和数字电路(数字电路基础、数制与编码、基本逻辑运算和逻辑门、逻辑代数基本运算规则和基本定律、逻辑函数的代数法化简与变换、集成逻辑门、组合逻辑电路)。

(3) 课程负责人: 王大鹏

14.Course Name: Fundamentals of Electrical Engineering

(1) Course Code: 3542110

(2) Brief introduction of the course: It is a basic course in electrical engineering technology for non-electrical majors in higher education institutions. This course includes electrical engineering (the role and components of circuits, circuit model, reference directions for current and voltage, absorption and provision of power, power and signal sources, inductors and capacitors, Kirchhoff's law, equivalent transformations of circuit, branch current analysis, junction voltage analysis, superposition principle, equivalent source theorem), analog circuit (basic knowledge of semiconductor, PN junction, semiconductor diode, semiconductor transistor, basic amplification circuit, integrated operational amplifier, feedback in amplification circuit, linear and nonlinear applications of integrated operational amplifier), and digital circuit (fundamentals of digital circuit, number systems and coding, basic logic operations and logic gates, basic operation rules and laws of logic algebra, algebraic simplification and transformation of logic function, integrated logic gate, combinational logic circuit).

(3) Course Leaders: Dapeng Wang

15. 课程名称: 人工智能与教育

(1) 课程编码: 3542111

(2) 课程简介: 本课程是高等学校科学教育专业选修课程。本课程包括人工智能基础(人工智能的发展阶段、关键技术以及人工智能教育应用的内涵); 人工智能相关编程技术(Python语言高级应用); 人工智能技术与应用(文本分类与分析和图像识别等); 人工智能教育应用环境(智能学习环境和教育应用场景); 人工智能的学习应用(智能学习助理、通用型智能学习工具和学科智能学习工具); 人工智能的教学设计等。

(3) 课程负责人: 艾轩

15. Course Name: The Education of Artificial Intelligence

(1) Course Code: 3542111

(2) Brief Introduction of the Course: The education of artificial intelligence is a professional elective curriculum for undergraduates majoring in "Science Education" at normal universities. The course includes: fundamentals of artificial intelligence (development stages of AI, key technologies, and the implications of AI in education); AI-related programming techniques (advanced applications of the Python language); AI technologies and applications (text classification and analysis, image recognition, etc.); AI educational application environments (intelligent learning environments and educational application scenarios); AI learning applications (intelligent learning assistants, general intelligent learning tools, and subject-specific intelligent learning tools); Instructional design for AI education.

(3) Course Leaders: Xuan Ai

16. 课程名称：工程制图

(1) 课程编码：3542112

(2) 课程简介：《工程制图》课程是一门工程学科的基础课，被誉为“工程界的语言”，它研究绘制和阅读工程图样的理论和方法，与生产实践密切相关。该课程主要内容包括画法几何和制图两部分。画法几何是制图的理论基础，主要研究各种投影法（主要是正投影法）的基本理论；制图是投影理论的运用，即运用投影法，绘制各种常见的工程图样。该课程的主要任务是培养学生绘图和读图的基本技能，并通过实践，培养他们的空间想象能力，为绘制符合国家制图标准的图样提供基础。

(3) 课程负责人：宁星铭

16. Course Name: Engineering Drawing

(1) Course Code: 3542112

(2) Brief Introduction of the Course: Engineering Drawing is a fundamental course in the field of engineering, known as the "language of the engineering world". It studies the theory and methods of drawing and reading engineering drawings, and is closely related to production practice. The main content of this course includes two parts: descriptive geometry and drawing. Descriptive geometry is the theoretical foundation of drawing, mainly studying the basic theories of various projection methods (mainly orthographic projection); Cartography is the application of projection theory, which uses projection method to draw various common engineering drawings. The main task of this course is to cultivate students' basic skills in drawing and reading, and through practice, to cultivate their spatial imagination ability, providing a foundation for drawing drawings that comply with national drawing standards.

(3) Course Leaders: Xingming Ning

17. 课程名称：跨学科教学实践

(1) 课程编码：3542113

(2) 课程简介：《跨学科教学实践》是科学教育本科专业的一门专业课。主要包括四个方面：一是跨学科教学的提出与发展。包括跨学科教学理念提出的社会背景、培养目标与国际发展趋势，引导学生理解在我国加强实施跨学科教学的现实意义。二是跨学科教学的内涵与特征。包括跨学科教学的内涵界定，基本特征以及跨学科教学与学科教学之间的内在联系。三是跨学科教学的实施路径，包括综合性与学科教学内的跨学科教学实施策略，使得学生在小学综合科学课程与初高中分科课程中都能有效实施跨学科教学。四是跨学科教学的评价，包括过程性评价与结果性评价的实施方案。

(3) 课程负责人：郭习佩

17. Course Name: The Practice of Interdisciplinary Teaching and Learning

(1) Course Code: 3542113

(2) Brief Introduction of the Course: "The Practice of Interdisciplinary Teaching and Learning" is majors a professional course for science education. The main content includes four aspects: ① the proposal and development of interdisciplinary teaching. It includes the social background, cultivation goal and international development trend of the concept of interdisciplinary teaching; ② the connotation and characteristics of interdisciplinary teaching, which includes the meaning and characteristics of interdisciplinary teaching, as well as the intrinsic connection between interdisciplinary teaching and subject teaching; ③ the implementation path of interdisciplinary teaching, including the implementation strategy of comprehensive interdisciplinary teaching and the interdisciplinary teaching within the subject teaching, so that the students can effectively implement interdisciplinary teaching in the elementary comprehensive science curriculum and the separate subject curriculum; ④ the evaluation of interdisciplinary teaching, including the implementation program of process

evaluation and outcome evaluation.

(3) Course Leaders: Xipei Guo

18. 课程名称：科技创客教育与实践

(1) 课程编码：3542114

(2) 课程简介：本课程是高等学校科学教育专业理论与实践相结合的选修课程。本课程包括创客教育概述（创客教育概念、分类和我国创客教育相关政策）；创客空间建设（创客空间的建设、功能、管理、评价及案例）；创客课程的设计与开发（创客课程目标设计、内容设计与教学评价设计）；图形化编程概述（Scratch 编程应用）；创客教育实践（创客教育活动的教学设计、教学模式和教育案例）；创客类比赛（创客类赛事介绍和创客类比赛案例）；图形化编程实验等。

(3) 课程负责人：艾轩

18. Course Name: The Education and Practice of Technological Makers

(1) Course Code: 3542114

(2) Brief Introduction of the Course: The education and practice of technological makers is a professional elective curriculum combining theory and practice for undergraduates majoring in "Science Education" at normal universities. The course includes: Overview of Maker Education (concepts, classifications, and relevant policies); Construction of Maker Spaces (building, functions, management, evaluation, and case studies of maker spaces); Design and Development of Maker Courses (designing goals, content, and assessment for maker courses); Overview of Graphical Programming (applications of Scratch programming); Practice in Maker Education (instructional design, teaching models, and educational case studies for maker activities); Maker Competitions (introduction to maker competitions and case studies); Experiments in Graphical Programming.

(3) Course Leaders: Xuan Ai

19. 课程名称：科学教育专业创新创业实训

(1) 课程编码：3546011

(2) 课程简介：高等学校理工类非化学相关专业的理论与实践相结合的综合实训课程，本课程包括理论与实践两部分，理论课包含创新教育实施要点、培养创新思维、创业者与创业团队、创业机会与创业资源、创业项目的选择、创业计划书、创业思维、创业大赛的提升和基地的孵化等；实践课包含互联网+商务服务、互联网+信息技术服务、互联网+制造业、互联网+公共服务等。

(3) 课程负责人：贾智慧

19. Course Name: Innovation and Entrepreneurship Training for Science Education Major

(1) Course Code: 3546011

(2) Brief Introduction of the Course: It is a comprehensive practical training course combining theory and practice for science and engineering majors of non-chemistry majors in colleges and universities. This course includes two parts: theory and practice. The theoretical course includes implementation points of innovative education, training of innovative thinking, entrepreneurs and entrepreneurial teams, entrepreneurial opportunities and entrepreneurial resources, selection of entrepreneurial projects, entrepreneurial plans, entrepreneurial thinking, promotion of entrepreneurial competitions and incubation of bases, etc. Practical courses include Internet + business services, Internet + information technology services, Internet + manufacturing, Internet + public services, etc.

(3) Course Leaders: Zhihui Jia

20. 课程名称：科学实验设计实训

(1) 课程编码：3546012

(2) 课程简介：该课程由以下三部分组成

(a) 教学实践项目（2 学分）：学生在学期间，须在导师指导下，申请并主持国家级、省级、校级大学生创新性项目、材料学子创新基金、勤助科研项目等。项目顺利结题，可获得 2 个学分。

(b) 中小学教师讲座（1 学分）：在学期间，学生参加不少于 5 次的中小学教师讲座报告，报告结束后，撰写 500 字左右的讲座内容及心得体会；

(c) 毕业论文（设计）准备阶段（1 学分）：学生毕业论文（设计）的调研准备阶段。

(3) 课程负责人：王强

20.Course Name: Practical Training in the Design of Scientific Experiments

(1) Course Code: 3546012

(2) Brief Introduction of the Course: This course consists of three parts, i.e teaching research practice (2 credits), attending the lecture (1 credit) and preparing for the graduation thesis (1 credit). In teaching research practice, students should apply for innovative projects that can be the national, provincial, university and school-level. Supported by these projects, students who can successfully complete the project will receive 2 credits.

(3) Course Leaders: Qiang Wang

III 专业任意选修课程简介 (Specialized Non-Restrictive Elective Courses)**1. 课程名称：科学教育经典文献选读**

(1) 课程代码：3543054

(2) 课程简介：《科学教育经典文献选读》是科学教育本科专业的一门选修专业课。主要内容包括四个方面：一是国内外高质量科学教育期刊与文献检索方法介绍；二是文献阅读方法介绍，帮助学生掌握不同类型科学教育文献的篇章结构、阅读步骤和关键信息提取；三是国内外经典文献与最新科学教育文献阅读和主题梳理，旨在引导学生了解科学教育研究的最新进展与发展趋势，并学会围绕特定主题进行文献综述；四是基于文献综述的问题提出，旨在培养学生用批判性精神阅读已有研究并创造性地提出研究问题与解决思路。

(3) 课程负责人：郭习佩

1.Course Name: Reading Classical Literature in Science Education

(1) Course Code: 3543054

(2) Brief Introduction of the Course: “Reading Classical Literature in Science Education” is a professional elective course for science education undergraduate majors. The main contents include four aspects: ①the introduction of domestic & foreign high-quality science education journals and literature search methods; ②the introduction of literature reading methods to help students master the chapter structure, reading steps, and key information extraction of different types of science education literature; ③the science education literature reading and theme combing. It aims to guide students to understand the latest progress and trend of science education research, further learn to conduct literature review around specific topics; ④the problem formulation based on literature review, which aims to cultivate students to read the existing research in a critical spirit and creatively put forward research problems and solution ideas.

(3) Course Leaders: Xipei Guo

2. 课程名称：现代化学专题

(1) 课程代码：3543055

(2) 课程简介:《现代化学专题》是一门针对科学教育专业学生开设的课程,旨在深入探讨现代化学的前沿领域和重要概念。本课程涵盖了化学领域的多个方面,包括但不限于化学结构与性质、化学键与分子构型、化学反应动力学、催化剂与反应机制、材料化学与纳米技术等。学生将通过理论学习、实验探究以及案例分析等方式,全面了解化学领域的最新进展和研究动态,培养其扎实的化学基础、科学思维和实验操作能力。

(3) 课程负责人: 李建锋

2.Course Name: Special Topics in Modern Chemistry

(1) Course Code: 3543055

(2) Brief Introduction of the Course: Special Topics in Modern Chemistry is a course designed for students majoring in science education, aiming to delve into the frontier areas and important concepts of modern chemistry. This course covers various aspects of chemistry, including but not limited to chemical structure and properties, chemical bonding and molecular configuration, chemical reaction kinetics, catalysts and reaction mechanisms, materials chemistry and nanotechnology, etc. Through theoretical study, experimental exploration, and case analysis, students will comprehensively understand the latest developments and research trends in the field of chemistry, cultivate their solid foundation in chemistry, scientific thinking, and practical laboratory skills.

(3) Course Leaders: Jianfeng Li

3. 课程名称: 现代物理专题

(1) 课程代码: 3543056

(2) 课程简介: 是高等学校工科专业的一门研究自然科学和工程技术的基础课程。本课程包括振动与波(单摆和复摆、双簧管音色、薄板控制噪声、驻波)、光学(激光陀螺仪、光的相干性、光栅原理)、热学(铀浓缩原理、真空度、熵与绝热)、量子物理(地球温暖、恒星命运预测)、质点力学(阿特伍德机作用、汽车驾乘人安全力学、动量迁移)、刚体(物体极限转速、转速与受力模型、空速管系统)、相对论(狭义相对论中佯谬问题、相对论与导航系统、时空的形状)、电磁场(大气中的电现象、场致发射显微镜、无线充电、磁透镜的聚焦原理)。

(3) 课程负责人: 王大鹏

3. Course Name: Special Topics in Modern Physics

(1) Course code: 3543056

(2) Brief introduction of the course: It is a fundamental course in the study of natural sciences and engineering technology for engineering majors in higher education institutions. This course includes vibration and waves (pendulum and compound pendulum, oboe sound, thin plate controlled noise, standing waves), optics (laser gyroscope, coherence of light, grating principle), thermodynamics (uranium enrichment principle, vacuum degree, entropy and adiabation), quantum physics (Earth warmth, stellar fate prediction), particle mechanics (Atwood machine effect, safety mechanics for drivers and passengers, momentum transfer), rigid bodies (object limit speed, speed and force model, airspeed tube system), relativity (paradox problem in special relativity, relativity and navigation system, shape of time and space), and electromagnetic fields (electrical phenomena in the atmosphere, field emission microscopy, wireless charging, the focusing principle of magnetic lenses).

(3) Course Leaders: Dapeng Wang

4. 课程名称: 稀土发光材料

(1) 课程编码: 3543018

(2) 课程简介:《稀土发光材料》是材料化学本科专业的一门专业拓展课程,本课程

旨在使学生掌握稀土离子发光的基础知识和基本原理，其由以下两方面内容组成：一、发光的基本原理和机制，包括激发态吸收、能量传递、辐射跃迁、无辐射跃迁等。二、发光材料的制备及其应用：稀土上转换材料及其发光机理、长余辉材料、电致发光材料等。课程在系统讲述稀土发光材料机理的基础上，理论联系实际，重点突出稀土发光材料在材料科学中特别是在生物医学及太阳能电池领域的应用，反映稀土发光材料在材料科学的综合性、边缘性和前瞻性。

(3) 课程负责人：石峰

4. Course Name: Rare Earth Luminescent Materials

(1) Course Code: 3543018

(2) Brief Introduction of the Course: *Rare Earth Luminescent Materials* is one specialized development course of School of Materials Science and Engineering. It mainly includes two parts: a) The basic principle of luminescence and mechanisms: excited state absorption, energy transfer, radiative transition, nonradioactive transition and so on. b) The preparation of luminescent materials and their applications: rare earth conversion materials and luminescence mechanisms, long persistence phosphors, electroluminescent materials. This course aims to master relevant fundamental knowledge and basic theory of rare earth luminescent materials. Linking theory with practice, it is emphasized on the practical applications of the fundamental theory of rare earth luminescent materials in materials science, especially in biomedicine and solar cell, presenting the comprehensiveness, marginality and perceptiveness of rare earth luminescent materials.

(3) Course Leaders: Feng Shi

5. 课程名称：传感材料与技术

(1) 课程编码：3543040

(2) 课程简介：纳米传感技术是纳米材料和传统传感技术交叉渗透而形成的一个新领域，它在航天、机械、仪器仪表、汽车制造、油气勘探、电子工程及医疗器械行业都有广泛用途，被欧盟评为对未来影响最大的六项前沿技术之一。本课程主要介绍纳米敏感材料与传感技术的基本概念、分子识别元件及其生物和化学反应基础。重点介绍电导型半导体氧化物纳米传感器、电化学传感器、纳米结构分子印迹化学/生物微纳传感器、电导型 DNA 及其复合纳米材料传感器、纳米材料化学发光传感器的原理。

(3) 课程负责人：贾丽超

5. Course Name: Materials and Technologies of Sensors

(1) Course Code: 3543040

(2) Brief Introduction of the Course : Nanosensor technology is a new emerging interdisciplinary of nanomaterials and traditional sensing technology. It has been widely used in space, machinery, instrument, automobile manufacturing, oil and gas exploration, electronic engineering and medical instrument industry. This course introduces the basic concepts of nanomaterials and sensing technology, molecular recognition components and their reaction basis of biology and chemistry. This course is mainly focus on the principle of conductivity type semiconductor oxide nanosensor, electrochemical sensor, nanostructured molecular imprinted chemical/biosensor, conductivity DNA and its composite nanomaterial sensor, nanomaterial chemiluminescence sensor.

(3) Course Leaders: Lichao Jia

6. 课程名称：胶体化学与界面

(1) 课程编码：3543035

(2) 课程简介：胶体化学与界面课程是一门研究胶体和界面现象的化学学科。该课程将介绍胶体化学与界面科学的基本概念、原理和方法，包括分散体系、表面活性剂、胶体

稳定性、界面吸附等。此外，课程还将深入探讨各种实际应用，如涂料、化妆品、石油工业、生物医学等领域的胶体和界面现象。通过实验和实践环节，学生将有机会探索胶体和界面的制备、表征和性能测试过程，培养解决实际问题的能力。本课程旨在培养学生对胶体化学与界面科学的兴趣和专业基础知识，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人：沈淑坤

6. Course Name: Colloid Chemistry and Interface

(1) Course Code: 3543035

(2) Brief Introduction of the Course: *Colloid Chemistry and Interfacial Science* is a branch of chemistry that studies colloid and interface phenomena. This course will introduce the basic concepts, principles, and methods of colloid chemistry and interfacial science, including dispersion systems, surfactants, colloid stability, and interfacial adsorption. Additionally, the course will delve into various practical applications, such as coatings, cosmetics, the petroleum industry, biomedicine, and other fields involving colloid and interface phenomena. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of colloids and interfaces, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of colloid chemistry and interfacial science, providing support for their research and development work in related fields.

(3) Course Leaders: Shukun Shen

7. 课程名称：光催化材料与技术

(1) 课程编码：3543052

(2) 课程简介：光催化材料与技术课程是一门介绍光催化材料及其在能源、环境等领域应用的课程。该课程将重点介绍光催化材料的原理、制备、性能和应用，包括光催化材料的基本性质、光催化反应机制、光催化材料的合成与改性等方面的知识。此外，课程还将深入探讨光催化技术在分解水制氢、污染物降解、太阳能转换等领域的应用，以及面临的挑战和未来的发展方向。通过实验和实践环节，学生将有机会探索光催化材料的制备、表征和性能测试过程，培养解决实际问题的能力。本课程旨在培养学生对光催化材料与技术的兴趣和专业基础知识，为他们在相关领域的研究和开发工作提供支持。

(3) 课程负责人：闫俊青

7. Course Name: Photocatalytic Materials and Technology

(1) Course Code: 3543052

(2) Brief Introduction of the Course: *Photocatalytic Materials and Technology* is a course that introduces photocatalytic materials and their applications in energy, environment, and other fields. This course will focus on the principles, preparation, properties, and applications of photocatalytic materials, including basic properties of photocatalytic materials, photocatalytic reaction mechanisms, synthesis and modification of photocatalytic materials. Additionally, the course will delve into the applications of photocatalytic technologies in areas such as water splitting for hydrogen production, pollutant degradation, solar energy conversion, as well as challenges and future perspective. Through experiments and practical sessions, students will have the opportunity to explore the preparation, characterization, and performance testing processes of photocatalytic materials, cultivating their ability to solve practical problems. This course aims to cultivate students' interest and expertise in the field of photocatalytic materials and technology, providing support for their research and development work in related fields.

(3) Course Leaders: Junqing Yan

8. 课程名称：有机光电材料与器件导论

(1) 课程编码：3543041

(2) 课程简介：《有机光电材料与器件导论》旨在使学生了解有机光电材料与器件这一新兴领域，并熟悉相关基础知识与基本理论。主要内容包括有机（包括小分子和聚合物）半导体的基本知识、有机光电材料的分子结构、导电与发光机理、有机光电器件的分类与工作原理以及有机光电材料在有机发光二极管和发光电化学池、有机太阳能电池、有机场效应晶体管、有机存储器、有机生物化学传感器、有机光泵浦激光器以及有机非线性光学材料等方面的应用。

(3) 课程负责人：胡鉴勇

8. Course Name: Introduction to Organic Optoelectronic Materials and Devices

(1) Course Code: 3543041

(2) Brief Introduction of the Course: This course is intended to introduce the new field of organic optoelectronic materials and devices to students and acquaint them with relevant fundamental knowledge and basic theory. The course includes the foundation knowledge of organic semiconductors (small molecules and polymers), the molecular structure of organic optoelectronic materials, conductive and light-emitting mechanism, classification and the principles of diverse organic optoelectronic devices, and the applications of organic optoelectronic materials in the devices, such as organic light-emitting diodes, emitting electrochemical cells, organic solar cells, organic field-effect transistors, organic memories, organic biochemical sensors, organic optical pumped lasers, and organic non-linear optical materials, etc.

(3) Course Leaders: Jianyong Hu

9.课程名称：材料科学前沿进展

(1) 课程代码：3543057

(2) 课程简介：材料科学前沿进展是高等学校是材料学专业基础课程之一。本课程结合材料与人类文明发展历史，介绍包括现代功能玻璃、功能陶瓷、纳米材料、金属材料、高分子材料、生物医用材料、能源材料、催化材料、光电材料、碳材料等不同前沿材料。通过本课程学习，学生将了解材料如何影响我们生活，新材料的概况、制备生产技术及应用，以及材料科学的未来及发展方向。

(3) 课程负责人：向万春

9.Course Name: Frontiers of material Science

(1) Course code: 3543057

(2) Brief introduction. Frontiers of material Science is one of the fundamental courses for students majoring in materials. Combining materials with the evolution of human civilization, this course contains modern functional glass, functional ceramics, nanomaterials, metal, polymers, biomedical materials, energy materials, catalytic materials, optoelectronic materials, carbon materials, etc. Through learning this course, students can know how materials affect our daily lives, the updated information of different materials, and their manufacturing and applications. Students can also know the future of the development of material science.

(3) Course Leaders: Wanchun Xiang

10. 课程名称：材料的力学性能

(1) 课程编码：3543025

(2) 课程简介：《材料的力学性能》是材料化学、新能源材料与器件专业的一门专业拓展课程。本课程主要介绍材料在力、能量、环境和时间单独或复合作用下，材料力学行为的响应规律、物理本质、评定方法、测试方法和工程应用。所涉及的内容主要有四部分：材料的基本力学性能，包括弹性、塑性，形变强化、强度、韧性和硬度等；断裂的抗力及其表征，主要包括断裂韧性、脆断的微观机制、缺口件的断裂和冲击能量作用下的断裂；与时间有关的失效机理和抗力，主要有疲劳、蠕变、应力腐蚀和氢脆、摩擦与磨损及接触

疲劳等。

(3) 课程负责人：孙颀

10. Course Name: Mechanical Properties of Materials

(1) Course Code: 3543025

(2) Brief Introduction of the Course: *Mechanical Properties of Materials* is a professional development course for Materials Chemistry and New Energy Materials and Devices. This course mainly introduces the response law, physical nature, evaluation method, test method and engineering application of mechanical behavior of materials under the action of force, energy, environment and time alone or in combination. Four main parts are involved in this course: the basic mechanical properties of the material, including elasticity, plasticity, deformation strengthening, strength, toughness and hardness; the resistance of the fracture and its characterization, including fracture toughness, microscopic mechanism of brittle fracture, fracture of the notched piece and under impact energy; time-dependent failure mechanism and resistance, mainly including fatigue, creep, stress corrosion and hydrogen embrittlement, friction, wear and contact fatigue.

(3) Course Leaders: Jie Sun

11. 课程名称：材料的相变原理

(1) 课程编码：3543026

(2) 课程简介：《材料的相变原理》是材料化学、新能源材料与器件专业的一门专业拓展课程。本课程是《材料科学基础》中凝固和相图理论的拓展和延伸，主要以材料相变的基本原理为出发点，从材料相变过程的热力学、动力学和晶体学角度论述各类典型材料相变过程中的基本规律，并对相变研究的前沿领域进行简要介绍和展望。本课程的主要内容包括：① 材料相变的分类和基本规律（相变热力学、动力学和晶体学）；② 液-固相变的基本理论（凝固、熔化和过热）；③ 固态相变的基本理论（扩散型相变、无扩散型相变和二级相变）；④ 纳米材料相变简介。

(3) 课程负责人：孙颀

11. Course Name: Phase Transformation Mechanisms of Materials

(1) Course Code: 3543026

(2) Brief Introduction of the Course: *Phase Transformation Mechanisms of Materials* is a professional development course for Materials Chemistry and New Energy Materials and Devices. This course is an extension of the theory of solidification and phase diagram in the course of "Fundamentals of Materials Science". It mainly takes the basic principle of material phase transition as the starting point, discussing the basic laws of various typical phase transformations from the perspectives of thermodynamics, dynamics and crystallography. Moreover, brief introduction and prospective on the frontier research field of phase transformation are also involved in this course. The main contents include: ① Classification and basic laws of phase transition of materials (phase transition thermodynamics, kinetics and crystallography); ② Basic theory of liquid-solid phase transition (solidification, melting and superheating); ③ Basic theory of solid state phase transition (diffusion phase transition, non-diffusion phase transition and secondary phase transition); ④ Introduction to phase transition in nanomaterials.

(3) Course Leaders: Jie Sun

12.课程名称：二维原子晶体材料与器件

(1) 课程编码：3543031

(2) 课程简介：《二维原子晶体材料与器件》是材料化学本科专业的一门专业拓展课。本课程旨在使学生了解二维原子晶体材料与器件这一前沿领域，并熟悉相关基础知识与基本理论，激发学生科学研究兴趣。课程主要内容包括二维原子晶体材料；二维原子晶体材料的种类和制备方法、结构和性质；二维原子晶体材料光电器件的种类与工作原理；二维

原子晶体材料在光电探测、场效应晶体管、存储器件、逻辑电路和传感等电子原器件中的应用；二维原子晶体材料的发展前景、问题与挑战。

(3) 课程负责人：徐华

12. Course Name: Two-dimensional Atomic Crystal and Device

(1) Course Code: 3543031

(2) Brief Introduction of the Course: *Two-dimensional Atomic Crystal and Device* is one professional development courses for BS degree students in materials chemistry. This course is intended to introduce the frontier field of two-dimensional atomic crystal materials and devices to students and acquaint them with relevant fundamental knowledge and basic theory, and excite their interest to scientific research. The course includes the foundation knowledge of two-dimensional atomic crystal materials; the classification, preparation, property and preparation of two-dimensional atomic crystal materials; classification and the principles of diverse two-dimensional atomic crystal optoelectronic devices, and the applications of two-dimensional atomic crystal optoelectronic materials in the devices, such as photodetector, field-effect transistors, memory, logical circuit, sensor; the prospect, problem and challenge of the two-dimensional atomic crystal materials.

(3) Course Leaders: Hua Xu

(三) 教师教育模块 (Teacher-Training Courses)

1. 课程名称：科学课程标准与教材分析

(1) 课程编码：3531001

(2) 课程简介：作为一门专业基础课程，内容包括初中小学科学课程标准的构成、使用原则、科学教材的组成与结构、中小学科学教材的使用指导。

(3) 课程负责人：胡卫平

1. Course Name: Analysis of Science Curriculum Standards and Textbooks

(1) Course code: 3531001

(2) Brief Introduction of the Course: As a major fundamental course, its content includes the composition of primary and middle school science curriculum standards, principles of usage, the composition and structure of science textbooks, as well as guidance on the use of primary and middle school science textbooks.

(3) Course Leaders: Weiping Hu

2. 课程名称：科学课程教学论

(1) 课程编码：3531002

(2) 课程简介：作为一门专业基础课，内容包括准备做科学教师，科学教育理念、科学课程、科学课程资源、科学教学设计、科学教学过程，科学教学实践、科学学习活动，科学学习测量与评价、科学教育研究，科学教师专业发展；此外还包括中小学科学实验教学的理论与实践研究等。

(3) 课程负责人：周青

2. Course Name: Teaching Theory of Science Curriculum

(1) Course Code: 3531002

(2) Brief Introduction of the Course: As a fundamental course, its content includes preparing to become a science teacher, educational philosophy of science, science curriculum, science curriculum resources, science teaching design, science teaching process, science teaching practice, science learning activities, measurement and evaluation of science learning, science education research, and professional development of science teachers. Additionally, it covers the theory and practice of primary and middle school science experimental teaching.

(3) Course Leaders: Qing Zhou

3. 课程名称：科学教学设计与实施

(1) 课程编码： 3531003

(2) 课程简介：作为科学（师范）专业的一门专业基础课，内容包括科学教学设计的原理、方法、过程和优秀案例评析，教学形式有理论授课、教学设计作品展示、教学技能提升训练，利用有控制的实践系统，集教学、多媒体编辑、影视音像制作、多媒体存储、视频点播、数字化现场直播等为一体的数字化网络系统提升科学教学设计能力和教学技能。

(3) 课程负责人：张红洋

3. Course Name: Design and Implementation of Science Teaching

(1) Course code: 3531003

(2) Brief Introduction of the Course: As a fundamental course for the major Science Education, its content includes the principles, methods, processes, and analysis of exemplary cases of science teaching design. The teaching formats include theoretical lectures, presentations of teaching design works, and training to enhance teaching skills. Utilizing controlled practice systems, it integrates teaching, multimedia editing, audio-visual production, multimedia storage, video-on-demand, digital live broadcasting, etc., into a digital network system to enhance the ability of science teaching design and teaching skills.

(3) Course Leaders: Hongyang Zhang

科学教育专业修读指南

一、指导性教学计划

第一学期			第二学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711031	思想道德与法治	3	1711033	马克思主义基本原理	3
1711022	中国近现代史纲要	3	0211012	大学语文	2
1211044	计算机基础（理工科）	2	1211056	Python 语言程序设计	3
0411061	大学外语（一）	2	0411062	大学外语（二）	2
1011039	大学体育（一）	1	1011040	大学体育（二）	1
0521005	高等数学（二）—1（理）	4	0521006	高等数学（二）—2（理）	4
2011002	国家安全教育	1	3541048	大学物理（上）	3
3541046	大学化学（上）	3	3541047	大学化学（下）及实验	4
3522057	科学教育专业导论	2	2650102	军事理论与训练	2
3522029	实验室安全与规范	0.5	3850004	大学生职业生涯规划	0.5
3522058	自然科学导论	2			
合计	必修 23.5 学分		合计	必修 24.5 学分	
(1)“形势与政策”为通识教育必修课，第 1-7 学期上课，共 2 学分。 (2)教育见习 1—6 个学期总共计 1 个学分 (3)教育研习 1—7 个学期总共计 1 个学分			(1)在第 2-7 学期中，须修读专业限选课 20 学分，专业任选课 6 学分； (2)在第 2-6 学期中，须修读通识教育选修课 12 学分，每学期最多选修 2 门课程。		
第三学期			第四学期		
课程号	课程名称	学分	课程号	课程名称	学分
1711034	毛泽东思想和中国特色社会主义理论体系概论	3	1711035	习近平新时代中国特色社会主义思想概论	3
0411063	大学外语（三）	2	0411064	大学外语（四）	2
1011041	大学体育（三）	1	1011042	大学体育（四）	1
1611045	创新创业理论与实践	1	2431056	中小学生认知与学习	1
3541050	普通生物学及实验	5		教育学基础	1.5
2431029	儿童发展	1	2431058	中小学生心理辅导	1
3541049	大学物理（下）及实验	4	3541052	自然地理学及实验	4
3541051	科学教育研究方法	2	3545005	科学实验（一）	1
2431028	心理学基础	1			
专业方向课程/专业限选课			专业方向课程/专业限选课		
3542097	化学与生活	2	3542100	科学技术与社会	2
3542096	科技史与科技哲学	2	3542099	师范生创新教学思维与实践	2
3542098	科普学概论	2	3542101	新材料概论	2
合计	必修 20 学分，选修 6 学分		合计	必修 14.5 学分，选修 6 学分	

第五学期			第六学期		
课程号	课程名称	学分	课程号	课程名称	学分
1531129	现代教育技术（网络教学）	1	1531171	德育与班级管理	1
1531184	教师专业发展与职业道德	1.5	3541006	研究方法与学术论文写作	1
3531001	科学课程标准与教材分析	1	3531002	科学课程教学论	2
3545006	科学实验（二）	2	3531003	科学教学设计与实施	2
3541053	科学教育专业英语	1	3850005	大学生求职指导与职场适应	0.5
			3550018	科学教育专业教学技能训练	1
			3550033	毕业论文（设计）	4
专业方向课程/专业限选课			专业方向课程/专业限选课		
3542102	生态学概论	2	3542109	环境科学概论	2
3542103	脑科学概论	2	3542110	电工学基础	2
3542104	工程技术概论	2	3542111	人工智能与教育	2
3542105	地球概论	2	3542112	工程制图	2
3542106	仿生学导论	2	3542113	跨学科教学实践	2
3542114	科技创客教育与实践	2	3546011	科学教育专业创新创业实训	2
3542108	营养与健康	2	3546012	科学实验设计实训	4
专业拓展课/专业任选课			专业拓展课/专业任选课		
3543054	科学教育经典文献选读	1.5	3543057	材料科学前沿进展	1.5
3543055	现代化学专题	1.5	3543031	二维原子晶体材料与器件	1.5
3543056	现代物理专题	1.5	3543036	材料的力学性能	1.5
3543052	光催化材料与技术	1.5	3543037	材料的相变原理	1.5
3543041	有机光电材料与器件导论	1.5			
3543032	稀土发光材料	1.5			
3543040	传感材料与技术	1.5			
3543035	胶体化学与界面	1.5			
合计	必修 6.5 学分，选修 26 学分		合计	必修 7.5 学分，选修 22 学分	
			(1)到本学期末应完成通识教育选修课 12 学分的修读。 (2) 组织毕业论文（设计）开题（一般在第 10 到 18 教学周内完成）。		
第七学期			第八学期		
课程号	课程名称	学分	课程号	课程名称	学分
3550035	教育实习	5	3550033	毕业论文（设计）	4
3550033	毕业论文（设计）	4			
			硕士先修课程		
合计	必修 5 学分		合计	必修 4 学分	
(1) 教育实习为完整一学期。 (2) 到本学期末应完成专业限定选修课 20 学分和专业任意选修课 6 学分的修读。 (3) 本学期进行毕业论文（设计）撰写。			(1) 完成毕业论文（学校对毕业论文进行查重、盲审和答辩，一般安排在第 12 教学周完成）； (2) 本学期进行硕士先修课程学习； (3) 本学期止，总学分应不得少于 153 学分（不含硕士先修课程学分）。		

二、修读指导和说明

1. 科学教育专业毕业前须修读至少 153 学分。其中通识教育课程 50 分（必修学分为 38，选修学分 12）；专业课程 81 学分；实践教学必修学分为 22。第 8 学期进行硕士先修课程学习，具体教学计划由研究生院负责。

2. 培养路径说明

本专业设置了常规培养型、融合创新型培养路径，达到毕业条件方可毕业。

3. 教师教学基本技能训练包括师范生粉笔字技能测试、钢笔字技能测试和普通话水平测试三部分。师范生粉笔字技能测试和钢笔字技能测试达到合格以上水平，普通话水平测试成绩达到二级乙等以上（少数民族学生达到三级甲等以上水平）。

4. 通识教育选修课修读说明

通识教育选修课分为人文社会科学、自然科学与技术、艺术与美育、生命与健康、教师教育 5 个系列。学生在校期间（建议第 2-6 学期）必须从通识教育选修课中选修 12 学分的非本专业课程（“非本专业课程”指本专业教学计划以外的课程）。为完善知识结构，建议学生从每一系列中至少选修 1 学分的课程，文科学生选修 2 学分的自然科学与技术系列课程，理科学生选修 2 学分人文社会科学系列课程；所有学生须修读 1 学分“四史”“校史”类特色选修课（人文社会科学系列四史类）；非艺术专业学生须修读 1 学分美育理论课程（艺术与美育系列美术理论类）和 1 学分美育实践课程（艺术与美育系列美术实践类），艺术专业学生须修读 2 学分非本专业类的美育理论课程（艺术与美育系列美术理论类）；体能测试未达标学生 5-8 学期须修读身体素质提升类选修课程 1-2 学分；师范生须选修 2 学分教师教育系列课程，选修 1 学分的科技史与科学伦理类（自然科学与技术系列科技史与科学伦理类）课程。

5. 国际交流预备课程修读说明

拟参加出国出境交换交流学习，并需要与我校进行学分互认项目的学生须修读 2 学分“国际交流预备课程”。项目包括交换学生项目、双学位联合培养项目、访学项目、暑期短期交流项目及其他需要进行学分互认的项目。具体规定见《国际交流预备课程学分认定细则》（师教〔2017〕3 号）。

6. 本科生国际暑期学校修读说明

本科生国际暑期学校课程是国际交流预备课程的重要组成部分，修读本科生国际暑期学校课程所得学分记入通识教育选修课中的国际交流预备课程学分。

每年暑假期间（第 1-2 周），学校邀请海外知名大学外籍教师为我校全校本科生开设通识类全英语课程（6 次讲座，3 次沙龙），为同学们创造与外籍教师面对面交流互动的平台。

同学们可在每个春季学期关注国际暑期学校相关动态，并在指定时间内在教务系统中进行选课。

7. 实践模块修读说明

（1）必读书目阅读：根据《陕西师范大学关于全面提高本科教学质量的实施意见》文件要求，本科生在校期间本科生大学四年期间须阅读不少于 5 大类共 48 本的课外书籍，建议每个月阅读课外书籍至少 1 本，达到阅读数量与质量要求的学生，方可毕业。

（2）科学教育专业教学技能训练：结合“学科教学导论”课程，在教育实习之前对学生进行本专业教学技能的严格训练，经学院考察合格，计 1 学分。）

(3) 教育见习：教育见习是在 1-6 学期期间在教师指导下到见习学校进行教育考察和教育观摩，加强学生对基础教育现状的了解，初步了解基础教育教学的一般规律，加深对学科教育理论学习的理解，为教育实习创造条件，进而为学生毕业后尽快适应教育教学工作奠定良好的基础。教育见习计 1 学分。

(4) 教育实习：由学校统一安排在第 7 学期，在实习学校教师和带队教师的指导下，积极、主动、自觉地运用教育理论、专业知识和技能，在实习学校参与、体验教育和教学。教育实习的核心任务包括教学实习、班主任实习和教育调查研究，目的在于检验知识、训练能力、体验教师职业和转变角色，计 5 学分。

(5) 教育研习：教育研习是在 1-7 学期期间在教师指导下，运用所学的教育学、心理学理论对教师职业的专业化过程中出现的有关问题进行分析、探讨和研究，在理论与实践的互动中提高反思能力和研究能力，进而提升自己的职业技能水平，以便更好地适应将来的教师工作，计 1 学分。

(6) 教育实践与社会调查：学院组织学生利用课外时间开展专业实践与社会调查，每个学生至少完成 2 篇专业实践与社会调查报告，经学院考核合格，计 1 学分。

(7) 毕业论文（设计）：参照《材料科学与工程学院毕业设计（论文）工作实施细则（试行）》执行。