

金属材料工程(精英班)

Metallic Materials Engineering

一、专业基本信息

I. Basic information

类型 (Type) : 学年学分制

院系 (Department) : 材料与化工学院Materials Science&Chemical Engineering

专业 (Major) : 金属材料工程(精英班)Metallic Materials Engineering

总学分 (Total Credits) : 174.5

学科门类 (Field of Study) : 工学Technology

专业类 (Specialized Classification) : 材料类Materials

专业代码 (Major Code) : 080405

授予学位 (Degree) : 工学学士Bachelor of Engineering

学制 (Years of Study) : 四年Four years

主干学科 (Primary Discipline) : 材料科学与工程Materials Science and Engineering

相关学科 (Related Discipline) : 冶金工程Metallurgical Engineering

大类名称 (Specialty) : 智能制造类

专业概况 (Introduction of Major) :

金属材料工程是国家一流本科建设专业及国防特色专业, 依托于材料科学与工程学科 (本学科为原兵器工业部重点学科和陕西省重点学科, ESI全球排名前5%学科)。本专业设有博士后流动站, 具备覆盖材料学、材料加工工程和材料物理化学三个二级学科的博士及硕士学位授予权, 以及材料与化工专业硕士学位和工程博士学位授予权, 本科专业设有智能成形、表面工程和先进连接三个专业方向。现任专职教师42名, 其中教授16人 (二级教授5人), 陕西省杰青等省部级人才10余人。本专业拥有1个“国家级教学团队”和2个省级科学创新团队。建有国家级科研平台2个 (国家地方联合工程研究中心、实验室)、省级科研平台2个 (重点实验室、工程研究中心1个) 及省级实验教学示范中心2个。2003年获陕西省名牌专业, 2008年获国家级优势特色专业, 2013年获国防特学科国家“专业综合改革试点”及教育部“卓越工程师”培养试点专业, 2019年入选国家级一流本科专业建设点并通过中国工程教育协会认证。近5年来, 本专业取得了包括获得国家级教学成果二等奖1项, 省级教学成果奖2项, 出版国家“十二五”规划教材及兵工优秀教材等7部, 多门课程获批国家级精品课程和一

流建设课程。承担国家973和国防973等国防类项目30余项，国家自然科学基金重点项目等国家级基金20项，陕西省重点研发计划等省部级项目30余项，累计科研到账超过1.2亿元。发表学术论文300余篇，其中SCI论文260篇，授权国家发明60余项。科研成果获得国家级奖2项，省部级奖10余项，厅局级奖18项，其中“高性能多尺度颗粒协同增强铝镁基复合材料关键技术与应用”获2015年国家科技进步奖二等奖，“高熵合金的跨尺度强韧化及其对复合材料的界面调控作用”及“×××材料关键技术”分别获2023年陕西省自然科学与科技进步一等奖。本专业承担科研项目成功研制新一代装备核心关键部件，解决了我国新型武器装备缺乏核心关键部件的“卡脖子”难题，批量装备在 99A、96B 坦克、055 舰及辽宁舰上，参加了国庆 60 周年以来的历次阅兵，多项相关成果达到国际领先水平。本专业致力于培养具备材料科学与工程深厚知识基础，能够在材料、兵工、航空航天、电子和信息等领域从事科学研究、技术开发、设备研制及经营管理的高素质人才。毕业生发展前景广阔，升学高校涵盖哈尔滨工业大学、西安交通大学、北京航空航天大学、西北工业大学、大连理工大学、上海交通大学等顶尖学府，升学率超过40%；就业单位包括中国兵器装备及中国兵器工业集团公司、中国航空工业集团公司、中国航空发动机集团公司、西北有色金属研究院、中国核工业集团有限公司、中国一重集团有限公司、三星(中国)半导体有限公司、三菱重工业(中国)有限公司、国家电网有限公司、陕西有色集团公司、比亚迪汽车有限公司、铂力特(西安)增材技术股份有限公司等行业龙头单位。

二、培养目标

II.Educational Objectives

本专业面向国防工业和区域经济发展需求，培养德智体美劳全面发展，掌握数学、自然科学、工程基础、金属材料基础理论和专业知识，能够在金属材料工程及相关领域从事新材料研发、技术创新、工艺设计、产品开发、生产及经营管理等工作，具有良好的人文素养、团队合作精神、社会责任感、终身学习能力和国际化视野的高素质学术型人才。

学生毕业5年左右能够达到：

(1) 具有解决复杂工程问题的能力，能够作为技术骨干从事金属材料工程及相关领域的产品与工艺设计、技术改造、生产和质量管理等方面的工作，取得相应工作岗位的专业资质。(工程素养)

(2) 具有创新精神和科学研究能力，能够完成研究生阶段培养并取得硕士学位，能够开展或参与材料方向原创性学术研究、工艺变革、设备研制等方面的创新性工作。(创新精神)

(3) 具备健全人格和良好的人文素养，遵守职业道德，具有社会责任感、事业心、安全与环保意识和国际视野，能够积极服务国家与社会。(道德修养)

(4) 能与国内为同行、专业的客户和公众有效沟通、具有团队意识和参与企业经营管理的的能力，并作为技术骨干或主要负责人发挥有效作用。(团队合作)

(5) 具有终身学习和自我完善的能力，能够通过行业训练、继续教育方式持续提高专业素养和自身素质。（终身学习）

This major is oriented towards the demands of the national defense industry and regional economic development, aiming to cultivate well-rounded individuals with comprehensive moral, intellectual, physical, aesthetic, and labor education. Students will master the fundamental theories and professional knowledge of mathematics, natural sciences, engineering, and metal materials, and be capable of engaging in new material research and development, technological innovation, process design, product development, production, and management in the field of metal materials engineering and related areas. They will also possess good humanistic qualities, teamwork spirit, a sense of social responsibility, lifelong learning ability, and an international perspective, thus becoming high-quality academic talents.

By about five years after graduation, students should be able to achieve the following:

(1) Possess the ability to solve complex engineering problems, and be able to work as technical backbone in product and process design, technological transformation, production, and quality management in the field of metal materials engineering and related areas, obtaining the professional qualifications for the corresponding positions. (Engineering literacy)

(2) Have an innovative spirit and scientific research capabilities, be able to complete postgraduate education and obtain a master's degree, and be capable of conducting or participating in original academic research, technological innovation, equipment development, and other innovative work in the field of materials. (Innovation spirit)

(3) Have a sound personality and good humanistic qualities, abide by professional ethics, possess a sense of social responsibility, dedication, safety and environmental awareness, and an international perspective, and be able to actively serve the country and society. (Moral cultivation)

(4) Be able to communicate effectively with domestic peers, professional clients, and the public, have a sense of teamwork, and possess the ability to participate in enterprise management and operation, and play an effective role as a technical backbone or key figure. (Teamwork)

(5) Have the ability for lifelong learning and self-improvement, and be able to continuously enhance professional competence and personal qualities through industry training and continuing education. (Lifelong learning)

三、毕业要求

III. Program Outcomes

毕业要求0

思想品德：具有坚定正确的政治方向，热爱祖国，热爱人民，拥护中国共产党的领导；具有正确的世界观、人生观、价值观，具有良好的思想品德、健全的人格、健康的体魄，践

行社会主义核心价值观。

0.1 热爱祖国，热爱人民，拥护中国共产党的领导，掌握和践行党的基本理论，具有坚定正确的政治方向，贯彻落实党和政府的方针政策，了解国情社情民情，践行社会主义核心价值观。

0.2 具有正确的世界观、人生观、价值观，良好的思想品德、健全的人格、健康的体魄和积极向上的人生态度。

毕业要求1

工程知识：能够将数学、自然科学、计算、工程基础和专业知用于解决金属材料工程领域的复杂工程问题；

观测点1.1：能够运用数学、自然科学、计算、工程科学的语言工具准确、恰当表述与金属材料工程领域相关的工程问题；

观测点1.2：能够针对金属材料工程领域中的具体对象建立数学模型并利用合适的工程条件求解；

观测点1.3：能够将相关知识（数学、自然科学、计算、工程基础和专业知）和数学模型方法用于推演、分析金属材料专业的工程问题；

观测点1.4：能够将相关知识（数学、自然科学、工程基础和专业知）和数学模型方法用于金属材料专业工程问题解决方案的比较与综合。

毕业要求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工程领域的复杂工程问题，综合考虑可持续发展的要求，以获得有效结论。

观测点2.1：能够利用数学、自然科学和工程科学的基本知，对金属材料工程领域相关的复杂工程问题的关键环节进行识别和判断；

观测点2.2：能够运用数学、自然科学的基本原理和数学模型方法对金属材料开发、生产和使用过程中的复杂工程问题进行正确分析和表达；

观测点2.3：能够对金属材料工程领域复杂工程问题进行综合分析和评价，综合考虑可持续发展的要求，对解决方案进行合理优化、改进和替代；

观测点2.4：能够掌握文献检索、资料查询的方法，并将获得的信息和结果应用于金属材料复杂工程问题的分析和解决中，综合考虑可持续发展的要求，以获得有效的结论。

毕业要求3

设计/开发解决方案：能够针对金属材料工程领域的复杂工程问题设计和开发解决方案，设计满足特定需求的系统、单元（部件）或工艺流程，体现创新性，并从健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理、社会与文化等角度考虑可行性。

观测点3.1：能够基于工程基础和专业基础知，掌握金属材料领域的工程设计和产品开发全周期、全流程的基本设计/开发方法和技术，了解影响设计目标和技术方案的各种因

素：

观测点3.2：能够根据金属材料产品的服役条件和性能要求，设计/开发金属材料，制定产品的制备加工方案和工艺流程；

观测点3.3：能够将金属材料的制备、加工和检测方法进行系统集成，设计满足多种技术因素制约条件、体现创新性的金属材料工程方案；

观测点3.4：能够针对金属材料工程领域的复杂工程问题，在设计/开发解决方案过程中，从健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理、社会与文化等角度考虑可行性。

毕业要求4

研究：能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

观测点4.1：能够基于自然科学和材料科学的相关科学原理，结合文献检索、资料查询，调研和分析解决金属材料工程领域复杂工程问题的方案；

观测点4.2：能够运用专业工程知识和基本原理，针对金属材料领域的工程问题和要求，选择技术研究路线，设计实验方案；

观测点4.3：针对金属材料领域的工程问题和要求，能够依据研究路线和实验方案，设计/搭建实验装置或实验平台，开展实验，正确采集实验数据；

观测点4.4：能够基于数学、自然科学和材料科学的相关科学原理，针对金属材料工程领域的复杂工程问题，对实验数据进行分析和解释，并通过信息综合得到合理有效的结论。

毕业要求5

使用现代工具：能够针对复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。

观测点5.1：理解解决金属材料工程领域复杂工程问题涉及的现代仪器、信息技术工具、工程工具和模拟软件的原理、使用方法和发展，并理解其局限性；

观测点5.2：能够选择与使用恰当的技术、资源、现代工具和模拟软件，对金属材料领域所涉及的材料成分设计、制备、成形及加工等复杂工程问题进行分析、计算与设计；

观测点5.3：能够针对金属材料领域所涉及的材料成分设计、制备、成形及加工等工艺环节，开发、选择与使用技术、资源及现代工具对金属材料复杂工程问题进行预测与模拟，并能够分析其局限性。

毕业要求6

工程与可持续发展：在解决复杂工程问题时，能够基于工程相关背景知识，分析和评价工程实践对健康、安全、环境、法律以及经济和社会可持续发展的影响，并理解应承担的责任。

观测点6.1：具有工程实习和社会实践的经历，具有环境保护意识，掌握金属材料工程

相关背景知识；了解本专业相关技术标准、知识产权、产业政策和法律法规，理解工程实践对健康、安全、环境、法律以及经济和社会可持续发展的影响。

观测点6.2：具有社会可持续发展意识，能客观认识、分析、评价金属材料工程领域实践和复杂工程问题解决与健康、安全、环境、法律以及经济和社会可持续发展等因素的相互影响和制约，并理解应承担的责任。

毕业要求7

伦理与职业规范：工程伦理和职业规范：有工程报国、为民造福的意识，具有人文社会科学素养和社会责任感，能够理解和践行工程伦理，在工程实践中遵守工程职业道德、规范和相关法律法规，履行责任。

观测点7.1：了解国情，了解历史，理解个人与社会的关系，有工程报国、为民造福的意识，具有正确的世界观、人生观和价值观；

观测点7.2：具有人文社会科学素养和社会责任感，理解金属材料工程领域技术人才的职业性质、规范和社会责任，具有职业道德并能在工程实践中自觉遵守；

观测点7.3：能够理解和践行工程伦理，理解金属材料工程领域的技术和管理人才对公众的安全、健康和福祉，以及环境保护的社会责任，能够在工程实践中自觉履行责任。

毕业要求8

个人与团队：能够在多样化、多学科背景下的团队中承担个体、团队成员以及负责人的角色。

观测点8.1：环境适应能力、人际交往和表达能力强，能与跨学科团队成员进行有效沟通和合作，具备团队协作精神；

观测点8.2：正确理解团队中每个角色的作用，能够在多样化、多学科背景下的团队中独立或合作开展工作。

观测点8.3：具备团队协作能力，能够在多样化、多学科背景下的团队中组织、协调和指挥团队开展工作。

毕业要求9

沟通：能够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，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令；能够在跨文化背景下进行沟通和交流，理解、尊重语言和文化差异。

观测点9.1：能够通过绘制图纸、撰写报告、设计文稿、陈述发言以及答辩等书面和口头形式准确描述、清晰表达金属材料工程的专业问题，理解与业内同行和社会公众交流的差异性。

观测点9.2：具备跨文化交流的语言和书面表达能力，了解国内外本专业的发展趋势和研究热点，理解、尊重世界不同文化的差异性和多样性，具备一定的国际视野；

观测点9.3：能就专业问题，在跨文化背景下进行基本沟通和交流，理解、尊重语言和

文化差异；具有与业界同行及社会公众进行有效沟通和交流专业复杂工程问题的能力。

毕业要求10

项目管理：理解并掌握与金属材料工程领域工程项目相关的管理原理与经济决策方法，并能够在多学科环境中应用。

观测点10.1：了解金属材料及其产品设计与生产的全流程成本构成，理解并掌握金属材料领域的工程项目中涉及的经济与管理因素。

观测点10.2：能够应用工程管理原理和经济决策方法，分析并优化金属材料领域实践过程中的经济性问题；

观测点10.3：能够在多学科环境下（包括模拟环境），设计开发解决方案的过程中，运用工程管理与经济决策方法。

毕业要求11

终身学习：具有自主学习、终身学习和批判性思维的意识 and 能力，能够理解广泛的技术变革对工程和社会的影响，适应新技术变革。

观测点11.1：能针对个人和行业发展需求，采用合适的方法不断学习，具有自主学习、终身学习和批判性思维的意识 and 能力；

观测点11.2：具有自主学习能力，持续关注和学习行业相关科学与工程进展，理解广泛的技术变革对工程和社会的影响，适应新技术变革，对金属材料领域的技术问题具有理解、归纳总结和提出问题的能力。

Graduation Requirements for the Metallic Materials Engineering Program

Graduation Requirement 0

Ideological and Moral Qualities: Students should have a firm and correct political orientation, love the motherland and the people, and support the leadership of the Communist Party of China. They should hold a correct worldview, outlook on life, and values; possess good ideological and moral qualities, a sound personality, and a healthy body; and practice the core socialist values.

0.1 Love the motherland and the people, support the leadership of the Communist Party of China, master and practice the Party's basic theories, have a firm and correct political orientation, implement the principles and policies of the Party and the government, understand national conditions, social conditions, and people's livelihood, and practice the core socialist values.

0.2 Possess a correct worldview, outlook on life, and values, good ideological and moral qualities, a sound personality, a healthy body, and a positive attitude toward life.

Graduation Requirement 1

Engineering Knowledge: Students should be able to apply mathematics, natural sciences, computing, engineering fundamentals, and specialized knowledge to solve complex engineering problems in the field of metallic materials engineering.

Observation Point 1.1: Be able to use the language and tools of mathematics, natural sciences, computing, and engineering science to accurately and appropriately describe engineering problems related to metallic materials engineering.

Observation Point 1.2: Be able to establish mathematical models for specific objects in the field of metallic materials engineering and solve them under appropriate engineering conditions.

Observation Point 1.3: Be able to apply relevant knowledge, including mathematics, natural sciences, computing, engineering fundamentals, and specialized knowledge, as well as mathematical modeling methods, to deduce and analyze engineering problems in metallic materials engineering.

Observation Point 1.4: Be able to apply relevant knowledge, including mathematics, natural sciences, engineering fundamentals, and specialized knowledge, as well as mathematical modeling methods, to compare and synthesize solutions to engineering problems in metallic materials engineering.

Graduation Requirement 2

Problem Analysis: Students should be able to apply the basic principles of mathematics, natural sciences, and engineering sciences to identify, formulate, and analyze complex engineering problems in metallic materials engineering through literature research, while comprehensively considering the requirements of sustainable development, in order to obtain valid conclusions.

Observation Point 2.1: Be able to use basic knowledge of mathematics, natural sciences, and engineering sciences to identify and judge the key aspects of complex engineering problems related to metallic materials engineering.

Observation Point 2.2: Be able to apply the basic principles of mathematics and natural sciences, as well as mathematical modeling methods, to correctly analyze and formulate complex engineering problems in the development, production, and application of metallic materials.

Observation Point 2.3: Be able to conduct comprehensive analysis and evaluation of complex engineering problems in metallic materials engineering, comprehensively consider the requirements of sustainable development, and reasonably optimize, improve, or propose alternatives to solutions.

Observation Point 2.4: Be able to master methods of literature retrieval and data inquiry, apply the obtained information and results to the analysis and solution of complex engineering problems in metallic materials, and comprehensively consider the requirements of sustainable development in order to obtain valid conclusions.

Graduation Requirement 3

Design/Development of Solutions: Students should be able to design and develop solutions to

complex engineering problems in metallic materials engineering, and design systems, units/components, or process flows that meet specific needs. The solutions should demonstrate innovation and consider feasibility from the perspectives of health, safety and environment, life-cycle cost and net-zero carbon requirements, law and ethics, society and culture.

Observation Point 3.1: Be able to master basic design/development methods and technologies for the full cycle and entire process of engineering design and product development in the field of metallic materials, based on engineering fundamentals and specialized basic knowledge, and understand various factors that affect design objectives and technical solutions.

Observation Point 3.2: Be able to design/develop metallic materials and formulate product preparation, processing plans, and technological processes according to the service conditions and performance requirements of metallic material products.

Observation Point 3.3: Be able to systematically integrate preparation, processing, and testing methods of metallic materials, and design innovative metallic materials engineering solutions that satisfy constraints imposed by multiple technical factors.

Observation Point 3.4: Be able to consider feasibility from the perspectives of health, safety and environment, life-cycle cost and net-zero carbon requirements, law and ethics, society and culture during the design/development of solutions to complex engineering problems in metallic materials engineering.

Graduation Requirement 4

Research: Students should be able to conduct research on complex engineering problems based on scientific principles and by using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and valid conclusions through information synthesis.

Observation Point 4.1: Be able to investigate and analyze solutions to complex engineering problems in metallic materials engineering based on relevant scientific principles of natural sciences and materials science, combined with literature retrieval and data inquiry.

Observation Point 4.2: Be able to apply specialized engineering knowledge and basic principles to select technical research routes and design experimental schemes according to engineering problems and requirements in the field of metallic materials.

Observation Point 4.3: Be able to design/build experimental devices or experimental platforms, conduct experiments, and correctly collect experimental data according to research routes and experimental schemes for engineering problems and requirements in the field of metallic materials.

Observation Point 4.4: Be able to analyze and interpret experimental data for complex

engineering problems in metallic materials engineering based on relevant scientific principles of mathematics, natural sciences, and materials science, and obtain reasonable and valid conclusions through information synthesis.

Graduation Requirement 5

Use of Modern Tools: Students should be able to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex engineering problems, including prediction and simulation of complex engineering problems, and understand their limitations.

Observation Point 5.1: Understand the principles, usage methods, development trends, and limitations of modern instruments, information technology tools, engineering tools, and simulation software involved in solving complex engineering problems in metallic materials engineering.

Observation Point 5.2: Be able to select and use appropriate technologies, resources, modern tools, and simulation software to analyze, calculate, and design complex engineering problems related to material composition design, preparation, forming, and processing in the field of metallic materials.

Observation Point 5.3: Be able to develop, select, and use technologies, resources, and modern tools to predict and simulate complex engineering problems in metallic materials for process stages such as material composition design, preparation, forming, and processing, and be able to analyze their limitations.

Graduation Requirement 6

Engineering and Sustainable Development: When solving complex engineering problems, students should be able to analyze and evaluate the impacts of engineering practice on health, safety, environment, law, and economic and social sustainable development based on engineering-related background knowledge, and understand the responsibilities they should assume.

Observation Point 6.1: Have experience in engineering internship and social practice, possess awareness of environmental protection, and master background knowledge related to metallic materials engineering. Understand relevant technical standards, intellectual property rights, industrial policies, laws and regulations of the profession, and understand the impacts of engineering practice on health, safety, environment, law, and economic and social sustainable development.

Observation Point 6.2: Possess awareness of social sustainable development, and be able to objectively understand, analyze, and evaluate the interactions and constraints among engineering practice, solutions to complex engineering problems in metallic materials engineering, and factors

such as health, safety, environment, law, and economic and social sustainable development, and understand the responsibilities they should assume.

Graduation Requirement 7

Ethics and Professional Norms: Students should have the awareness of serving the country through engineering and benefiting the people, possess humanities and social science literacy and a sense of social responsibility, understand and practice engineering ethics, comply with engineering professional ethics, norms, and relevant laws in engineering practice, and fulfill their responsibilities.

Observation Point 7.1: Understand national conditions and history, understand the relationship between individuals and society, have the awareness of serving the country through engineering and benefiting the people, and possess a correct worldview, outlook on life, and values.

Observation Point 7.2: Possess humanities and social science literacy and a sense of social responsibility, understand the professional nature, norms, and social responsibilities of technical personnel in metallic materials engineering, possess professional ethics, and consciously abide by them in engineering practice.

Observation Point 7.3: Be able to understand and practice engineering ethics, understand the social responsibilities of technical and managerial personnel in metallic materials engineering for public safety, health and well-being, as well as environmental protection, and consciously fulfill these responsibilities in engineering practice.

Graduation Requirement 8

Individual and Teamwork: Students should be able to assume the roles of an individual, a team member, and a leader in teams with diverse and multidisciplinary backgrounds.

Observation Point 8.1: Possess strong environmental adaptability, interpersonal communication, and expression abilities; be able to communicate and cooperate effectively with members of interdisciplinary teams; and demonstrate teamwork spirit.

Observation Point 8.2: Correctly understand the role of each member in a team, and be able to work independently or cooperatively in teams with diverse and multidisciplinary backgrounds.

Observation Point 8.3: Possess teamwork ability, and be able to organize, coordinate, and direct teams to carry out work in diverse and multidisciplinary contexts.

Graduation Requirement 9

Communication: Students should be able to communicate effectively with industry peers and the general public on complex engineering problems, including writing reports and design documents, making presentations, clearly expressing ideas, and responding to instructions. They

should also be able to communicate in cross-cultural contexts and understand and respect linguistic and cultural differences.

Observation Point 9.1: Be able to accurately describe and clearly express professional problems in metallic materials engineering through written and oral forms, such as drawing engineering drawings, writing reports and design documents, making presentations, and participating in defenses, and understand the differences in communication with industry peers and the general public.

Observation Point 9.2: Possess language and written expression abilities for cross-cultural communication, understand the development trends and research hotspots of the profession at home and abroad, understand and respect the differences and diversity of cultures around the world, and possess a certain international perspective.

Observation Point 9.3: Be able to conduct basic communication and exchanges on professional issues in cross-cultural contexts, understand and respect linguistic and cultural differences, and possess the ability to communicate effectively with industry peers and the general public on complex engineering problems in the profession.

Graduation Requirement 10

Project Management: Students should understand and master management principles and economic decision-making methods related to engineering projects in the field of metallic materials engineering, and be able to apply them in multidisciplinary environments.

Observation Point 10.1: Understand the cost structure of the entire process of design and production of metallic materials and their products, and understand and master the economic and management factors involved in engineering projects in the field of metallic materials.

Observation Point 10.2: Be able to apply engineering management principles and economic decision-making methods to analyze and optimize economic issues in the practice of metallic materials engineering.

Observation Point 10.3: Be able to apply engineering management and economic decision-making methods in the process of designing and developing solutions in multidisciplinary environments, including simulated environments.

Graduation Requirement 11

Lifelong Learning:

Students should have the awareness and ability for independent learning, lifelong learning, and critical thinking; be able to understand the impacts of broad technological changes on engineering and society; and adapt to new technological changes.

Observation Point 11.1: Be able to adopt appropriate methods for continuous learning

according to personal and industry development needs, and possess the awareness and ability for independent learning, lifelong learning, and critical thinking.

Observation Point 11.2: Possess independent learning ability, continuously follow and learn about scientific and engineering advances related to the industry, understand the impacts of broad technological changes on engineering and society, adapt to new technological changes, and have the ability to understand, summarize, and raise questions about technical issues in the field of metallic materials.

四、毕业条件及学位授予要求

IV. Graduation Requirements and Degree Awarding Requirements

在修业年限内修完本专业规定课程，获得的总学分不低于153+X学分、第二课堂学分不低于7学分（须通过《Python语言程序设计》课程考核获得1学分），且通过《国家学生体质健康标准》的合格测试，方可准予毕业。

注：X学分包含通识选修课程、专业选修课程、自选课程，根据个人职业发展意愿，修读10-20学分。其中，通识选修课程应至少修读各模块要求的最低学分（不少于7学分）。达到毕业要求，且符合《西安工业大学学士学位授予工作细则》，授予工学士学位。

Only after completing the required courses within the length of study, and obtaining the total credits of no less than 153+X and the second classroom credits of no less than 7 (passing the examination of " Python Language Programming " course and obtain 1 credit),and passing the qualification test of "National Student Physical Health Standard" can be allowed to graduate.

Note: The X credits include general elective courses, professional elective courses, and self-selected courses. Students should take 10 to 20 credits based on their career development intentions. Among them, at least the minimum credits required by each module of the general elective courses should be completed (no less than 7 credits). Those who meet the graduation requirements and comply with the "Xi'an Technological University Bachelor's Degree Awarding Work Rules" will be awarded a Bachelor of Engineering degree.

五、课程体系

V. Curriculum System

分类 Course Category	课程 代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hour	周数 Total Weeks	理论 学时 Semester Hour of Theory Course	实验 学时 Semester Hour of Experiment Program	上机 学时 Semester Hour	其他 学时 Semester Hour	建议修读学期 Recommendation of Study Semester	是否 必修 Required course	考核 方式 Evaluation Methods	是否 核心 课程 Core Course	开课 情况 Open Course Info	备注 Remarks
						Semester Hour	Semester Hour	Semester Hour	Semester Hour						
通识 教育 必修	180001	1 思想道德与法治 Morality and the Rule of Law	3	48		40	8			1	是	考查	否	是	必修,
	230006	2 大学生职业生涯规划	0.5	20		20				1	是	考查	否	是	必修,

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credits	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Career Planning of College Students													
	230 023	3 Python语言 程序设计 Python language programming	0	32					32	1	是	考试	否	缺0分	必修, 通过制
	230 026	4 军事理论 Military Theory	2	36		36				1	是	考查	否	是	必修,
	230 062	5 现代工程导 论 Introduction to Modern Engineering	0.2 5	8		8				1	是	考查	否	缺0.2 5分	必修,
	230 065	6 工程伦理与 安全 Engineering Ethics and Safety	0.2 5	8		8				1	是	考查	否	是	必修,
	230 066	7 大学英语I College English I	2	64		64				1	是	考试		是	必修,
	230 080	8 计算思维与 人工智能导论 (工A) Introduction to Computational Thinking and Artificial Intelligence	1	32		24	8			1	是	考查	否	是	必修,

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
	180016	9 国家安全教育 National Security Education	1	16		12	4			2	是	考查	否	缺1分	必修,
	200002	10 人工智能:模型与算法 Artificial Intelligence: Models and Algorithms	0.25	8		8				2	是	考查	否	缺0.25分	必修,
	230067	11 大学英语II College English II	2	64		64				2	是	考试		缺2分	必修,
	230078	12 数字化思维与智能技术基础(理工) Digital Thinking and Fundamentals of Intelligent Technology	0.25	8		8				2	是	考查	否	缺0.25分	必修,
	550002	13 大学生心理健康教育 Mental Health Education for College Students	2	32		32				2	是	考查	否	缺2分	必修,
	9811	14 中国近现代史纲要 Outline of China's Modern	3	48		40	8			2	是	考试	否	缺3分	必修,

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		History													
	020121	15 工程经济与项目管理 Engineering Economics and Project Management	0.5	16		16				3	否	考查	否	缺0.5分	
	050177	16 创新创业学 Innovation and Entrepreneurship	1	32		32				3	否	考查	否	缺1分	
	4983	17 马克思主义基本原理 The Basic Principles of Marxism	3	48		40	8			3	是	考试		缺3分	必修,
	180003	18 毛泽东思想和中国特色社会主义理论体系概论 Introduction of Mao Zedong Thought and Theory System of Socialism with Chinese Characteristics	3	48		40	8			4	是	考试		缺3分	必修,
	050178	19 企业(军工)管理 Enterprise (Military Industry)	0.75	24		24				5	否	考查	否	缺0.75分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Management													
	180004	20 习近平新时代中国特色社会主义思想概论 Introduction of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	3	48		40	8			5	是	考试		缺3分	必修,
	230007	21 大学生就业指导 Employment Guidance for College Students	0.5	18		18				6	是	考查	否	缺0.5分	必修,
	180006	22 形势与政策-1 Current Foreign & Domestic Issues and Policy	0	8		8				1	否	考查	否	是	形势与政策
	180007	23 形势与政策-2 Current Foreign & Domestic Issues and Policy	0	8		8				2	否	考查	否	缺0分	形势与政策
	180008	24 形势与政策-3 Current Foreign & Domestic Issues and Policy	0	8		8				3	否	考查	否	缺0分	形势与政策

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Current Foreign & Domestic Issues and Policy													
	180009	25 形势与政策-4 Current Foreign & Domestic Issues and Policy	0	8		8				4	否	考查	否	缺0分	
	180010	26 形势与政策-5 Current Foreign & Domestic Issues and Policy	0	8		8				5	否	考查	否	缺0分	
	180011	27 形势与政策-6 Current Foreign & Domestic Issues and Policy	0	8		8				6	否	考查	否	缺0分	
	180012	28 形势与政策-7 Current Foreign & Domestic Issues and Policy	0	8		8				7	否	考查	否	缺0分	
	180013	29 形势与政策-8 Current Foreign & Domestic Issues and Policy	0	8		8				8	否	考查	否	缺0分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
通识 限选		Issues and Policy													
		应修学分	29.25							1(9),1(8.5),1(4.5),1(3),1(3.75),1(0.5)					
	230027	30 体育I Physical EducationI	1	36		36				1	否	考查	否	是	
	230028	31 体育II Physical EducationII	1	36		36				2	否	考查	否	缺1分	
	230029	32 体育III Physical EducationIII	0.5	18		18				3	否	考查	否	缺0.5分	
	230056	33 大学英语III College English III	1	32		32				3	否	考试	否	缺1分	四级未通过选
	230008	34 大学英语拓展课 Expanding Course of College English	2	32		32				3,4	否	考试	否	缺2分	四级通过选
	230030	35 体育IV Physical EducationIV	0.5	18		18				4	否	考查	否	缺0.5分	
230057	36 大学英语IV College English IV	1	32		32				4	否	考试	否	缺1分	四级未通过	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
														选	
	230031	37 体育V Physical EducationV	0.5	18		18				5	否	考查	否	缺0.5分	
	230032	38 体育VI Physical EducationVI	0.5	18		18				6	否	考查	否	缺0.5分	
		应修学分	8							1(1),1(1),1(1.5),1(3.5),1(0.5),1(0.5)					
通识选修		通识选修-文化传承	0.5												
		通识选修-“四史”教育	0.5												
		通识选修-国际视野	0.5												
		通识选修-社会责任	0.5												
		通识选修-美学修养	2												“美学和艺术史论类”，“艺术鉴赏和评

分类 Course Category	课程 代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
															论类”课程至少取得1个学分
		通识选修-健康生活	0.5												
		通识选修-科技创新	0.5												
		通识选修-创新创业	0.5												
		通识选修-国防军工	0.5												
		通识选修-劳动教育	1												
		学分小计	7												
		学分小计	44.25												
学科 基础 课程	0051	39 高等数学A1 Advanced Mathematics AI	5.5	88		88				1	是	考试		是	
	0052	40 高等数学 AII Advanced Mathematics	5.5	88		88				2	是	考试		缺5.5分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credits	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		All													
	0073	41 大学物理I College Physics I	3	48		48				2	是	考试		缺3分	
	0101	42 线性代数 Linear Algebra	2.5	40		40				2	是	考试	否	缺2.5分	
	030065	43 无机与分析化学 Inorganic and Analytical Chemistry	4.5	72		48	24			2	是	考试	否	缺4.5分	
	230022	44 C++程序设计 C++ programming	1.5	48		32		16		2	是	考试	否	缺1.5分	
	9886	45 工程图学基础 Engineering Graphics	2.5	40		40				2	是	考试	否	缺2.5分	
	0065	46 概率与数理统计 Probability Theory and Mathematical Statistics	3	48		48				3	是	考试	否	缺3分	
	0074	47 大学物理II College Physics II	3	48		48				3	是	考试		缺3分	
	9887	48 机械制图 Engineering Drawing	1.5	24		24				3	是	考查	否	缺1.5分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
	040191	49 电工电子技术 Electrical and Electronic Technology	3	48		48				4	是	考试	否	缺3分	
	1208	50 机械设计基础 Fundamentals of Machine Design	2.5	40		40				4	是	考查	否	缺2.5分	
	2260	51 工程力学 Engineering Mechanics	2.5	40		40				4	是	考试	否	缺2.5分	
	学分小计			40.5						1(5.5),2(19.5),3(7.5),4(8)					
专业教育	030009	52 新生研讨课 (材料类) Freshman Seminar Courses	1.25	24		24				1	是	考查	否	是	
	1504	53 物理化学 Physical Chemistry	4	64		56	8			3	是	考试		缺4分	
	030132	54 材料工程传输原理 Material Engineering Transmission Principle	2	32		32				4	是	考试		缺2分	
	030004	55 材料研究方法 Methods for	2	32		32				5	是	考试		缺2分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hour	周数 Total Weeks	理论学时 Semester Hour of Theory Course	实验学时 Semester Hour of Experiment	上机学时 Semester Hour of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Materials Analysis													
	030091	56 材料性能学 Properties of Materials	2	32		32				5	是	考试		缺2分	
	030227	57 材料科学与工程学科前沿 讲座 Frontier Lecture on Materials Science and Engineering	1	16		16				5	是	考查	否	缺1分	
	030276	58 金属材料及热处理 Metal materials and heat treatment	3	48		48				5	是	考试		缺3分	
	031531	59 材料制备技术 Material preparation technology	2	32		32				5	是	考试		缺2分	
	030228	60 未来材料与可持续发展 Development of Future Materials and Sustainable	1	16		16				6	是	考查	否	缺1分	
	1958	61 计算材料学 Computational Materials	2	32		24	8			6	是	考查		缺2分	
	030260	62 材料科学基础	4.5	72		72				4	是	考试		缺4.5分 二选	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hour	周数 Total Weeks	理论学时 Semester Hour of Theory Course	实验学时 Semester Hour of Experiment Program	上机学时 Semester Hour of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Foundation of Material Science												分	一
	030261	63 材料科学基础（双语） Fundamentals of Materials Science (Bilingual)	4.5	72		72				4	是	考试		缺4.5分	
		学分小计	29.25							1(1.25),3(4),4(11),5(10),6(3)					
实践 教育	210001	64 军训 Military Training	2		2周					1	否	考查	否	缺2分	
	9014	65 入学教育 Entrance Education	0	8				8		1	否	考查	否	缺0分	
	230024	66 大学物理实验I College Physics Experiment I	0.75	24			24			3	否	考查	否	缺0.75分	
	9025	67 电装实习A Electrical installation practice A	1		1周					3	否	考查	否	缺1分	
	030098	68 材料科学基础实验 Basic Experiments of Materials Science	1	32			32			4	否	考查		缺1分	
	230	69 大学物理实	0.7	24			24			4	否	考查	否	缺	

分类 Course Category	课程 代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
	025	验II College Physics Experiment II	5										0.7 5分		
	020 008	70 机械设计基 础课程设计 Fundamental Experiment of Machinery Manufacturing	1		1 周					5	否	考查	否	缺1 分	
	030 099	71 材料加工基 础实验 Basic experiment of material processing	1	32			32			6	否	考查	否	缺1 分	
	030 100	72 材料分析检 测实验 Material analysis and testing experiment	1	32			32			6	否	考查	否	缺1 分	
	157 0	73 生产实习 Production Practice	4		4 周					6	否	考查	否	缺4 分	
	030 101	74 设计型综合 实验 Designed comprehensive experiment	1.5	48			48			7	否	考查		缺 1.5 分	
	030 166	75 金属材料工 程专业毕业设 计（论文）	18		18 周					8	否	考查		缺 18 分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Graduation Project of Metal Materials Engineering (Thesis)													
	9015	76 毕业教育 Graduation Education	0	8					8	8	否	考查	否	缺0分	
		应修学分	32							1(2),1(1.75),1(1.75),1(1),1(6),1(1.5),1(18)					
实践 限选	030262	77 创新项目实践训练(分流培养) 1 Practice of Innovative project (diversion training) 1	0.5	16			16				否			缺0.5分	
	030263	78 创新项目实践训练(分流培养) 2 Practice of Innovative project (diversion training) 2	0.5	16			16				否			缺0.5分	
	030264	79 创新项目实践训练(分流培养) 3 Practice of Innovative project	0.5	16			16				否			缺0.5分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credits	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		(diversion training) 3													
	600011	80 智能制造创新创业实训-小型机电系统操作与拆装 Intelligent Manufacturing Innovation and Entrepreneurship Training-Operation and Disassembly of Small	0.25	8		8				3	否	考查	否	缺0.25分	
	600012	81 智能制造创新创业实训-移动机器人避障与路径规划 Intelligent Manufacturing Innovation and Entrepreneurship Training-Mobile Robot Obstacle Avoidance a	0.25	8		8				3	否	考查	否	缺0.25分	
	600013	82 智能制造创新创业实训-零件增材制造与智能检测	0.25	8		8				3	否	考查	否	缺0.25分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		Intelligent Manufacturing Innovation and Entrepreneurship Training-Parts Additive Manufacturing and													
	600016	83 智能制造创新创业实训-智能制造产线基础实训 Basic Practical Training of Intelligent Manufacturing Production Line	0.25	8			8			3	否	考查	否	缺0.25分	
	600017	84 智能制造创新创业实训-工业机器人基本操作与虚拟仿真 Basic Operations and Virtual Simulation of Industrial Robots	0.25	8			8			3	否	考查	否	缺0.25分	
	600019	85 智能制造创新创业实训-智能制造大数据与人工智能基	0.25	8			8			3	否	考查	否	缺0.25分	

分类 Course Category	课程 代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		础实训 Intelligent Manufacturing Big Data and Artificial Intelligence Basic Training													
	600031	86 数控制造实训2—数控特种加工 Numerical Control Manufacturing Training	0.75	24			24			3	否	考查	否	缺0.75分	
	030265	87 创新项目实践训练(分流培养)4 Practice of Innovative project (diversion training) 4	0.5	16			16			4	否			缺0.5分	
	0310	88 理科创新思维实训 Innovation and Entrepreneurship (Science)	0.5	16		16				4	否	考查	否	缺0.5分	
	600028	89 基础工程训练1 Basic Engineering Training	1	32			32			4	否	考查	否	缺1分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hour	周数 Total Weeks	理论学时 Semester Hour of Theory Course	实验学时 Semester Hour of Experiment Program	上机学时 Semester Hour of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
	600030	90 基础工程训练3 Basic Engineering Training	0.75	24			24			4	否	考查	否	缺0.75分	
	030266	91 创新项目实践训练(分流培养) 5 Practice of Innovative project (diversion training) 5	0.5	16			16			5	否			缺0.5分	
	030267	92 创新项目实践训练(分流培养) 6 Practice of Innovative project (diversion training) 6	0.5	16			16			6	否			缺0.5分	
	030268	93 创新项目实践训练(分流培养) 7 Practice of Innovative project (diversion training) 7	0.5	16			16			7	否			缺0.5分	
	030269	94 创新项目实践训练(分流培养) 8 Practice of Innovative project (diversion training) 8	0.5	16			16			8	否			缺0.5分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
个性业 化方 展课	030114	98 表面工程理论及技术 Surface engineering theory and technology	2	32		32				5	否	考试		缺2分	表面工程
	030113	99 增材再制造技术及设备 Additive remanufacturing technology and equipment	2	32		32				6	否	考试	否	缺2分	
	030116	100 金属表面损伤与控制 Metal surface damage and control	2	32		32				6	否	考试	否	缺2分	
	030108	101 合金成形原理与设备 Alloy shaping principle and equipment	2	32		32				5	否	考试		缺2分	
	030110	102 材料成形三维建模与模拟仿真 3D Modeling and Simulation of Material Forming	2	32		32				6	否	考查	否	缺2分	
	030111	103 3D打印技术及其应用 3D printing	2	32		32				6	否	考试	否	缺2分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hour	周数 Total Weeks	理论学时 Semester Hour of Theory Course	实验学时 Semester Hour of Experiment Program	上机学时 Semester Hour	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		technology and application													
	030118	104 材料累加成形原理与设备 Material additive forming principle and equipment	2	32		32				5	否	考试		缺2分	先进连接
	030086	105 焊接机器人及控制 Welding robot and control	2	32		32				6	否	考试	否	缺2分	
	030120	106 工程结构连接 Engineering structural connection	2	32		32				6	否	考试	否	缺2分	
		应修学分	6							1(2),1(4)					
专业选修课	030303	107 功能材料与人工智能应用(双语) Functional Materials and Artificial Intelligence Applications (Bilingual)	2	32		32				7	否	考查	否	缺2分	二选一
	030304	108 AI辅助科技英语翻译及写作技巧	2	32		32				7	否	考查	否	缺2分	

分类 Course Category	课程代码 Course Code	课程名称 Course Name	学分 Credit	总学时 Total Semester Hours	周数 Total Weeks	理论学时 Semester Hours of Theory Course	实验学时 Semester Hours of Experiment Program	上机学时 Semester Hours of Program	其他学时 Rest Semester Hour	建议修读学期 Recommendation of Study Semester	是否必修 Required course	考核方式 Evaluation Methods	是否核心课 Required or Elective Course	开课情况 Open Course Info	备注 Remarks
		AI辅助科技英语翻译及写作技巧													
		应修学分	2							1(2)				AI融合课程	
		自选课程	10							1(10)				建议第七学期选修硕士至少10学分课程	
		应修学分	18							5(2),6(6),7(10)					
		全程总计	17 4.5							1(6.75), 2(19.5), 3(11.5), 4(19), 5(12), 6(9), 7(10), 8(0)					
		备注													

六、学分分配

VI.Credit Allocation

表1 课程模块学分分配表

课程模块 Course Module	通识教育课程 General Education Courses	学科基础课程 Subject Basic Courses	专业教育课程 Discipline Courses	实践教育课程 Practical Courses	个性化发展课程 Personalized Development Courses	合计 Total
学分 Credits	44.25	40.5	29.25	42.5	18	174.5
占比 (%) Percentage	25.4%	23.2%	16.8%	24.4%	10.3%	100%

表2 课程类别学分分配表

课程类别 Course Category	必修课学分 Required Courses Credits		选修课程学分 Elective Courses Credits		理论教学学分 Theoretical Teaching Credits	实践教学学分 Experimental Teaching Credits	
	含限选课学分	不含限选课学分	不含限选课学分	含限选课学分		课内实验学分	不含课内实验实践教学学分
学分 Credits	131			43.5	132	6.75	35.75
占比 (%) Percentage	75.1%			24.9%	75.6%	3.9%	20.5%

七、教学计划

VII. Teaching Schedule

1. 学期周学时分配表

Weekly Study Hours

学期 Term	一	二	三	四	五	六	七	八
周学时 Weekly Study Hours	22.8	30.1	25.4	30.8	18.3	14.3	4.2	

2. 教学进程

Schedule

学年 Academic Year	学期 Term	各学期教学内容 Teaching Activities in Each Term																									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
		一	1	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	:	=	=	=	=
	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	:	=	=	=	=	=	=
二	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	:	=	=	=	=	=	=
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	:	=	=	=	=	=	=
三	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	<	<	<	:	=	=	=	=	=	=
	6	-	-	-	-	-	-	-	-	-	-	-	-	:	@	@	@	@	@	@	@	=	=	=	=	=	=
四	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<	<	:	=	=	=	=	=	=
	8	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	>	B	J	=	=	=	=	=

图例：* 入学教育 - 理论教学 : 考试 <课程设计 θ 写生 = 假期 S 教学实
习 O 金工实习 \$ 社会调查 X 学年论文 ! 测绘 @ 生产实习 J 机动 + 军训 >
毕业设计 & 毕业实习 B 毕业教育 Z 专业实训

Legend: * Orientation - Theory Teaching : Examination <Course Project θ Sketch =
Vacation S Teaching Practice O Metalworking Practice \$ Social Survey X Term Paper !
Mapping @ Production Practice J Mobility + Military Training >Graduation
Project/Paper &Graduation Internship B Graduation Education Z Professional Training

八、毕业要求支撑培养目标矩阵图

VIII. Matrix of Graduation Requirements Supporting Training Objectives

	培养目标(1) 工程 素养	培养目标(2) 创新 精神	培养目标(3) 道德 修养	培养目标(4) 团队 合作	培养目标(5) 终身 学习
思想品德			√		√
工程知识	√				√
问题分析		√		√	
设计/开发解决方案	√	√		√	
研究	√	√		√	
使用现代工具		√	√		
工程与可持续发展	√				√

方案中与之对应的课程。

培养方案与工程教育认证通用标准对应情况

	工程教育认证通用标准要求	本方案	是否满足标准 (是/否)
总学分	无	170	是
数学与自然科学类课程学分 (比例)	15%	18.2%	是
人文社会科学类课程学分(比 例)	15%	16.3%	是
学科基础和专业课程学分(比 例)	30%	43.1%	是
实践教学环节学分比例	20%	28.7%	是
选修课程学分比例	——	20%	是
核心课程		大学英语I,大学英语II,马克思 主义基本原理,习近平新时代 中国特色社会主义思想概论, 毛泽东思想和中国特色社会 主义理论体系概论,高等数学 AII,大学物理II,高等数学AI, 大学物理I,材料性能学,材料 研究方法,材料制备技术,计 算材料学,金属材料及热处 理,物理化学,材料工程传输 原理,材料科学基础,材料科 学基础(双语),金属材料工 程专业毕业设计(论文),材 料科学基础实验,设计型综合 实验,表面工程理论及技术, 合金成形原理与设备,材料累 加成形原理与设备	

注：（1）专业认证标准中未规定的项目填写无即可。（2）“核心课程”一栏逐项罗列规定课程和方案中与之对应的课程。

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