材料科学与工程(金属材料科学与工程)

Materials Science & Engineering (Metallic Materials Science & Engineering）

专业代码：080401　　**学　制：**4 年

Speciality Code:080401　　**Schooling Years：**4 years

培养目标：

本专业培养坚持社会主义道路，掌握扎实的自然科学基础和材料学专业知识，能够利用学科基本原理和方法解决金属材料相关的实际工程问题，具备与材料工程相关的实践技能和创新能力，具有良好的沟通与管理能力、社会责任及全球意识和终身学习能力。能够在机械制造、电子信息、新材料等领域，从事材料设计与研发、制造与应用、经营与管理等工作的高水平工程技术人才。

Educational Objectives:

The undergraduate training of the specialty aims to provide high level engineering professionals in the field of mechanical manufacturing, electronic information and innovative materials to conduct materials design, development, manufacturing, application, operation and management. The students are expected to be equipped with the persistence in socialism, solid basic knowledge of natural science and specialty-related knowledge of materials science and engineering, an ability to solve practical engineering problems in metallic material using basic principles and methods of the specialty, practical skills and innovative spirit in the relevant field of material engineering, abilities of communication and management, awareness of social compliance and globalization, together the lifelong learning ability upon the completion of the degree program.

毕业要求：

№1.工程知识：掌握扎实的基础知识和专业基础理论，能够将数学、自然科学、工程基础和专业知识用于解决金属材料设计与制备、热处理与构件选材中的复杂工程问题。

№1.1 掌握扎实的数学、自然科学和工程基础知识，能运用数学、自然科学、工程基础和专业知识描述复杂材料工程问题；

№1.2 能够运用化学、物理知识对金属材料设计、合成与制备过程进行问题分析，揭示反应原理，确定关键因素，对所研究的对象进行合理优化；

№1.3 掌握扎实的专业基础理论；能够运用专业基本原理和工程知识，针对工程构件等进行材料选择，并提出热处理与机加工工艺路线；

№1.4 能将专业基本原理和工程知识用于揭示材料组成、结构、性能及应用之间关系，针对具体工程问题提出解决方案。

№2.问题分析：能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析金属材料生产与服役过程中的复杂工程问题，以获得有效结论。

№2.1.能够基于数学、自然科学和工程科学的基本原理分析、识别和判断影响产品质量和金属构件使役性能的关键因素；

№2.2.针对金属材料生产和服役过程中复杂工程问题，能结合专业基本原理和文献研究进行分析论证，提出可能的解决方案，并认识到解决方案的多样性；

№2.3.能正确表达生产与服役过程中工程问题的解决方案，并分析解决方案的合理性，以获得有效结论，并提出改进方案。

№3.设计/开发解决方案：能够设计针对特定工况零件与功能器件制造中复杂工程问题的解决方案，设计满足特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。

№3.1.针对特定工况零件制造中的工程问题，能选择合理的材料，设计制造工艺流程，分析并提出合理的材料性能改进方案，包含热处理、表面改性等工艺及其参数；

№3.2.针对功能器件制造中的工程问题，能设计满足特定功能(磁性、储氢、储电、信息储存等)的系统或部件，提出制造工艺流程，分析影响器件特定功能的关键因素，并提出改进方案；

№3.3.针对特定工况零件与功能器件制造中，能独立提出实施路线和解决方案，具有独立思考能力与创新意识；能分析工艺过程对社会、健康、安全、法律、文化和环境的影响，主动规避可能的负面作用。

№4.研究：能够基于科学原理并采用科学方法对材料性能改善、新材料与功能器件设计与开发过程中的复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

№4.1.针对金属材料及零件性能改善与强化中的工程问题，能基于自然科学和专业基本原理分析并提出具体方案和实施工艺路线；

№4.2.在新材料与功能器件设计与开发过程中，能根据功能要求并基于基本科学原理提出设计方案，并能优化最佳的工艺路线；

№4.3.针对材料性能改善、新材料与功能器件设计与开发中的工程问题，能基于科学原理分析和确定关键因素，能利用优化理论设计实验方案；

№4.4.能利用专业实践技能分析和解释实验数据，基于优化分析获得合理有效结论，并提出改进方案。

№5.使用现代工具：能够针对材料成型与组织控制、结构与功能器件设计与开发过程中的复杂工程问题，选择与使用恰当的技术、资源和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。

№5.1.熟练掌握材料分析与检测技术，针对材料性能改善中的复杂工程问题，能利用分析与检测技术对组织和结构进行表征，提出组织控制的工艺方案；

№5.2.掌握计算机基础知识，能将计算机技术用于材料成型、组织分析、模拟与预测和新功能器件设计与开发；

№5.3.能熟练应用馆藏资源，搜集文献并能基本把握新材料发展现状，分析和判断新材料与功能器件设计方案的合理性和先进性。

№6.工程与社会：能够基于工程相关背景知识进行合理分析，评价材料制备与处理及器件制造

过程中的工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。

№6.1.充分认识材料科学在技术进步和社会发展中的重要地位和作用，具备职业健康、安全风险和法律法规意识，并理解应承担的社会责任；

№6.2.通过材料制备与处理及器件制造过程中的实验、实践和实习报告等，评价工程问题解决方案对社会、安全、健康、法律及文化的影响，明确承担的责任和义务。

№7.环境和可持续发展：能够理解和评价针对材料生产、新材料与功能器件设计与开发过程中复杂工程问题的专业工程实践对环境、社会可持续发展的影响。

№7.1.能充分认识材料生产对环境的潜在风险，在制定工程问题解决方案时充分考虑并评价环境影响因素，能针对环境和可持续发展的影响进行自我约束；

№7.2.在新材料与功能器件设计与开发过程中的复杂工程问题解决方案中体现新能源、环境友好型新技术等创新思想，评价解决方案对社会可持续发展的影响。

№8.职业规范：具有人文社会科学素养、社会责任感，能够在材料科学与工程实践中理解并遵守工程职业道德和规范，履行责任。

№8.1. 学习人文和社会科学及其思政系列课程，具有人文社会科学素养、坚定的社会主义信念和社会责任感；

№8.2.了解基本的职业道德和规范，并认识其重要性；在专业实践和实习过程中，遵守工程师职业道德，并能对材料科学与工程领域中实践活动的社会道德进行判断和评鉴，并履行责任。

№9.个人和团队：能够在金属材料及其交叉学科背景下的团队中承担个体、团队成员以及负责人的角色。

№9.1.能认识团队协作的重要性，具有团队协作意识和能力；通过军训、分组实验和报告等培养学生能正确对待作为个体、团队成员和负责人的角色；

№9.2.具有跨领域的综合能力，了解与本专业相关的跨学科领域基本理论，具备金属材料设计与制造为主体，适应多学科背景的职场环境。

№10.沟通：能够就金属材料工程和新材料与器件设计中复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达和回应。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

№10.1.熟练掌握常见的多媒体和信息沟通手段和技术，具备较强的撰写和设计文稿的能力；能整合实验实践环节中的文字和图表，并融入适合的视觉表现；

№10.2.能清晰陈述和展示实验实践环节中的内容和思想，传递信息和有效回应；具备就复杂工程问题与业界同行及社会公众进行有效沟通和交流的能力；

№10.3.掌握一门外国语，具备较强的专业外语能力，与世界范围内的其他文化、思想进行交流；具有国际视野和跨文化交流、竞争与合作能力。

№11.项目管理：理解并掌握材料工程管理原理与经济决策方法，并能在多学科环境中应用。

№11.1.掌握基本的工程管理原理和经济决策方法，能有效利用经济分析方法对材料工程领域的新工艺、新材料和新设备进行技术分析和比较；

№11.2.能根据市场、用户需求及技术发展的变化，跨学科提出技术改造和效能改进的方案，并进行可行性分析。

№12.终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

№12.1.具有良好的身体素质，认同终身教育和持续教育理念，自觉学习外语，能利用计算机、搜索等现代信息技术跟踪并获取信息，具有适应金属材料专业领域新技术发展的能力；

№12.2.具有良好的心理素质，具有较强的适应能力，能灵活应对新的人际和职场环境，具备不断学习和适应发展的能力。

Student Outcomes:

№1.**Engineering Knowledge: A solid grasp of basic knowledge and specialized fundamentals, an ability to apply knowledge of mathematics, natural science, engineering fundamentals and engineering specialization to solving complex engineering problems in design and fabrication of metallic materials, heat treatment and material selection for components.**

1.1 A solid grasp of basic knowledge in mathematics, natural science and engineering fundamentals, being able to describe complex materials engineering problems using knowledge of mathematics, natural science, engineering fundamentals and engineering specialization.

1.2 An ability to conduct problem analysis in metallic materials design, synthesis and manufacturing process, and further reveal reaction principles, determine critical factors and properly optimize research objects using chemical and physical knowledge.

1.3 A solid grasp of specialized fundamentals, being able to conduct materials selection for engineering components and propose process routes for materials heat treatment and machining using specialized fundamentals and engineering knowledge.

1.4 An ability to reveal the interrelationship among materials composition, structure, properties and applications, and thus propose solutions to specific engineering problems using specialized fundamentals and engineering knowledge.

№2.**Problem Analysis: An ability to apply basic principles of mathematics, natural science, and engineering science to identifying, formulating and analyzing complex engineering problems in metallic materials manufacturing and serving based on literatures, in order to reach substantiated conclusions.**

2.1 An ability to analyze, identify and determine the critical factors in product quality and metallic components performance based on mathematical, natural scientific and engineering fundamentals.

2.2 An ability to analyze and demonstrate complex engineering problems in metallic materials manufacturing and serving based on specialized fundamentals and literatures, as well as to provide solutions with an understanding of various possibilities.

2.3 An ability to properly express solutions to engineering problems in metallic materials manufacturing and serving and analyze the rationality, in order to reach substantiated conclusions and propose improvement schemes.

№3.**Design / Development Solutions: An ability to design solutions to complex engineering problems**

in manufacturing components under special working conditions and functional devices, together with systems, units(components) or processes meeting specific needs, with innovation spirit as well as societal, public health, safety, legal, cultural and environmental considerations.

3.1 An ability to select proper materials, design process flows, analyze and propose reasonable materials performance improvement schemes, including processing and relevant parameters in heat treatment and surface modification, according to the engineering problems in manufacturing of components under special working conditions.

3.2 An ability to design systems or components that fulfill specific functions (magnetism, hydrogen storage, electric storage and information storage etc.), propose manufacturing process flows, analyze critical factors that impact on the specific function of the devices and thus propose improvement schemes, according to the engineering problems in manufacturing of functional devices.

3.3 An ability to propose process routes and solutions in manufacturing of components under special working conditions and functional devices independently, together with independent mind and innovation awareness. An ability to analyze the impact of processes in manufacturing components under special working conditions and functional devices on societal, public health, safety, legal, cultural and environmental issues, avoiding possible negative effects proactively.

№4.**Research: An ability to conduct investigations of complex engineering problems concerning improvement of materials properties, design and development of innovative materials and functional devices, based on scientific theories and adoption of scientific methods including design of experiments, analysis and interpretation of data and synthesis of information to provide substantiated conclusions.**

4.1 An ability to analyze and propose concrete schemes and process routes based on natural science and specialized fundamentals according to the engineering problems in metallic materials and components performance improvement and enhancement.

4.2 An ability to propose design schemes and optimize process routes in the design and development of innovative materials and functional devices based on basic scientific fundamentals.

4.3 An ability to analyze and determine critical factors as well as to optimize experimental designs based on scientific fundamentals according to the engineering problems concerning improvement of materials properties, design and development of innovative materials and functional devices.

4.4 An ability to adopt specialized practical skills in analysis and interpretation of experimental data, as well as to draw rational and substantiated conclusions based on optimized analysis and propose improvement schemes.

№5.**Applying Modern Tools: An ability to select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems concerning materials forming and microstructure controlling, structural and functional devices designing and developing, with an understanding of the limitations.**

5.1 An good grasp of materials analysis and testing techniques, being able to conduct microstructural characterization for proposal of process schemes in microstructure controlling.

5.2 An ability to grasp basic knowledge of computer so as to apply computer technology in materials forming, structure analysis, modelling and prediction, design and development of innovative functional devices, and to adopt the results in scheme improvement.

5.3 An ability to gather literatures for a good understanding of the innovative materials development using library resource so as to analyze and determine the rationality and advantage of the design schemes for innovative materials and functional devices。

№6.**Engineering and Society: An ability to apply reasoning informed by contextual knowledge to assessing the impact on societal, health, safety, legal and cultural issues caused by engineering practice and solutions to the complex engineering problems concerning materials preparation and processing as well as devices manufacturing, with an understanding of the consequent responsibilities.**

6.1 A full understanding of the important role that materials science plays in development of technological progress and social development, with the awareness of occupational health, safety risk and legality.

6.2 An ability to assess the impact on societal, health, safety, legal and cultural issues caused by solutions to engineering problems with an understanding of the consequent responsibilities through experiments, practical activities and practice reports in materials preparation and processing as well as devices manufacturing.

№7.**Environment and Sustainable Development: An ability to understand and evaluate the impact on environment and sustainable development of society caused by specialized engineering practice for the solutions to the complex engineering problems in materials manufacturing, design and development of innovative materials and functional devices.**

7.1 A full understanding of the potential environmental risk induced by materials manufacturing, being able to propose solutions to engineering problems with thorough consideration and assessment of the impact on environment as well as self-restraint to limit the environmental impact for sustainable development.

7.2 An ability to reveal innovative ideas such as new energy and environmental friendly technologies in the solutions to the complex engineering problems in design and development of innovative materials and functional devices.

№8.**Professional Standards: An understanding of humanity science and social compliance, being able to understand and abide by professional ethics and standards responsibly in practice of materials science and engineering**

8.1 Cultivation of humanity and social sciences, a firm belief in socialism and social compliance obtained through relevant courses.

8.2 An understanding of occupational ethics and regulation as well as their importance, being able to

comply with the occupational ethics of engineer, judge and assess the social morality as well as to perform duties in specialized practical activities.

№9.**Individual and Teams: An ability to function effectively as an individual and as a member or leader in diverse teams and in metallic materials related inter-disciplinary settings**

9.1 An understanding, an awareness and an ability of teamwork to promote and attend group activities, functioning effectively as an individual and as a member or leader in diverse teams through military education and training, group presentation and experiment.

9.2 Skills of organization, management, self-control and coordination trained through military education and training, group presentation and experiment, together with extracurricular activities.

9.3 A comprehensive multi-disciplinary ability with an understanding of specialty-related multi-disciplinary fundamentals, being able to adapt to multi-disciplinary work environment with a main direction of metallic materials design and manufacturing.

№10.**Communication: An ability to communicate effectively on complex engineering problems in metallic materials engineering and design of innovative materials and devices with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions, and communicate in cross-cultural contexts with international perspective.**

10.1 Sophisticated skills of multimedia and communication together with good capabilities of manuscript writing and design, being able to comprehend texts, figures and tables obtained from experiments and practices with proper visual presentation.

10.2 An ability to make effective presentations on the contents and ideas of experiments and practices, convey information and give effective feedback, being able to communicate effectively on complex engineering problems with the engineering community and with society at large.

10.3 A good grasp of a foreign language to allow international cultural and idea exchange with professional foreign language, being able to communicate, compete and cooperate in cross-cultural contexts with international perspective.

№11.**Project Management: Demonstrated knowledge and understanding of materials engineering management principles and methods of economic decision-making, to function in multidisciplinary environments**

11.1 A good grasp of engineering management principles and methods of economic decision-making, being able to apply economic analysis methods effectively to technical analysis and comparison in the areas of materials engineering, including innovative technologies, materials and equipment.

11.2 An ability to offer proposals for technological transformation and efficiency improvement in multidisciplinary environments and conduct feasibility analysis according to the variations of market, user requirements and technique evolution.

№12.**Lifelong Learning: Recognition of the need for, and an ability to engage in independent and life-long learning, being able to learn continuously and adapt to new developments**

12.1 Having better physical condition and recognition of the need for life-long and continuous education, being able to learn foreign languages independently, and to utilize modern information technologies for information tracking and collecting, so as to adapt to the development of innovative technology in the area of metallic materials

12.2 Having better psychological l condition and awareness of career planning, strong adaptability to handle interpersonal relationships and work environment, together with an ability to learn continuously and adapt to new developments

专业简介：

金属材料科学与工程专业始于 1952 年华南工学院建校时成立的热处理教研组，1958 年更名为金属学及热处理教研室，同年创立金属材料及热处理专业并开始招收本科生，2004 年后以材料科学与工程（金属材料科学与工程方向）恢复招收本科生。本专业 1965 年开始招收硕士研究生，1981 年获硕士学位授予权，1995 年获博士学位授予权，现隶属于华南理工大学材料科学与工程国家一级重点学科，拥有“材料科学与工程”一级学科博士后流动站，形成“本-硕-博”一体化培养体系。

专业师资力量雄厚，有海外留学经历的教师达到 70%，教授比例达到 46%。主要研究方向包括高性能金属结构材料、功能材料（含储能材料、磁性材料、薄膜材料等）、复合材料、材料表面工程技术、固态相变与材料表征、电子封装材料等。拥有一个广东省重点实验室和两个广东省工程技术中心。与美国、日本、澳大利亚、荷兰和新加坡等国以及香港特区的知名高校和科研单位建立了长期的科研合作与交流关系，可联合培养博士研究生、交换本科生等。

Program Profile：

The specialty of Metallic Materials Science and Engineering originated from the Heat Treatment teaching and research group founded in 1952, when South China Institute of Technology was established. After being renamed to Metallic Materials and Heat Treatment teaching and research section in 1958, the specialty of Metallic Materials and Heat Treatment was set up in the same year with a bachelor program, which resumed in 2004 in name of Materials Science and Engineering (Metallic Materials Science and Engineering direction). Postgraduate program in the specialty dates from 1965, with a M.S. degree established in 1981 and a Ph.D. degree in 1995. Nowadays, the specialty is affiliated to the first-class state key discipline and specialty of Materials Science and Engineering in South China University of Technology, with a postdoctoral research station in this first-class discipline, and an integrated "Bachelor-Master-Doctor" training system.

Approximately 40 Faculty members with strong academic and professional backgrounds are involved in the specialty, in which 92% are doctoral degree holders, 70% are of oversea experience, and 46% are in the rank of full professor. In their ranks are two Awardees of the National Outstanding Youth Funds, one

Changjiang scholar, and one Pearl River scholar. The main research directions encompass preparation and processing of functional materials (including energy storage materials, magnetic materials, film materials, etc.), composite materials and nanomaterials, steel material strengthening and material surface engineering technology, solid phase transformation and material characterization, high performance metallic structural materials, electronic packaging materials and engineering, and other discipline-related teaching and research. A Guangdong Province key laboratory and two Guangdong Province engineering and technology research centers are affiliated to the specialty. Long-term scientific collaboration and communication with reputable universities and institutes in the Netherlands, the United States, Australia, Japan, Singapore, Hong Kong SAR and other countries or regions have been established to offer joint training program for doctoral students and exchange program for undergraduate students.

专业特色：

以金属材料的成分-工艺-组织-性能关系和微观分析理论为学科基础，强化实践技能，培养学生掌握金属结构和功能材料的设计与制备、应用与检测的理论和技术。毕业生具有宽的专业口径、扎实的理论基础和突出的实践能力，具备攻读更高学位的潜力与条件。

Program Features:

The undergraduate degree program in Materials Science and Engineering (Metallic Materials Science and Engineering）emphasizes the fundamental studies of the inter-relationships among the composition, processing, microstructure, and performance of the metallic materials, along with the theory of microstructural analysis, meanwhile, enhances the practical skills. The students are taught to the fundamental concepts and core techniques of design, fabrication, testing, application and management of the metallic structural and functional materials.

The graduates should possess a solid understanding of the theoretical basis for this discipline, a broad appreciation of engineering related subjects and outstanding practical abilities, and have the potentials and abilities to pursue higher degrees.

授予学位：工学学士学位

Degree Conferred: Bachelor of Engineering

主干课程：

材料科学基础、物理化学、热处理原理与工艺、金属材料学、机械设计基础、材料微观分析方法、材料成型技术基础、材料的力学与物理性能、金属功能材料。

Core Courses:

Fundamentals of Materials Science, Physical Chemistry, Principle and Technology of Heat Treatment，Metal Materials Science， Elements of Mechanical Design, Microanalysis Methods of Materials,

Fundamentals of Materials Forming Technology，Mechanical and Physical Properties of Materials, Functional Metallic Materials.

特色课程：

全英语教学课程：纳米材料与纳米技术

双语教学课程：材料科学与工程导论、金属功能材料、材料类科技英语

研究型课程：电子封装与制造概论、材料安全与失效分析

新生研讨课：先进金属材料前沿讲座

专题研讨课：新能源材料、材料计算与模拟技术

本研贯通课：材料物理、材料化学、薄膜材料与技术

创新实践课程：金属材料热处理综合实验、金属功能材料综合实验

创业教育课程：材料管理学

Featured Courses:

Courses Taught in English: Nanomaterials and Nanotechnology

Bilingual Courses: An Introduction to Materials Science and Engineering, Functional Metallic Materials, Technical English for Materials Discipline

Research Courses: Introduction to Electronic Packaging and Manufacturing, Safety Assessment and Failure Analysis of Materials

Freshmen Seminars: Lecture Series on Advanced Metallic Materials

Special Topics: New Eneregy Materials, Computational and Simulation Techniques of Materials

Baccalaureate-Master’s Integrated Courses: Fundamental of Materials Physics,Materials Chemistry, Thin Film Materials and Technology

Innovation Practice: Comprehensive experiment of Metal Materials, Comprehensive Experiment for Metal Functional Materials

Entrepreneurship Courses: Materials Management.

一、教学计划总体安排表（General Teaching Schedule）

学年	学期	教学进度安排（周）																				理论教学	考试	入学教育	军训	课程设计	大作业	工程训练	电子实习	综合实验	社会实践	生产实习	毕业实习	其它实习	中外合作项目	毕业设计	就业安排	机动	假期	小计
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
一	1		C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	D	D	D	14	1	1	3																
	2	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	M	B	B	17	2											1						
二	3	A	A	A	A	A	A	A	A	G	G	G	G	A	A	A	A	A	A	B	B	14	2					4												
	4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	18	2																	
三	5	A	A	A	A	A	A	A	A	H	H	A	I	I	E	E	A	A	A	B	B	12	2			2			2	2										
	6	A	A	A	A	A	A	A	A	I	A	A	A	A	A	A	A	A	A	B	B	17	2							1										
四	7	K	K	K	A	A	A	L	L	L	A	A	A	A	A	A	A	A	Q	B	B	11	2									3	3				1		
	8	O	O	O	O	O	O	O	O	O	Q	O	O	O	O	O	Q	Q	Q	P	P															15	2	3		
合计（周）																						102	14	1	3	2		4	2	3		3	3	1		15	2	4		159

二、各类课程学分登记表（Registration Form of Curriculum Credits）

1.学分统计表（Credits Registration Form）

课程类别 Course Category	课程要求 Requirement	学分 Credits	学时 Academic Hours	备注 Remarks
公共基础课 General Basic Courses	必修 Compulsory	62.0	956	
	通识 General Education	10.0	160	
学科基础课 Disciplinary Basic Courses	必修 Compulsory	40.0	682	
	选修 Elective	4.0	64	
专业领域课 Specialty- related Courses	必修 Compulsory	12.0	192	
	选修 Elective	12.0	192	
合　计 Total		140.0	2246	
集中实践教学环节（周） Practice Training (Weeks)	必修 Compulsory	39.0	39 周	
毕业学分要求 Credits Required for Graduation	140.0+39.0=179.0			

备注：学生在取得专业教学计划规定学分的同时，还必须取得第二课堂 2 个人文素质教育学分和 4 个创新能力培养学分。

2.类别统计表（Category Registration Form）

学时 Academic Hours					学分 Credits						
总学时数 Total	其中 Include		其中 Include		总学分数 Total	其中 Include		其中 Include			其中 Include
	必修学时 Compulsory	选修学时 Elective	理论教学学时 Theory Course	实验教学学时 Lab		必修学分 Compulsory	选修学分 Elective	集中实践教学环节学分 Practice-concentrated Training	理论教学学分 Theory Course Credits	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2246	1830	416	1944	302	179	153	26	39	130.5	9.5	14

三、专业教学计划表（Teaching Schedule）

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	上机 Computer-aided Class Hours	实验 Lab Hours	实践 Practice Hours			
公共基础课 General Basic Courses	143093	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law	必修课 C	(40) (36)				2.5	2	№6.1,8.2, №9.1,12.2
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	1	№8.1
	143106	毛泽东思想和中国特色社会主义理论体系概论 Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics		(80) 48				5.0	4	№8.1
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	3	№8.1
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	1-8	№8
	144001	大学英语（一） College English(1)		64				4.0	1	№10.1,12
	144002	大学英语（二） College English(2)		64				4.0	2	№10.1,12
	145223	大学计算机基础 Foundations of Computer		32				2.0	1	№5.2,12
	152001	体育（一） Physical Education (1)		32			32	1.0	1	№12
	152002	体育（二） Physical Education (2)		32			32	1.0	2	№12
	152003	体育（三） Physical Education (3)		32			32	1.0	3	№12
	152004	体育（四） Physical Education (4)		32			32	1.0	4	№12
	106001	军事理论 Military Principle		(16)				1.0	2	№9
	130139	工程制图（一） Engineering Drawing(1)		48				3.0	1	№1.1,2.1,3.1,4.1
	130140	工程制图（二） Engineering Drawing(2)		32				2.0	2	№1.1,2.1,3.1,4.1
	140189	微积分Ⅰ（一） Calculus Ⅰ(1)		80				5.0	1	№1.1,2.1
	140190	微积分Ⅰ（二） Calculus Ⅰ(2)		64				4.0	2	№1.1,2.1
	140197	线性代数与解析几何 Linear Algebra & analytic Geometry		48				3.0	1	№1.1,2.1
	140019	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	№1.1,2.1
	141005	大学物理Ⅲ（一） General Physics(1)		64				4.0	2	№1.1,1.2,2.1
	141006	大学物理Ⅲ（二） General Physics(2)		64				4.0	3	№1.1,1.2,2.1
	141007	大学物理实验（一） Physics Experiment(1)		32		32		1.0	2	№2.1,4.2, 4.3
	141008	大学物理实验（二） Physics Experiment(2)		32		32		1.0	3	№2.1,4.2, 4.3
	145268	C++程序设计基础 C++ Programming Foundations		48				3.0	2	№5.2,10.1,12.1
		人文科学领域 Humanities	通识课 E	96				6.0		№6.1,8.1
		社会科学领域 Social Science		64				4.0		№7.1,7.2,8.1
	合计 Total			1116		64	128	72.0		

三、专业教学计划表（续）（Teaching Schedule）

类别 Course Category	课程代码 Course No.	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours				学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
				总学时 Class Hours	上机 Computer-aided Class Hours	实验 Lab Hours	实践 Practice			
学科基础课 Disciplinary Basic Courses	135092	电工与电子技术II Electrical and Electronic Engineering	必C	64				4.0	4	№1.1,3.2,4.1
	135081	电工与电子技术实验 Experiment of Electrica and Electronic l Engineering	必C	24		24		1.0	5	№3.2, 3.3,9.1
	147001	无机化学Ⅰ Inorganic Chemistry	必C	32				2.0	1	№1.1, 1.2,2.1, 3.1,4.1, 4.3
	147003	无机化学实验Ⅰ Experiment of Inorganic Chemistry	必C	16		16		0.5	1	№1.2, 2.1,4.1, 4.3
	147059	物理化学II Physical Chemistry	必C	64				4.0	4	№1.1, 1.2,2.1, 3.1,4.1, 4.3
	147012	物理化学实验Ⅰ Physical Chemistry Experiment	必C	16		16		0.5	4	№1.2, 2.1,4.1, 4.3
	133092	工程力学II Engineering Mechanics	必C	64				4.0	4	№1.1, 2.1,3.1
	130083	机械设计基础 Basis of Mechanical Design	必C	48				3.0	5	№1.1,2.1,2.3, 3.1
	130310	机械基础综合实验Ⅰ Poly-experiment of Mechanical Fundamentals	必C	10		10		0.5	5	№1.1,2.1,2.3, 3.1
	136296	实验室安全规范 Laboratory safety specification	必C	8				0.5	3	№6.2, 8.2
	136191	材料科学与工程导论 An Introduction to Materials Science and Engineering	必C	48				3.0	3	№1.4,10.3,12.1
	136331	材料科学基础Ⅰ Fundamentals of Materials Science	必C	64		8		4.0	4	№1.4, 2.2,4.2, 4.3,12.1
	136332	材料科学基础II Fundamentals of Materials Science	必C	32		4		2.0	5	№1.4, 2.2,4.2, 4.3,12.1
	136333	材料类科技英语 Technical English for Materials Discipline	必C	32				2.0	6	№5.3,10.3,12.1
	130169	材料微观分析方法 Microanalysis methods of materials	必C	64				4.0	6	№3.3, 4.,4.4, 5.1
	136334	材料微观分析方法实验 Microanalysis Experiments of Materials	必C	32		32		1.0	6	№3.3,4.1,4.4, 5.1,9.1
	130170	材料成型技术基础 Fundamentals of Materials Forming Technology	必C	64				4.0	5	№1.4.2.2,2.3, 3.1,3.3, 4.1
	136335	材料物理基础 Fundamental of Materials Physics	选E	32				2.0	4	№1.2, 3.2,4.2

	136195	材料化学 Materials Chemistry	选E	32				2.0	5	№1.2, 2.2,3.2, 4.2
	136336	材料热力学与动力学 Thermodynamics and Kinetics of Materials	选E	32				2.0	5	№1.2, 3.2,4.2, 4.3
	合 计 Total		必C	682		110		40.0		
			选E	选修课修读最低要求 4.0 学分 minimum elective course credits required:4						
专业领域课 Specialty- related Courses	136337	热处理原理与工艺 Principle and Technology of Heat Treatment	必C	40				2.5	5	№1.3, 1.4 ,2.2, 3.1,4.1, 4.3
	136338	金属材料学 Metallic Materials Science	必C	40				2.5	6	№1.3, 2.2,3.3
	130172	材料的力学与物理性能 Mechanical and Physical Properties of Materials	必C	48				3.0	5	№1.4, 2.2,2.3, 3.1,3.2 3.3 ,4.1, 4.2,4.3
	130296	金属功能材料 Functional Materials	必C	48				3.0	7	№1.3, 1.4 ,3.2, 3.3,4.2, 4.3
	136256	先进金属材料前沿讲座 Lecture Series on Advanced Metallic Materials	必C	16				1.0	2	№6.1,7.1,9.1, 10.1,10.2
	130307	纳米材料与纳米技术 Nanomaterials and Nanotechnologies	选E	32				2.0	6	№1.4,5.3,9.2,10. 1,10.3
	136257	材料安全与失效分析 Safety Assessment and Failure Analysis of Materials	选E	24				1.5	6	№2.2, 2.3,3.1, 4.4,6.2, 7.1
	130174	材料成型测试及计算机控制 Computer-controlled Materials Testing and Forming	选E	32				2.0	6	№1.1, 2.1,3.2, 5.2,11.2
	136224	电子封装与制造概论 Introduction to Electronic Packaging and Manufacturing	选E	32				2.0	6	№1.1, 3.3,6.1, 7.1,10.2,12.2
	130239	材料表面工程 Surface Strengthening Technologies of Materials	选E	32				2.0	6	№1.1, 2.2,2.3, 3.1,4.1, 4.4,7.2, 11.2
	130240	计算机技术在材料加工中的应用 Application of Computer Technology in Materials Processing	选E	32				2.0	6	№1.1, 2.1,3.2, 5.2,11.2,12.1
	136223	薄膜材料与技术 Thin Film Materials Science and Technology	选E	32				2.0	6	№1.2, 1.4,4.2, 5.1,6.1, 6.2
	130025	复合材料 Composite Materials	选E	32				2.0	6	№1.4, 3.1,4.1
	130249	金属腐蚀与防护 Corrosion and Prevention of Metals	选E	32				2.0	6	№2.2,2.3,3.1, 4.3
	130196	材料管理学 Materials Management	选E	32				2.0	5	№9.2, 11.1
	136339	科技写作与文献检索 Scientific/Technological Writing and Information Retrieval	选E	32				2	5	№5.3, 10.1,10.3,12.1

	136340	实验设计与数据处理 Experiment Design and Data Processing	选E	16				1	6	№2.1,4.2, 4.4
	136341	先进材料制备新技术 New Techniques for Advanced Materials Manufacturing	选E	32				2	6	№1.4, 2.2 ,2.3, 4.2 ,4.3 7.2,9.2, 12.1
	136342	材料计算与模拟技术 Computational and Simulation Techniques of Materials	选E	32				2	5	№5.2, 9.2,12.1
	136343	增材制造技术及应用 Additive Manufacturing Technology and its Application	选E	32				2	6	№1.4, 5.2,6.1, 7.2,12.1
	136344	先进焊接技术与应用 Advanced welding technology and Application	选E	32				2.0	6	№1.3, 3.3,6.2, 7.1,,10.2, 12.1
	136345	有色金属材料及制备 Nonferrous Alloy Materials and Their Preparation	选E	32				2.0	7	№1.4, 3.1,4.1, 9.1
	136346	新能源材料 New Energy Materials	选E	32				2.0	7	№3.2,3.3,4.2, 4.3,6.1, 6.2,,7.2
	136092	生物材料学导论 Introduction to Biomaterials	选E	24				1.5	6	№1.4, 6.1,9.2
	136076	高性能陶瓷材料 Advanced Ceramic Materials	选E	32				2.0	6	№1.4, 6.1,9.2
	136145	高分子材料基础 Fundamentals of Polymeric Materials	选E	32				2.0	7	№1.4, 6.1,9.2
	120003	创新研究训练 Innovation Research Training	选E	32				2.0		№3.3, 4.3,7.2, 9.2
	120004	创新研究实践 I Innovation Research Practice I	选E	32				2.0		№3.3, 4.3,7.2, 9.2
	120005	创新研究实践 II Innovation Research Practice II	选E	32				2.0		№3.3, 4.3,7.2, 9.2
	120006	创业实践 Entrepreneurial Practice	选E	32				2.0		№3.3, 4.3,7.2, 9.2
	合 计 **Total**		必C	192				12.0		
			选E	选修课修读最低要求 12.0 学分 minimum elective course credits required:12						

备注：学生根据自己开展科研训练项目、学科竞赛、发表论文、获得专利和自主创业等情况申请折算为一定的专业选修课学分（创新研究训练、创新研究实践 I、创新研究实践 II、创业实践等创新创业课程）。每个学生累计申请为专业选修课总学分不超过 4 个学分。经学校批准认定为选修课学分的项目、竞赛等不再获得对应第二课堂的创新学分。

四、集中实践教学环节(Practice-concentrated Training)

课程代码 Course No	课程名称 Course Title	是否必修 C/E	学时数 Total Curriculum Hours		学分数 Credits	开课学期 Semester	毕业要求 Student Outcomes
			实践 Practice weeks	授课 Lecture Hours			
106002	军训 Military Training	必 C	3 周		3.0	1	№9.1, 12.1, 12.1
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	№8.1, 9.1
130195	机械设计基础课程设计 Course Project for the Elements of Mechanical Design	必 C	2 周		2.0	5	№1.1, 3.1, 3.2, 3.3
130357	工程训练 II Basic Industry Training	必 C	4 周		4.0	3	№3.1, 6.2, 8.2,9.1, 10.2
141073	电子工艺实习 II Practice of Electronics Technology	必 C	2 周		2.0	5	№3.2, 6.2, 8.2, 9.1
130215	金属材料热处理综合实验 Comprehensive experiment of Metal Materials	必 C	1 周		1.0	6	№1.3, 1.4, 2.2, 3.1 №4.1, 5.1, 5.3, 6.1 №6.2, 8.2, 9.1,10.1 №10.2, 12.1
136347	材料成型技术综合实验 Comprehensive Experiment of Materials Formation Technologies	必 C	1 周		1.0	5	№1.4, 3.1, 4.1, 4.4 №5.1, 6.1, 6.2, 7.1 №9.1,10.1
136348	材料的力学与物理性能测试综合实验 Comprehensive Experiment of Mechanical and Physical Properties of Materials	必 C	1 周		1.0	5	№2.2, 2.3, 4.1 №6.2 ,10.1, 10.2
136349	金属功能材料综合实验 Comprehensive Experiment for Metal Functional Materials	必 C	1 周		1.0	7	№1.2, 1.4, 3.2, 3.3 №4.2, 4.3, 4.4 №5.1, 5.3, 6.2, 7.2 №9.1,10.1, 10.2, №12.1
136138	认识实习 Cognition Practice	必 C	1 周		1.0	2	№6.1, 7.1, 8.2, 9.1
136142	生产实习 Manufactural Practice	必 C	3 周		3.0	7	№6.1, 7.1, 8.2, 9.1 №10.1, 10.2 №11.1, 11.2
136163	毕业实习 Practice on Diploma Project	必 C	3 周		3.0	7	№1.4, 4.4, 5.3 №8.2, 9.1,10.1,10.2
136162	毕业设计（论文） Diploma Project (Thesis)	必 C	15 周		15.0	8	№1.4, 3.1, 3.2, 3.3 №4.1, 4.2, 4.3, 4.4 №5.1,5.3, 10.1,10.2
合 计 Total		必 C	39 周		39.0		

五、第二课堂

第二课堂由人文素质教育和创新能力培养两部分组成。

1.人文素质教育基本要求

学生在取得专业教学计划规定学分的同时，还应结合自己的兴趣适当参加课外人文素质教育活动，参加活动的学分累计不少于 2 个学分。

2.创新能力培养基本要求

学生在取得本专业教学计划规定学分的同时，还必须参加国家创新创业训练计划或广东省创新创业训练计划或 SRP（学生研究计划）或百步梯攀登计划或一定时间的各类课外创新能力培养活动

（如学科竞赛、学术讲座等），参加活动的学分累计不少于 4 个学分。

5.“Second Classroom” Activities

“Second Classroom” Activities are comprised of two parts, Humanities Quality Education and Innovative Ability Cultivation.

1) Basic Requirements of Humanities Quality Education

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in extracurricular activities of Humanities Quality Education based on one’s interest, acquiring no less than two credits.

2) Basic Requirements of Innovative Ability Cultivation

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in any one of the following activities: National Undergraduate Training Programs for Innovation and Entrepreneurship, Guangdong Undergraduate Training Programs for Innovation and Entrepreneurship, Student Research Program (SRP), One-hundred-steps Innovative Program, or any other extracurricular activities of Innovative Ability Cultivation that last a certain period of time (e.g. subject contests, academic lectures), acquiring no less than four credits.