资源与环境学院本科人才培养方案

Undergraduate Program for College of Resources and Environment

(2025 级)

目 录

Contents

资源与环境学院简介

资源与环境学院现有环境科学、环境工程、水文与水资源工程、资源循环科学与工程 4 个本科专业，其中环境科学和环境工程专业入选湖北省普通高等学校战略性新兴（支柱）产业人才培养计划，环境工程专业入选湖北省一流专业建设点。环境工程专业 2020 年通过了国际通行的工程教育专业认证，为国家民委院校首个通过专业。在研究生教育方面，学院现有环境科学与工程学术型硕士点、环境化学学术型硕士点和资源与环境领域工程专业型硕士点，环境工程学科为湖北省楚天学者设岗学科。

学院拥有一支结构合理、奋发有为的师资队伍，现有教职员工 50 人。现有教授 9 人（其中二级教授 1 人，三级教授 2 人），副教授 14 人，包括教育部新世纪优秀人才 3 人、国家民委突出贡献专家 1 人及湖北省有突出贡献中青年专家 2 人。我院现有在校本科生 880 余人，研究生 153 人。

学院现有 7000 平米的综合实验楼，建有环境监测实验室、环境工程综合实验室、水力学实验室、资源加工实验室、虚拟仿真实验室等专业教学实验室 18 个，另有 400 平米分析测试中心 1 个，校内气象站 1 个，工程设计资料室 1 个。学院现有湖北省重金属污染防治工程技术研究中心、资源转化与污染控制国家民委重点实验室等研究机构，其中“碳族废物资源化利用重点实验室”于 2016 年获批为全国循环经济工程实验室。学院已与美国加州大学、英国布里斯托尔大学、加拿大康考迪亚大学等高校建立了交流与合作，推进人才培养和科学研究。与广西中信大锰集团、长江三峡集团、湖北兴发集团、武汉水务集团等企业及众多环保部门建立了实践教学和产学研基地。学院坚持以人才培养为中心，并注重教学与科研相融合。学院现有 6 个科研团队——分别是重金属污染控制与含碳废物的能源化利用团队、环境材料和环境控制化学团队、碳基材料与环境修复团队、生态毒理与 VOCs 污染控制团队、矿产资源综合利用团队、水资源利用与水环境治理团队。优质的学术环境、前沿的科研平台，无不彰显着学院高亢的学术热情和务实的科研精神。近年来，学院共承担科研项目 240 余项，包括国家科技支撑计划项目、科技部 863 计划、国家自然科学基金等国家级项目 30 余项，到账经费 7000 余万元。近年，学院教师主持获得湖北省科技进步特等奖 1 项、三等奖 5 项，环境保护科学技术二等奖 1 项，湖北省自然科学二等奖、三等奖各 1 项，湖北省教学成果奖一等奖 1 项，国家民委教学成果奖二等奖 1 项。

学院积极融入“一带一路”、粤港澳大湾区建设等国家发展战略，积极拓展国际国内合作交流，承办了多个相关的国际学术会议，创建有品牌学术交流栏目——南湖环境讲坛，每年邀请国内外知名专家学者来学院学术讲座 10 余人次。自建院以来，学院先后举办了多次大型国内国际学术交流会议，2016 年，学院承办了第十六届世界催化大会卫星会议（环境催化国际研讨会）及第十一届海峡两岸催化学术会议，2017 年与清华大学环境学院共同承办持久性有机污染物论坛 2017 暨第十二届持久性有机污染物学术研讨会（POPs2017），2018 年、2022 年承办

环境与能源科技国际研讨会，2020年承办中国环境科学学会科学技术年会“乡村环境治理”分会。学院资源与环境相关学科在国内已具有一定的影响力，特别是工业废水处理和环境催化领域相关研究已达到国内先进水平。

学院围绕“立德树人”的根本任务，优化“三全育人”工作机制，以“崇德、尚学、自然、和谐”为院训，积极推行导师制，“德智体美劳”五育并举，全方位培养学生。第一课堂学生学习氛围浓厚，学院所有科研团队实验室向本科生开放，鼓励学生利用课余时间开展科研创新；学院创新开展“绿色空间”科技文化节和“世界环境日”等品牌特色学生活动，进一步丰富第二课堂教育平台，提升了学生的综合素质。

学生专业知识扎实，创新能力强，综合素质高。近年来学生曾在大学生“挑战杯”多次获得省级一、二等奖，在全国大学生节能减排社会实践与科技竞赛等多项国家级赛事中载誉而归，数位本科生以第一作者发表 SCI 一区等高水平科研论文，在“垃圾投进趣 • 全国青年公益实践大赛”获得总冠军，每年均有学生获得国家、省级和校级大学生创新创业训练计划项目立项、结题，先后注册成立了多家创业公司，也涌现出了杨晨等湖北省向上向善好青年和全国“中国电信”奖学金获得者蓝际荣等众多优秀学生。

毕业生升学就业率高。2023 届毕业生考研升学率超过 42.86%，不少学生考入浙江大学、武汉大学、中山大学、华中科技大学等国内名校以及英国曼彻斯特大学、韩国首尔大学等国外名校深造。毕业生就业率稳定在 84.57%左右，就业主要分布在环境类上市公司、设计和科研院所等企业，也有环保局、水文局、国土资源局等公务员、事业单位部门，学生培养质量受到用人单位好评，获得良好的社会声誉。

College of Resources and Environment

The College offers four undergraduate programs (Environmental Science, Environmental Engineering, Hydrology and Water Resources Engineering, and Resources Circulation Science and Engineering). Both Environmental Science and Environmental Engineering were selected as the strategic new-type (pillar) industrial talent training program for general colleges and universities in Hubei Province. Environmental Engineering was accredited by China Engineering Education Accreditation in 2020，being the first university to be accredited in the National Ethnic Affairs Commission University system. The College offers a doctoral degree program in Environmental Chemistry, an academic master degree program in Environmental Science and Engineering, and a professional master degree program in Resources and Environmental Engineering. Moreover, Environmental Science and Engineering offers position for “Chutian” scholar.

There is a rational composition of staffs and faculties at the college with a number of 50 personal in total. There are 9 full-time professors (Tier II: 1, Tier III: 2), 14 full-time associate professors (3 recognized as outstanding talents in the new century by the Ministry of Education; 1 recognized as expert with outstanding contributions by the National Ethnic Affairs Commission; 2 recognized as young and middle-aged experts with outstanding contributions by Hubei Province). Currently, there is a total number of ~880 undergraduate students and 153 graduate students.

The College has 7,000 square meters of comprehensive laboratory building, including 18 professional teaching laboratories (Environmental Monitoring Laboratories, Hydraulics Laboratories, Environmental Engineering Laboratories, Virtual Simulation Laboratories, etc.) and an additional 400 square meters of Analysis and Testing Center, 1 Weather Station and 1 engineering design library. The college owns the Hubei Province Heavy Metal Pollution Prevention and Control Engineering Technology Research Center, National Ethnic Affairs Commission Key Laboratory of Resource Transformation and Pollution Control and other research institutions. Among them, the "Key Laboratory of Carbon Waste Resource Utilization" has been approved as the national circular economy engineering laboratory in 2016. The college has established exchanges and cooperation with the University of California, the University of Bristol in the United Kingdom, Concordia University in Canada and other universities to promote talent training and scientific research. Practical teaching and industry-academia-research bases have been established with Guangxi CITIC manganese Group, Three Gorges Corporation, Hubei Xingfa Group Co., Ltd, Wuhan Water Group and many other enterprises and environmental protection departments. The college emphasizes on talent training and focuses on the integration of teaching and research. There are 6 existing research groups, namely Heavy metal pollution prevention

and control, Environmental materials and environmental control chemistry, Carbon-based materials and environmental remediation, Ecotoxicology and VOCs pollution control, Resource planning and comprehensive utilization of mineral resources and Water pollution and control. The high-quality academic environment and cutting-edge research platforms all demonstrate the high academic enthusiasm and pragmatic research spirit of the college. In recent years, the college has undertaken more than 240 scientific research projects, including the national science and technology support plan, the subproject of the Ministry of Science and Technology's 863 plan, and the National Natural Science Foundation of China, with a total funding of more than 70 million yuan. Faculties at the college have won 1 special prize and 5 third prize of Hubei Province Science and Technology Progress Award, 1 second prize of Science and Technology Award of the Ministry of Environmental Protection, 1 second prize and 1 third prize of Hubei Province Natural Science Award, , 1 frist prize of Teaching Achievement Award of Hubei Province and 1 first prize of Teaching Achievement Award of National Ethnic Affairs Commission.

The college actively integrates into national development strategies such as the “Belt and Road Initiative” and the construction of the Guangdong-Hong Kong-Macao Greater Bay Area, actively expands international and domestic cooperation and exchanges, and has hosted a number of relevant international academic conferences. The college has established exchanges and cooperation with universities such as the University of California, the University of Bristol in the United Kingdom, and Concordia University in Canada, and has created a brand academic exchange column - Nanhu Environmental Forum. Since the establishment of the college, the college has held many large-scale domestic and international academic conferences. In 2016, the college hosted the 16th Satellite Meeting of the World Congress on Catalysis (International Symposium on Environmental Catalysis), the 11th Cross-Strait Catalysis Conference in 2017, the International Symposium on Environment and Energy Science and Technology in 2018 and 2022, and the 2020 Science and Technology Conference of the Chinese Society of Environmental Science (CSES) on "Rural Environmental Governance" in 2020. Additionally, the college and the School of Environment of Tsinghua University co-hosted the Persistent Organic Pollutants (POPs) Forum 2017 and the 12th POPs Colloquium (POPs2017) in 2017. The school's resource and environment-related disciplines have a certain degree of influence in China, especially research in the field of industrial wastewater treatment and environmental catalytic has reached the advanced level in China.

The college implements the fundamental task of "cultivating people with morality", optimizes the working mechanism of "All-round education", takes "cultivating morality, honoring learning, nature, and harmony" as the school motto, and fully implements the undergraduate tutor system,emphasis

equally on the development of moral, intellectual, physical, aesthetics and labor educations.

There is a strong learning atmosphere in classrooms, and all the laboratories are open to undergraduates, encouraging students to carry out scientific research and innovation in their spare time; the College has innovatively carried out the "Green Space" Science and Technology and Culture Festival and the "World Environment Day" and other brand-name student activities, which have further enriched the educational platform of the second classroom and improved the comprehensive quality of the students.

Students have solid professional knowledge, strong innovation abilities and high comprehensive qualities. In recent years, students have won the first and second prizes at the provincial level in the Challenge Cup for college students many times, and have won a number of national competitions such as the National College Students' Energy Saving and Emission Reduction Social Practice and Science and Technology Competition, etc. Several undergraduates have published high-level scientific research papers as the first authors in top SCI journals, and have won the overall champion of the "Garbage Throwing into the Interests - National Youth Public Welfare Practice Competition". Every year, students have won the national, provincial and school-level college student innovation and entrepreneurship training program projects. The completion of the projects lead to registration of a number of start-up companies, as well as the emergence of students such as Yang Chen (Good young people in Hubei Province), and Lan Jirong (national "China Telecom" scholarship recipients).

The employment rate of graduates is high, with over 42.86% of the 2023 graduates going on to graduate school, and many of them have been admitted to famous domestic universities such as Zhejiang University, Wuhan University, Sun Yat-sen University, Huazhong University of Science and Technology, as well as famous foreign universities such as the University of Manchester of the United Kingdom and Seoul National University of South Korea. The employment rate of graduates is stable at about 84.57%, and the employment is mainly distributed in environmental related companies, design and scientific research institutes and other enterprises, as well as the Environmental Protection Bureau, Hydrological Bureau, Bureau of Land and Resources and other civil servants, institutions and departments, and the quality of the training of the students has been praised by the employers, and has gained a good reputation in the society.

专业简介

环境工程专业

本专业以工程教育认证的标准制定了完善的培养目标、培养方案、毕业要求和课程质量管理体系，以学生为中心，以产出为导向，坚持可持续改进的理念，培养学生解决复杂环境工程问题的能力。为毕业生走向世界提供国际统一的“通行证”。

本专业开设环境工程微生物学、环境监测、环境工程原理、水污染控制工程、大气污染控制工程、物理性污染控制工程、固体废弃物的处理与处置、环境规划与管理、环境影响评价等专业基础理论课程。本专业培养符合国家、区域及少数民族经济和社会发展需要，具备良好的思想品德、人文素养、职业道德和敬业精神，系统掌握环境工程专业基础知识和污染控制工程、资源利用及环境修复等方面的理论与实践技能，具备创新意识和持续学习能力，不断适应行业科学与技术进步，能够从事环境污染控制工程的设计及运营、环境管理、环境监测和水土环境保护及修复技术研发等环境保护事业的高级专门人才，成长为扎根地方尤其是民族地区从事环境保护的骨干人才。本科，学制四年，按环境科学与工程大类招生，招收理科生，毕业时若符合学位授予条件，即授予工学学士学位。

Environmental Engineering Program

The department of Environmental Engineering has customized a complete set of training goals, training plans, graduation requirements, and course quality management system based on the standards of China Engineering Education Accreditation. The philosophy is based on student-centered and output-oriented approaches, and adheres to the concept of sustainable improvement. The goal is to train students to acquire the capability to solve complex environmental engineering problems and to provide graduates with an internationally unified "passport" to the world.

The degree offers fundamental environmental engineering courses (theoretical) such as environmental engineering microbiology, environmental monitoring, environmental engineering principles, water pollution control engineering, air pollution control engineering, physical pollution control engineering, solid waste treatment and disposal, environmental planning and management, and environmental impact assessment. The Environmental Engineering program meets the needs of national, regional, and ethnic minorities' economic and social development, it aims to equip students with good ideological morality, humanistic quality, professional ethics and professionalism. Students should systematically masters the basic knowledge of environmental engineering and pollution control

engineering, resource utilization, and environmental restoration. Students possess theoretical and practical skills, innovative consciousness and continuous learning capabilities and be able to constantly adapt to the scientific and technological progress in the environmental engineering and related industries, and engage in environmental protection undertakings such as the design and operation of environmental pollution control projects, environmental management, environmental monitoring, water and soil environmental protection and restoration technology research and development. The trained students with the above professional talents will grow into the backbone talents who have taken root in local areas, especially in ethnic areas. This undergraduate program adapts a four-year curriculum system. Enrollment is based on the major categories of environmental science and engineering for science oriented students. If they meet the degree-granting conditions upon graduation, they will be awarded a bachelor's degree in engineering.

资源循环科学与工程专业

资源循环科学与工程专业是为解决国民经济发展面临的资源短缺和环境污染两大根本问题，于 2010 年经教育部批准设置的新兴交叉学科专业，2011 年被批准为国家首批战略性新兴产业急需特色本科专业。

本专业本着“宽口径、厚基础、重能力、求创新”的人才培养思路，通过组织多种教学活动，形成小班教学、“导师”引领和实践创新三者有机融合的特色人才培养模式。现开设资源加工过程与装备、化工原理、冶金原理、分离工程、固体废物处置与资源化、清洁生产与循环经济、环境工程学、工程测量学、画法几何&工程制图、程序设计语言（Python）等专业基础理论课程。本专业培养符合国家和区域低碳循环经济产业发展战略需求的，具有“资源-产品-再生资源-产品”的资源开发和循环可持续利用理念，具备一次资源加工、二次资源综合利用、清洁生产与循环经济、资源规划与管理等专业基础知识理论，系统掌握从“资源开发-高效利用-循环再生”各环节实现“环境源头保护”的科学方法，同时兼具实践和创新能力的高级专业人才。本科，学制四年，按环境科学与工程大类招生，招收理科生，毕业时若符合学位授予条件，即授予工学学士学位。

The major of Resources Circulation Science and Engineering is an emerging interdisciplinary major, which was set up by the Ministry of Education in 2010 to solve the two fundamental problems of resource shortage and environmental pollution faced by national economic development. In 2011, this major was further approved as the first batch of specialties urgently needed major for the national strategic emerging industries.

The idea of talent cultivation in this major is "broad-caliber, thick foundation, emphasis on ability, and pursuit of innovation". Through a variety of teaching activities, the major has formed a unique talent

cultivation model with the integration of small class teaching, "mentor" leadership and practical innovation. Fundament Resources Circulation Science and Engineering courses (theoretical) such as Resource Processing and Equipment, Chemical Engineering, Metallurgical Engineering, Separation Engineering, Disposal and Reuse of Solid Waste, Recycling Economy and Clean Production, Environmental Engineering, Engineering Surveying, Descriptive Geometry & Engineering Drawing, Resource Microbiology, Programming language (Python)are offered. This major is designed to cultivate professional talents who meet the strategic needs of national and regional low-carbon circular economy industry development, fulfil the concept of the multi-directional resource development, cycling and sustainable utilization of “resources-products-renewable resources-products”, master the professional knowledge of development of natural primary resources, comprehensive utilization of secondary resources, cleaner production and circular economy, and resource recycling planning and management, acquire the ability to solve the science and engineering problems of comprehensive utilization of resources and environmental protection, accomplish the work in the field of resource recycling science and engineering, such as scientific research, engineering technology development, process design, industrial management and management planning, et al. This undergraduate program adapts a four-year curriculum system. Enrollment is based on the major categories of environmental science and engineering for science oriented students. If they meet the degree-granting conditions upon graduation, they will be awarded a bachelor's degree in engineering.

环境科学专业

环境科学是一门研究人类社会发展活动与环境演化规律之间相互作用关系，寻求人类社会与环境协同演化、持续发展途径与方法的学科。

本专业开设环境化学、现代环境分析、环境监测、环境影响评价、环境生态学、环境毒理学、环境微生物学、环境工程学、环境规划与管理等专业课程，注重污染物监测和分析方面的基本训练，培养学生掌握环境监测和环境影响评价的技能。本专业是一门综合研究“人类—环境”系统基本运动规律及其调控的学科，培养掌握环境自然科学、环境技术科学和环境人文社会科学等方面基础知识，具备环境科学的基本理论和基本技能的高级专业人才。学生毕业后，能在政府、企业与事业单位从事环境管理、环境科学研究、环保产品开发、环境监测和环境影响评价、自然资源与自然生态保护和管理规划工作。本科，学制四年，招理科生，毕业时若符合学位授予条件，即授予理学学士学位。

Environmental science is a discipline, seeking the interaction of the development of human society and environmental evolution, and exploring co-evolution of human society and environment as well as

new ways and methods of sustainable development.

The major offers Environmental Chemistry, Modern Environmental Analysis, Environmental Monitoring, Environmental Impact and Assessment, Environmental Ecology, Environmental Toxicology, Environmental Microbiology, Environmental Engineering, Environmental Planning and Management and other fundamental Environmental science courses, focusing on the basic training of pollutant monitoring and analysis, to develop students' skills in environmental monitoring and environmental impact assessment. This major is a comprehensive discipline involving the basic movement laws and regulations of the "human-environment" system, which aims to culture talents with the basic theories and skills of environmental science, mastering the basic knowledge of environmental natural science, environmental technology science and environmental humanity and social sciences. After graduation, students can be engaged in the work of environmental management, environmental scientific research, environmental protection product development, environmental monitoring and environmental impact assessment, natural resources and ecological protection and management planning in government, enterprises and institutions. This undergraduate program adapts a four-year curriculum system. Enrollment is based on the major categories of environmental science and engineering for science oriented students. If they meet the degree-granting conditions upon graduation, they will be awarded a bachelor's degree in science.

水文与水资源工程专业

水文与水资源工程是国民经济基础产业——水利中的重要专业领域之一，是水资源开发利用和管理中的一门重要的工程技术学科。

本专业开设自然地理学、气象学、水力学、水文学原理、水文统计、水文测验、水文预报、水文分析与计算、水利计算、水资源利用、水环境保护、地下水水文学、地理信息系统等课程。本专业培养适应国家经济社会发展需要，德、智、体、美、劳全面发展，具有良好的思想品德、人文素养、职业道德和敬业精神，具备扎实的基础知识，富有创新精神的水文与水资源工程专业高级专门人才。学生毕业后，能够在水利（水务）、国土、能源、交通、城建、农林、环保、地矿等部门从事水文、水资源、水环境及水生态领域的勘测、评价、规划、设计、预测预报、管理和科学研究等方面的工作。本科，学制四年，招理科生，毕业时若符合学位授予条件，即授予工学学士学位。

Hydrology and water resources engineering is one of the important professional fields in water conservancy, which is the basic industry of the national economy, and an important engineering technology discipline in the development, utilization and management of water resources.

This major offers courses in Physical Geography, Meteorology, Hydraulics, Principles of

Hydrology, Hydrological Statistics, Hydrometry, Hydrological Forecasting, Hydrological Analysis and Computation, Water Conservancy Computation, Water Resources Utilization, Protection of Water Environment, Groundwater Hydrology, Geographic Information System and so on. This major is designed to cultivate engineering professionals who meet the needs of economic and social development of the country, region or ethnic minority, have good moral education, humanistic quality, professional ethics and professionalism, solid basic knowledge and innovative spirit. After graduation, students can be engaged in surveying, evaluating, planning, designing, predicting and forecasting, managing and researching in the fields of hydrology, water resources, water environment and hydroecology in the departments of water conservancy (water affairs), land, energy, transportation, urban construction, agriculture and forestry, environmental protection, geology and mineral. This undergraduate program adapts a four-year curriculum system. Enrollment is based on the major categories of environmental science and engineering for science oriented students. If they meet the degree-granting conditions upon graduation, they will be awarded a bachelor's degree in science.

专业大类构成表

Major specialization

大类名称 **Name**	**专业名称** **Major**	**所属专业门类** **Major Categories**	**大类培养时间** **Semester**
环境科学与工程	环境工程	工学-环境科学与工程	第 1 学期至 第 2 学期 Semester 1 to 2
	资源循环科学与工程	工学-化工与制药类	
	环境科学	理学-环境科学与工程	
	水文与水资源工程	工学-水利类	

环境工程专业本科培养方案

Undergraduate Program for Environmental Engineering

一、培养规格

I Education Standards

I）学制

Length of Schooling

修业年限：4 年

Duration:　four-year

II）学位

Degree

授予学位：工学士学位

Degree conferred:　Bachelor of　Engineering

二、培养目标

II Education Objectives

本专业以铸牢中华民族共同体意识为主线，培养符合国家、区域经济和社会发展需要，具备良好的思想品德、人文素养、职业道德和敬业精神，德智体美劳全面发展，系统掌握环境工程专业基础知识和污染控制工程、资源利用及环境修复等方面的理论与实践技能，具备创新意识和持续学习能力，不断适应行业科学与技术进步，能够**从事环境污染控制工程的设计及运营、环境管理、环境监测和水土环境保护及修复技术研发等**环境保护事业的高级专门人才，**成长为扎根地方尤其是民族地区从事环境保护的骨干人才。**

具体培养目标可以归纳为以下四方面内容：

目标 1（知识能力）：能够掌握环境工程专业相关技术在资源与环境保护中的应用与发展现状，融会贯通工程数理基础知识和环境工程专业知识，针对复杂环境工程项目提供整体解决方案。

目标 2（实践能力）：具备系统思维和可持续发展理念，能将知识有效运用到环境污染控制工程的设计及运营、环境管理、环境监测和民族地区水土环境保护及修复技术研发的实践中，并具备一定的创新能力。

目标 3（职业素养）：德智体美劳全面发展，具有社会责任感和职业道德修养，拥有团队精神、有效的沟通、表达能力和工程项目管理能力。

目标 4（发展潜能）：具备较强的获取知识和综合运用知识的能力，能及时了解环境工程

专业最新理论、技术及国际前沿动态，有效地持续自主学习以适应社会和行业的多样性发展。

This program is designed to strengthen the sense of community for the Chinese nation and cultivate high-level professionals who meet the needs of national and regional economic and social development. Graduates will possess strong moral integrity, humanistic literacy, professional ethics, and dedication, along with well-rounded development in moral, intellectual, physical, aesthetic, and labor education. They will systematically master foundational knowledge in environmental engineering and practical skills in pollution control engineering, resource utilization, and environmental remediation. Equipped with innovative thinking and lifelong learning capabilities, they will adapt to technological advancements in the field and contribute to environmental protection through roles in pollution control engineering design and operation, environmental management, environmental monitoring, and the research and development of soil/water conservation and remediation technologies. Graduates will become backbone talents dedicated to environmental protection, particularly in ethnic regions.

Specific objectives are outlined as follows:

Objective 1 (Knowledge Competency):

Graduates will master the application and development of environmental engineering technologies in resource and environmental protection, integrate engineering mathematical-physical principles and environmental engineering expertise, and provide holistic solutions for complex environmental projects.

Objective 2 (Practical Competency):

Graduates will apply systems thinking and sustainable development concepts to practice in pollution control engineering design and operation, environmental management, environmental monitoring, and the R&D of soil/water conservation and remediation technologies in ethnic regions. They will demonstrate innovative capabilities in addressing real-world challenges.

Objective 3 (Professional Integrity):

Graduates will achieve well-rounded development in moral, intellectual, physical, aesthetic, and labor education. They will exhibit social responsibility, professional ethics, teamwork spirit, effective communication and presentation skills, and project management capabilities.

Objective 4 (Developmental Potential):

Graduates will acquire strong knowledge acquisition and integration abilities, stay updated on the latest theories, technologies, and international trends in environmental engineering, and engage in proactive lifelong learning to adapt to the evolving diversity of societal and industrial demands.

三、毕业要求

III Basic Requirements for Graduation

根据我校环境工程专业培养目标的要求，通过人文社会科学课程、工程基础课、专业基础

课、专业课的课堂教学、讲座、社会活动、文化活动、各种竞赛、实践、辅导、座谈等教学环节，使环境工程专业毕业生能力达到如下基本要求：

1.工程知识：能够利用数学、物理、化学等自然科学、计算和工程科学的基本原理及环境工程专业知识来解决环境污染治理工程的设计、运行和管理等复杂环境工程问题。

1.1 基于大数据、AI 思维，能将数学、计算机的知识运用到工程问题的恰当表述之中。

1.2 理解物理、化学等自然科学知识的原理及在识别环境污染问题基本应用。

1.3 能够将工程制图、工程力学、流体力学、环境工程微生物、化工原理等环境工程基础知识应用环境污染治理单元的设计、运行和管理。

1.4 能将水、气、固及物理性污染控制等环境工程专业知识用于环境污染防治工艺的设计、系统的控制和改进中。

2.问题分析：能够利用数学、自然科学和环境工程相关的基础理论和知识以及文献资料对环境污染问题进行识别、表达和分析，综合考虑可持续发展的要求，以获得有效结论。

2.1 能够运用数学、自然科学和环境工程的基本原理和专业知识，识别和判断复杂环境工程问题的关键点和参数。

2.2 能通过数学、自然科学和环境工程专业的概念、原理、方法，分析环境污染防治工程的关键环节和参数，并给予表述。

2.3 综合考虑可持续发展的要求，能够运用环境工程相关的基础理论和知识结合文献分析环境污染防治过程的影响因素及采用相关技术，并获得有效结论。

3.设计/开发解决方案：能够应用水污染控制、大气污染控制及固体废物处理处置与资源化、土壤及地下水修复的基本原理和方法设计、开发满足环境防治要求的污染治理工艺流程与处理单元，并能够在设计中体现创新性，综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素。

3.1 能够根据环境污染的特征和防治要求提出复杂环境工程问题的解决方案。

3.2 能够对所提技术方案及工艺流程的可行性进行初步分析与论证。

3.3 能够进行污染治理工艺系统及处理单元的设计，体现创新性，并在设计中综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素，进而优化设计方案。

4.研究：能够基于科学原理并采用科学方法，开展试验研究，预测、分析环境污染防治技术和工程中的问题，为解决环境污染防治实践中的复杂工程问题提供合理有效的结论；

4.1 掌握现代分析方法，能够识别复杂工程问题中的各种制约条件，分析研究对象的基本特征；

4.2 能够基于环境工程专业理论，根据环境污染对象特征，选择合适的研究路线、设计可行的研究方案；

4.3 能正确采集、整理研究数据，对研究结果进行关联、分析处理，获取合理有效的结论。

5.现代工具的使用：能够针对复杂环境工程问题，开发、选择与使用恰当的环境工程专业

领域相关的计算机辅助设计、计算机模拟仿真等技术、资源和工具，熟练使用现代分析检测仪器，具备预测、模拟及优化环境污染防治实践中的复杂工程问题的能力，并能够理解其局限性；

5.1 能够基于复杂环境工程问题的技术背景，选择、使用和开发恰当的计算机语言程序、计算机辅助设计软件等现代工具；

5.2 能够运用环境工程仿真软件和现代分析检测仪器，预测、模拟和评价复杂环境工程问题，明确各种方法的局限性。

5.3 掌握专业工具，能够进行环境污染防治实践中复杂环境工程问题的工程设计和实施，能理解其局限性。

6.工程与可持续发展：能基于环境工程相关背景知识，在解决复杂工程问题的同时，分析和评价工程实践对健康、安全、环境、法律及经济和社会可持续发展的影响，并理解其承担的责任；

6.1 理解环境工程和社会可持续发展的内涵和意义，熟悉环境工程领域相关的技术规范、法律法规和区域政策，

6.2 能客观评价环境污染防治工程对对健康、安全、环境、法律及经济和社会可持续发展的影响，能理解环境污染防治过程中应承担的责任。

7.工程伦理和职业规范：具有工程报国、为民造福的意识，具有人文社会科学素养和社会责任感，能够在环境工程实践中理解和践行工程伦理，并遵守工程职业道德、规范和相关法律，履行责任；

7.1 具有爱党敬国、敬业奉献和服务人民的意识，具有人文社会科学素养和社会责任感；

7.2 理解工程伦理的核心理念，熟悉环保工程师的职业性质和责任，在工程实践中能自觉遵守职业道德、规范和相关法律，履行责任。

8.个人和团队：具有在科学研究、工程设计与实践的多样化、多学科背景团队中团结互助的合作精神、一定的组织管理协调能力及在工作中对不同角色的适应能力；

8.1 能在多样化、多学科背景下的团队合作中承担自己的角色，听取不同意见，具有一定组织管理能力，能够综合团队成员的建议，并进行合理决策；

8.2 具有较强的团队协作和人际交往能力，能同其他成员进行有效交流，并妥善处理组织内外关系。

9.沟通：具备良好的文字及语言表达能力、辩论能力、倾听能力、外语应用能力，并能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。注重与民众的沟通，尤其是在民族地区民汉之间的顺畅沟通与交流，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；

9.1 具备良好的文字及语言表达能力、辩论能力、倾听能力；

9.2 能够通过口头或者图纸、报告等书面形式表达自己的想法和见解，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；

9.3 能够掌握环境工程专业及相关领域的发展动态，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。

10.项目管理：能够理解和掌握工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用；

10.1 理解和掌握环境工程实践活动中涉及的工程管理原理与经济决策方法；

10.2 能够在多学科环境中应用工程管理的原理和经济决策的方法。

11.终身学习：具有自主学习、终身学习和批判性思维的意识和能力，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；

11.1 能认识不断探索和学习的必要性，具有自主学习、终身学习和批判性思维的意识和能力；

11.2 掌握自主学习的方法和拓展知识、提高能力的途径，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。

Based on the training objectives of our university’s Environmental Engineering program, graduates will acquire the following competencies through comprehensive teaching approaches, including humanities and social sciences courses, engineering fundamentals, specialized core courses, lectures, social and cultural activities, competitions, practical training, counseling, and seminars:

1. Engineering Knowledge

Ability to apply principles of mathematics, physics, chemistry, computational sciences, engineering sciences, and environmental engineering expertise to address complex environmental engineering challenges in the design, operation, and management of pollution control systems.

1.1 Apply big data and AI-oriented thinking to integrate mathematical and computational knowledge into the accurate formulation of engineering problems.

1.2 Understand principles of natural sciences (e.g., physics, chemistry) and their fundamental applications in identifying environmental pollution issues.

1.3 Utilize foundational environmental engineering knowledge (e.g., engineering graphics, engineering mechanics, fluid mechanics, environmental microbiology, chemical engineering principles) in the design, operation, and management of pollution control units.

1.4 Apply specialized knowledge in water, air, solid waste, and physical pollution control to the design, optimization, and improvement of environmental protection systems.

2. Problem Analysis

Ability to identify, formulate, and analyze environmental pollution issues using mathematical, natural science, and environmental engineering theories, literature, and sustainable development principles to derive effective conclusions.

2.1 Identify and evaluate critical parameters of complex environmental engineering problems using principles from mathematics, natural sciences, and environmental engineering.

2.2 Analyze key components and parameters of pollution control systems through conceptual, theoretical, and methodological frameworks of environmental engineering.

2.3 Synthesize sustainable development requirements and literature research to assess influencing factors and technologies in pollution control processes, leading to valid conclusions.

3. Design/Development of Solutions

Ability to design and innovate pollution control processes (e.g., water, air, solid waste treatment, soil/groundwater remediation) that meet environmental standards, while integrating health, safety, environmental sustainability, life cycle cost, net-zero carbon requirements, legal/ethical norms, and socio-cultural considerations.

3.1 Propose solutions for complex environmental engineering problems based on pollution characteristics and control requirements.

3.2 Conduct preliminary feasibility assessments of technical solutions and process flows.

3.3 Design innovative pollution control systems and units, optimizing plans by integrating health, safety, environmental sustainability, legal/ethical, and socio-cultural factors.

4. Research

Ability to conduct experimental studies, predict and analyze challenges in environmental technologies and projects, and provide evidence-based conclusions for practical applications.

4.1 Apply modern analytical methods to identify constraints and characterize research subjects.

4.2 Design research methodologies and feasible plans based on environmental engineering theories and pollution characteristics.

4.3 Collect, organize, and analyze data to derive valid conclusions.

5. Use of Modern Tools

Ability to select, develop, and apply advanced tools (e.g., CAD, simulation software, analytical instruments) to predict, simulate, and optimize complex environmental engineering problems, while understanding their limitations.

5.1 Employ programming languages, CAD software, and other modern tools tailored to technical contexts.

5.2 Utilize simulation software and analytical instruments to evaluate complex problems and recognize

methodological limitations.

5.3 Implement professional tools in engineering design and execution, acknowledging their constraints.

6. Engineering and Sustainable Development

Ability to analyze and evaluate the impacts of engineering practices on health, safety, environment, law, economy, and societal sustainability, while understanding professional responsibilities.

6.1 Comprehend the significance of sustainable development and relevant technical standards, laws, and regional policies.

6.2 Objectively assess the impacts of pollution control projects on sustainability and recognize ethical responsibilities.

7. Engineering Ethics and Professionalism

Commitment to national development, public welfare, and social responsibility; adherence to ethical norms, professional codes, and legal standards in environmental engineering practice.

7.1 Demonstrate patriotism, dedication, and commitment to serving the people, with a strong sense of social responsibility.

7.2 Uphold core principles of engineering ethics, comply with professional standards and laws, and fulfill responsibilities.

8. Individual and Teamwork

Ability to collaborate in multidisciplinary teams, adapt to diverse roles, and demonstrate organizational and interpersonal skills.

8.1 Contribute effectively in team settings, synthesize member input, and make informed decisions.

8.2 Communicate and collaborate proficiently, managing internal and external organizational relationships.

9. Communication

Proficiency in written, oral, and cross-cultural communication to engage with peers and the public on complex engineering issues, emphasizing inclusivity in multicultural and ethnic contexts.

9.1 Demonstrate strong writing, speaking, and listening skills.

9.2 Convey ideas via reports, presentations, and technical documents to diverse audiences.

9.3 Communicate across cultures, respecting linguistic and cultural differences.

10. Project Management

Ability to apply engineering management principles and economic decision-making methods in

multidisciplinary environments.

10.1 Master project management and economic decision-making frameworks in environmental engineering.

10.2 Implement these principles in multidisciplinary contexts.

11. Lifelong Learning

Commitment to self-directed learning, critical thinking, and adaptability to technological advancements and societal changes.

11.1 Recognize the necessity of continuous learning and cultivate self-driven, lifelong learning capabilities.

11.2 Develop strategies to expand knowledge, adapt to technological shifts, and understand their societal impacts.

四、毕业要求与培养目标对应矩阵

IV **Matrices of Graduation Requirements and Education Objectives**

本专业的毕业要求能够实现对本专业培养目标的完全支撑，具体的支撑关系矩阵如表 2 所示。

表 2 毕业要求对培养目标的支撑

毕业要求 / 培养目标	（1）工程知识	（2）问题分析	（3）设计/开发解决方案	（4）研究	（5）使用现代工具	（6）工程与可持续发展	（7）工程伦理与职业规范	（8）个人与团队	（9）沟通	（10）项目管理	（11）终身学习	支撑关系分析说明
培养目标 1	√	√	√	√	√					√		**毕业要求 1** 关于能够将工程和专业基础知识运用到解决复杂环境工程问题；**毕业要求 2** 能够利用数学、自然科学和环境工程相关的基础理论和知识以及文献资料对环境污染问题进行识别、表达和分析，综合考虑可持续发展的要求，以获得有效结论；**毕业要求 3** 能够应用水污染控制、大气污染控制及固体废物处理处置与资源化、土壤及地下水修复的基本原理和方法设计、开发满足环境防治要求的污染治理工艺流程与处理单元，并能够在设计中体现创新性，综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素；**毕业要求 4** 能够基于环境工程原理并采用科学方法，开展试验研究，预测、分析环境污染防治技术和工程中的问题；**毕业要求 5** 能够针对复杂环境工程问题，开发、选择与使用恰当得环境工程领域相关的计算机辅助设计等技术和工具，熟练使用现代分析检测仪器；**毕业要求 10** 能够理解和掌握工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用。
培养目标 2	√	√	√	√	√	√						**毕业要求 1** 关于能够将工程和专业基础知识运用到解决复杂环境工程问题；**毕业要求 2** 能够利用数学、自然科学和环境工程相关的基础理论和知识以及文献资料对环境污染问题进行识别、表达和分析，综合考虑可持续发展的要求，以获得有效结论；**毕业要求 3** 能够应用水污染控制、大气污染控制及固体废物处理处置与资源化、土壤及地下水修复的基本原理和方法设计、开发满足环境防治要求的污染治理工艺流程与处理单元，并能够在设计中体现创新性，综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素；**毕业要求 4** 能够基于环境工程原理并采用科学方法，开展试验研究，预测、分析环境污染防治技术和工程中的问题；**毕业要求 5** 能够针对复杂环境工程问题，开发、选择与使用恰当得环境工程领域相关的计算机辅助设计等技术和工具，熟练使用现代分析检测仪器；**毕业要求 6** 能基于环境工程相关背景知识，在解决复杂工程问题的同时，分析和评价工程实践对健康、安全、环境、法律及经济和社会可持续发展的影响，并理解其承担的责任。
培养目标 3						√	√	√	√	√		**毕业要求 6** 能基于环境工程相关背景知识，在解决复杂工程问题的同时，分析和评价工程实践对健康、安全、环境、法律及经济和社会可持续发展的影响，并理解其承担的责任；**毕业要求 7** 具有工程报国、为民造福的意识，具有人文社会科学素养和社会责任感，能够在环境工程实践中理解和践行工程伦理，并遵守工程职业道德、规范和相关法律，履行责任；**毕业要求 8** 具有在科学研究、工程设计与实践的多样化、多学科背景团队中团结互助的合作精神、一定的组织管理协调能力及在工作中对不同角色的适应能力；**毕业要求 9** 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，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；。**毕业要求 10** 能够理解和掌握工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用。
培养目标 4											√	**毕业要求 11** 具有自主学习、终身学习和批判性思维的意识和能力，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。

五、毕业要求实现矩阵

V Matrices of relations of courses and Graduation Requirements

表 3 课程体系与毕业要求关联度矩阵

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
思想道德与法治																		H		H										
形势与政策																		H		H										
中国近现代史纲要																			H	H										
马克思主义基本原理																			H	H										
毛泽东思想和中国特色社会主义理论体系概论																			H	H										
习近平新时代中国特色社会主义思想概论																			H	H									H	
创业教育与就业指导																				M			H							
英语																										H				
人工智能与 Python 程序设计															H															

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
分析化学			H				H																							
分析化学实验												H																		
无机化学			M			H																								
无机化学实验												H																		
有机化学			M			H																								
有机化学实验												H																		
物理化学			H			H																								
物理化学实验												H																		
现代环境分析			H				H																							
现代环境分析实验												H				H														
大学物理			H																											
大学物理实验												H																		
高等数学		H																												
线性代数		M																												
概率论与数理统计		M																												
画法几何&工程				H											L															

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
制图																														
工程测量学				H		M																								
工程测量学实习						M																	H							
环境工程 CAD				M											H															
环境工程微生物学				H		H																								
环境工程微生物学实验												H	L																	
流体力学				H			M																							
流体力学实验												H		L																
工程力学				H			L																							
电子电工学				H																										
电子电工学实验				M																										
土建工程基础							H														M									
工程项目管理																						M					H	H		
环境保护法规											H							H												
环境监测						H	M						M																	

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
环境监测实验												H				H														
环境工程原理				H			H																							
大气污染控制工程					H			H	H																					
物理性污染控制工程					H			M	M																					
水污染控制工程（A1）					H																						H	H		
水污染控制工程（A2）					H			H	H																					
环境工程概预算																			L									H		
固体废物处理与处置					H			H	H																					
大气污染控制工程实验													M	H																
水污染控制工程实验													H	H																
固体废物处理													M	H																

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
与处置实验																														
环境工程原理实验												H				H														
环境工程综合实验																						H							M	H
大气污染控制工程课程设计										H														H						
水污染控制工程课程设计										H														H				H		
环境工程原理课程设计										H														H						
固体废物处理与处置课程设计										H														H			M			
环境规划与管理										H									H											
环境工程专业英语																										H				M
土壤及地下水污染修复					H			L	L																					

毕业要求	一级	1)工程知识				2）问题分析			3）设计/开发解决方案			4）研究			5）现代工具使用			6）工程与可持续发展		7）工程伦理与职业规范		8）个人和团队		9）沟通			10）项目管理		11）终身学习	
	二级	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
环境工程设备											H																			
废水处理工程设计											H														H					
环境影响评价																			H											
军事理论与训练																							H							
工程训练																	H													
认识实习																		H							M					
生产实习																		H			H				H					
毕业实习																					H				H					H
毕业设计（论文）											H		H	H								H		H		H				H

六、核心课程

VI Core Courses

环境工程微生物学 Microbiology of Environmental Engineering、环境监测（B）Environmental Monitoring（B）、环境工程原理 Environmental Engineering Principle、物理性污染控制工程 Physical Pollution Control Engineering、大气污染控制工程 Air Pollution Control Engineering、水污染控制工程（A1）Water Pollution Control Project (A1)、环境规划与管理 Environmental Planning and Management、水污染控制工程（A2）Water Pollution Control Project (A2)、固体废物处理与处置 Solid Waste Treatment and Disposal、环境影响评价 Environmental Impact Assessment、土壤及地下水污染修复 Remediation of Soil and Groundwater Pollution.

七、主要实践性教学环节

VII Main Internship and Practical Training

环境工程原理实验 Principle Experiments of Environmental Engineering、环境监测实验 Experiments of Environmental Monitoring、环境工程微生物学实验 Experiments of Environmental Engineering Microbiology、水污染控制工程实验 Experiments of Water Pollution Control Engineering、固体废物处理与处置实验 Experiments of Solid Waste Treatment and Disposal、环境工程综合实验 Comprehensive Experiments of Environmental Engineering、环境工程原理课程设计 Course Design of Environmental Engineering Principles、大气污染控制工程课程设计 Course Design of Air Pollution Control Engineering、水污染控制工程课程设计 Course Design of Water Pollution Control Engineering、固体废物处理与处置课程设计 Course Design of Treatment and Disposal of Solid Wastes、工程测量学实习 Engineering Surveying Practice、工程训练 Metalworking Practice、认识实习 Cognition Practice、生产实习 Production Practice、毕业实习 Graduation Practice、毕业设计（论文）Graduation Design (Thesis).

八、学时与学分

VIII Hours/Credits

学时学分构成表

Table of Hours and Credits

<table>
<tr><th colspan="3" rowspan="2">课程类别
Courses Classified</th><th rowspan="2">学时/周数
Period/Weeks</th><th colspan="2">学分
Credits</th><th rowspan="2">学分比例
Proportion of Credits</th></tr>
<tr><th>理论
Theory</th><th>实践（双创）
Practice
（I&E Crs.)</th></tr>
<tr><td colspan="2" rowspan="2">通识课程平台
General Courses Platform</td><td>必修
Compulsory</td><td>546</td><td>26</td><td>3</td><td>18.13%</td></tr>
<tr><td>选修
Elective</td><td>112</td><td>7</td><td>（含创业 2）</td><td>4.37%</td></tr>
<tr><td colspan="2">学科基础课程平台 Basic Courses Platform</td><td>必修
Compulsory</td><td>1040</td><td>44.5</td><td>10</td><td>34.06%</td></tr>
<tr><td colspan="2" rowspan="2">专业课程平台
Major Courses Platform</td><td>必修
Compulsory</td><td>608</td><td>26</td><td>6</td><td>20.00%</td></tr>
<tr><td>选修
Elective</td><td>96</td><td>6</td><td></td><td>3.75%</td></tr>
<tr><td colspan="2" rowspan="2">集中性实践课程平台
Practical Teaching Platform</td><td>必修
Compulsory</td><td></td><td></td><td>23.5</td><td rowspan="2">14.69%</td></tr>
<tr><td>选修
Elective</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">素质拓展平台
Quality Development Platform</td><td>双创学分
Innovation& Entrepreneurship Credits</td><td rowspan="2">必修
Compulsory</td><td></td><td></td><td>2</td><td>1.25%</td></tr>
<tr><td>其他学分
Other Credits</td><td></td><td>5</td><td>1</td><td>3.75%</td></tr>
<tr><td rowspan="2">小计
Amount</td><td colspan="2">必修学分总数
Compulsory Credits</td><td>147</td><td>选修学分总数
Elective Credits</td><td>13</td><td>选修学分比例
Proportion of Elective Credits</td><td>8.13%</td></tr>
<tr><td colspan="2">理论学分总数
Theory Credits</td><td>117.5</td><td>实践学分总数
Practice Credits</td><td>42.5</td><td>实践教学环节比例
Proportion of Internship and Practical Training</td><td>26.56%</td></tr>
<tr><td colspan="3">最低毕业学分
The Lowest Graduate Credits</td><td colspan="5">160</td></tr>
</table>

注：

①学分比例：各教学平台或教学环节占最低毕业学分的比例。

②实践教学环节，包括集中性实践教学环节和实验教学（不含体育）。集中性实践教学环节，包括培养方案内集中实施的实践、实习、课程设计、毕业设计、毕业论文、社会调查等；实验教学，包括课内实验和独立开设实验。

③必修学分总数=通必学分+学科基础学分+专必学分+实践必修学分+素质拓展学分；

选修学分总数=通选学分+专选学分+实践（选修）学分；

理论学分总数=所有平台理论学分之和（不包括双创学分）；

实践学分总数=所有平台实践学分之和（不包括双创学分）；

最低毕业学分=必修学分+选修学分=理论学分+实践学分+双创学分。

九、教学进程计划表 /IX Teaching Schedule Form

表一：通识课程平台 / Form I: General Course Platform

表一（A）：通识必修课程/Form I (A):General Compulsory Courses (General Required)

课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
20W100000613	英语 1 English 1	2	32	32				1	
218110000313	体育 1 Physical Education 1	0/1	26			26		1	
217100014918	思想道德与法治 Moral Education and Rule of Law	2.5/0.5	52	40		12		2	
217100015218	形势与政策 Situation and Policy	2	32	32				2	
225100000118	中华民族共同体概论 Education of Chinese Minzu Community Consciousness	1.5/ 0.5	36	24		12		2	
20W100000713	英语 2 English 2	2	32	32				2	
218110000213	体育 2 Physical Education 2	0/1	32			32		2	
2171000122	中国近现代史纲要 Essentials of China Modern and Contemporary History	2.5/ 0.5	52	40		12		1	
218110015018	体育 3 Physical Education 3	0/0.5	16			16		3	
217100012318	马克思主义基本原理 The Basic Principles of Maxism	2.5/0.5	52	40		12		4	
218110014718	体育 4 Physical Education 4	0/0.5	16			16		4	
20W100001018	学术英语阅读与写作 Academic English Reading and Writing	2	32	32				3/4	6门课程，要求在第3或4学期完成2学分
20W100001318	高级媒体英语视听说 Advanced Media English: viewing, listening and speaking	2	32	32				3/4	
20W100001518	英语国家社会与文化 Society and Culture ofEnglish-speaking Countries	2	32	32				3/4	
20W100001618	中华文化导论（英文） Intoduction to Chinese Culture	2	32	32				3/4	
20w100002623	跨文化交际 Intercultural Communication	2	32	32				3/4	
20W100002523	中外文化比较 Comparison of Chinese and Foreign Cultures	2	32	32				3/4	

217100015818	毛泽东思想和中国特色社会主义理论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics	2.5/0.5	52	40		12		3	
217100015918	习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	2.5/0.5	52	40		12		5	
218110014018	体育 5 Physical Education 3	0/0.5	16			16		5	
218110015318	体育 6 Physical Education 3	0/0.5	16			16		6	
学分要求：必修学分 29 Demand of Credits: Required 29									

注：大学英语扩展课程包括学术英语阅读与写作、高级媒体英语视听说、英语国家社会与文化、中华文化导论（英文）、跨文化交际（英文）、中外文化比较，要求在第 3,4 学期完成 2 学分即可。。

表一（B）：通识选修课程（通选课）/Form I (B): General Elective Courses

模块 Module	**学分 Crs.**
心理健康与安全 Psychological Health and Safety	7 **注：** 1. 必修心理健康教育、大学生生命与财物防护实务和美育相关课程 2. 理工科专业学生必修文科类课程 1 门
人文素养与写作 Humanistic Accomplishment and Writing	
科学技术与工程 Science and Technology & Engineering	
艺术体验与审美 Art Appreciation and Aesthetics	
国际视野与世界 Contemporary China and the World	
中华文化与文明 Chinese Culture and Civilization	
创业素养与实践	

表二：学科基础课程平台

Form II. Basic Course Platform

课程类别 Course Classi-fied	课程编号 Courses Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学科基础必修 Basic Courses Required	213100035618	无机化学（B）Z Inorganic Chemistry	3	48	48				1	
	213110035818	无机化学实验（C） Inorganic Chemistry Experiments	/0.5	16		16			1	
	2101000113	高等数学 A(1) Higher Mathematics A (1)	4	80	64			16	1	
	2101000118	线性代数 Linear Algebra	2	48	32			16	1	
	213103005213	分析化学(B) Analytical Chemistry (B)	2	32	32				1	
	213110036418	分析化学实验（B） Analytical Chemistry Experiments	1	32		32			1	
	209100064918	人工智能与 Python 程序设计 Artificial Intelligence and Python Programming	2.5	56	24		32		1	人工智能类课程
	210100025623	高等数学 A(2) Higher Mathematics A (2)	4.5	96	72			24	2	
	211100011318	大学物理 C College Physics C	3	56	48			8	2	
	211110021318	大学物理实验(1) University Physics (1) Experiments	0.5	16		16			2	
	2241000067	工程测量学 Engineering Surveying	2	32	32				2	
	2101000112	概率论与数理统计 Probability Theory and Mathematical Statistics	2.5	56	40			16	3	
	213100047518	有机化学(D) Organic Chemistry(D)	2	32	32				3	
	213110036118	有机化学实验(B) Organic Chemistry Experiments (B)	1	32		32			3	
	213100047118	物理化学(C) Physical chemistry (C)	2.5	40	40				3	

课程类别 Course Classi-fied	课程编号 Courses Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	213110034618	物理化学实验 Physical Chemistry Experiments	1	32		32			3	
	224100000913	画法几何&工程制图 Descriptive Geometry & Engineering Drawing	2	32	32				3	
	212100018318	电子电工学 Electronic Engineering	2.0	32	32				3	
	2241100071	电子电工学实验 Electronics and Electrotechnics Experiments	0.5	16		16			3	
	2241000133	环境工程微生物学 Microbiology of Environmental Engineering	2	32	32				3	
	2241100132	环境工程微生物学实验 Environmental Engineering Microbiology Experiments	0.5	16		16			3	
	2241000073	现代环境分析 Modern Environmental analysis	2	32	32				4	
	2241100074	现代环境分析实验 Modern Environmental Analysis Experiments	1	32		32			4	
	213103016813	流体力学 Fluid Mechanics	3.0	48	48				4	
	213113016913	流体力学实验 Experiments of Fluid Mechanics	0.5	16		16			4	
	224100021518	工程力学 Engineering Mechanics	2.0	32	32				4	
	224100025218	土建工程基础 Foundation of Civil Engineering	1.5	24	24				4	
	213103012113	工程项目管理 Project Management	1.5	24	24				4	
	224110023218	环境工程 CAD 实验 Environmental Engineering CAD	2.0	64		64			4	

课程类别 Course Classi-fied	课程编号 Courses Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学分要求：必修学分 54.5 Demand of Credits:Required 54.5										

表三：专业课程平台

Form III: Major Courses Platform

课程类别 Course Classi-fied	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
专业必修 Required Courses	224100027423	环境工程原理 Environmental Engineering Principle	3.5	56	56				5	
	213113016213	环境工程原理实验 Principle Experiments of Environmental Engineering	1	32		32			5	
	213103011313	大气污染控制工程 Air Pollution Control Engineering	3	48	48				5	
	2241100127	大气污染控制工程实验 Experiments of Air Pollution Control Engineering	0.5	16		16			5	
	213103021513	环境监测（B） Environmental Monitoring (B)	2	32	32				5	
	213113023813	环境监测实验（B） Environmental Monitoring Experiments (B)	1	32		32			5	
	2241000124	物理性污染控制工程 Physical Pollution Control Engineering	2	32	32				5	
	224100023018	环境规划与管理 Environmental Planning and Management	1.5	24	24				5	铸牢中华民族共同体意识课程
	213103018313	水污染控制工程（A1） Water Pollution Control Project (A1)	2.0	32	32				5	
	224100027523	水污染控制工程（A2） Water Pollution Control Project (A2)	3.0	48	48				6	
	214113019613	水污染控制工程实验 Water Pollution Control Engineering Experiments	1	32		32			6	
	224100021818	废水处理工程设计 Wastewater Treatment Engineering Design	1.5	24	24				6	
	224100021918	环境工程设备 Environmental Engineering Equipment	1.5	24	24				6	

课程类别 Course Classi-fied	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	224100022318	环境影响评价 Environmental Impact Assessment	1.5	24	24				6	
	2241000137	固体废物处理与处置 Solid Waste Treatment and Disposal	2.5	40	40				6	
	2241100136	固体废物处理与处置实验 Solid Waste Treatment and Disposal Experiments	0.5	16		16			6	
	213113018513	环境工程综合实验 Comprehensive Experiments of Environmental Engineering	2	64		64			6	
	2241000077	土壤及地下水污染修复 Remediation of Soil and Groundwater Pollution	2	32	32				6	
专业选修 Elective courses	2241000075	环境工程专业英语 English for Environmental Engineering	1.5	24	24				6（限选）	至少修读 6.0 学分，第 4 学期修 1.5 学分。《环境保护法规》《环境生态学（B）》课程为铸牢中华民族共同体意识课程；《人工智能在资源环境中的应用》《环境大数据》《智慧
	224100024718	土壤学 pedology	1.5	24	24				3	
	224100022718	环境保护法规 Environmental Protection Regulations	1.5	24	24				4（限选）	
	2241000131	环境工程概预算 Budget Estimates For Environmental Engineering	1.5	24	24				6（限选）	
	224100024218	清洁生产 Cleaner Production	1.5	24	24				6	
	213103018913	污染控制微生物工程 Microbial Engineering for Pollution Control	1.5	24	24				6	
	213103023613	高级氧化技术 Advanced oxidation technology	1.5	24	24				6	
	213103020613	给排水与环境工程施工 Water Supply and Drainage and Environmental Engineering Construction	1.5	24	24				7	
	213103021013	给水处理 Treatment of Water Supply	1.5	24	24				7	
	213103014513	水化学（B） Hydrochemistry	1.5	24	24				7	

课程类别 Course Classi-fied	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	213103021413	生态水文学 Ecohydrology	1.5	24	24				7	环保与可持续发展》课程为人工智能类课程
	224100017418	环境生态学（B） Environmental Ecology (B)	1.5	24	24				7	
	213103008413	GIS 与环境模型 GIS and Environmental Modelling	1.5	24	24				7	
	224100022118	文献检索及科技论文写作 Document Retrieval and Scientific Paper Writing	0.5/0.5	24	8	16			7	
	224100028623	环境大数据 Environmental Big Data	1.5	24	24				7	
	224100028523	智慧环保与可持续发展 Smart Environmental Protection and Sustainable Development	1.5	24	24				7	
	224100027923	人工智能在资源环境中的应用 Applications of Artificial Intelligence in the Resource Environment	1	16	16				7	

表四：集中性实践课程平台

Form IV: Practical Teaching Platform

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Names	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 PeriodClassified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实践 Practice	实践 Teaching Practice	必修 Compulsory Courses	112110010718	劳动教育 Labor Education	1	36	√		1
			109110000318	军事技能训练 Military Skill Training	2	36	√		1
	课程设计 Project Design	必修 Compulsory Course	224110018718	环境工程原理课程设计 Course Design of Environmental Engineering Principles	1	1W	√		5
			224110018618	大气污染控制工程课程设计 Course Design of Air Pollution Control Engineering	1	1W	√		5
			224110019018	固体废物处理与处置课程设计 Course Design of Treatment and Disposal of Solid Wastes	1	1W	√		6
			224110019318	水污染控制工程课程设计 Course Design of Water Pollution Control Engineering	1	1W	√		6
	小计 Amount		7						
实习 internship	专业实习 Course internship	必修 Compulsory Course	2241100080	工程测量学实习 Engineering Surveying Practice	0.5	0.5W		√	2
			701110000118	工程训练 A Engineering Training	1	1W		√	5
			224110006213	认识实习 Cognition Practice	1	1W		√	4
			224110019218	生产实习 Production Practice	2	2W			7
		选修 Elective Courses							
	毕业实习 Graduation Practice		2241100134	毕业实习 Graduation Practice	2	2W			8

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Names	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 PeriodClassified		开课学期 Semester
							实践 Exp.	实习 Pra.	
	毕业论文（设计） Graduation Thesis (Project)	必修 Compulsory Course	224110000113	毕业设计（论文） Graduation Project（Thesis）	10	10W			8
	小计 Amount								
学分要求: 23.5，其中必修学分 23.5，选修学分 0 Demand of Credits: 23.5, Required23.5, Elective 0									

表五：素质拓展平台

Form V: Quality Development Platform

课程编号 Course Code	课程/模块名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
109100000418	军事理论 Military Theory	2	36	36				1
109100000818	国家安全教育 National Security Education	1	16	16				2
	美育实践	1	24			24		1-7
/	创新教育 Innovation Education	2	/					
115100000213	大学生职业生涯与发展规划 Career and Development Planning of University Students	1	16					1
115100000113	就业指导 Employment Guidance	1	16	16				6
学分要求：必修学分 8 **Demand of Credits: Required 8**								

执笔人:　　审核人:

学院盖章:　　完成日期:

资源循环科学与工程专业本科人才培养方案

Undergraduate Program for Resources Circulation Science and Engineering

一、培养规格

Ⅰ Cultivation Standards

I）学制

Length of Schooling

修业年限：4 年

Duration:　4years

II）学位

Degree

授予学位：工学学士学位

Degrees conferred:　Bachelor of Engineering

二、培养目标

Ⅱ Education Objectives

本专业以立德树人为根本任务，以铸牢中华民族共同体意识为主线，以服务区域经济社会发展为导向，面向“双碳”目标与循环经济国家战略，培养具有扎实的资源循环科学与工程的理论和实践基础，具备“资源-产品-再生资源-产品”的多向式资源开发和循环可持续利用理念，掌握一次资源开发、二次资源综合利用、清洁生产与循环经济、资源循环规划与管理等专业基础知识体系，具有解决“城市矿产”等二次资源综合利用和环境保护的科学与工程的能力，能在资源循环科学与工程领域从事科学研究、工程技术开发、工艺设计、产业经营和管理规划等工作的跨学科高级工程技术及管理人才。毕业生能在政府部门、规划管理部门、设计单位、化工企业、矿冶企业、环保企业、科研院所和学校等，从事资源循环科学与工程领域管理、规划、设计、工程建设、产业经营、制造、研发和教育等工作，也可以选择国内外相近学科的科研机构或高校继续深造。具体需达到以下目标：

目标 1（知识能力）：能够掌握资源循环科学与工程专业相关技术发展现状，融会贯通数理化基础知识、人工智能和资源循环科学与工程专业知识，具备独立发现、研究与解决复杂工程问题的能力。

目标 2（实践能力）：具备系统思维和可持续发展理念，能将知识有效运用到一次资源开发、“城市矿产”等二次资源综合利用、清洁生产与循环经济、资源循环规划与管理等相关工程实践中，并具备一定的创新能力。

目标 3（职业素养）：德智体美劳全面发展，具备家国情怀、正确民族观、高尚职业道德、高度社会责任感和良好人文科学素养，具有与主管部门、业界同行、相关专业的配合和协调能力，具有一定的国际视野和文化交流能力。

目标 4（发展潜能）：具有终身学习和批判性思维能力，能及时了解资源循环科学与工程专业最新理论、技术及国际前沿动态，有效持续自主学习，以适应社会和行业的多样性发展。

This program is rooted in the fundamental mission of fostering virtue and nurturing talent, guided by the imperative to strengthen the sense of community for the Chinese nation, and oriented toward serving regional economic and social development. Aligned with the national "Dual Carbon" goals and circular economy strategy, it aims to cultivate interdisciplinary senior engineering and management professionals equipped with a solid theoretical and practical foundation in Resource Recycling Science and Engineering. Graduates will develop a multi-directional concept of resource development and circular sustainable utilization ("resource-product-renewable resource-product"), master professional knowledge systems including primary resource development, comprehensive utilization of secondary resources, clean production and circular economy, and resource recycling planning and management. They will acquire the scientific and engineering capabilities to address challenges such as comprehensive utilization of "urban minerals" (secondary resources) and environmental protection. Graduates will be prepared to engage in scientific research, engineering technology development, process design, industrial operations, and management planning within the field of resource recycling science and engineering. Career opportunities span government agencies, planning authorities, design institutes, chemical enterprises, mining/metallurgical companies, environmental protection firms, research institutions, and educational organizations, where they may undertake roles in management, planning, design, engineering construction, industrial operations, manufacturing, R&D, and education. Graduates may also pursue advanced studies in related disciplines at domestic or international research institutions or universities. Specific program objectives include:

Objective 1 (Knowledge Competency):

Graduates will master the current technological advancements in Resource Recycling Science and Engineering, integrate and apply foundational knowledge in mathematics, physics, chemistry, artificial intelligence, and specialized expertise in resource recycling. They will demonstrate the ability to independently identify, research, and resolve complex engineering challenges.

Objective 2 (Practical Competency):

Graduates will possess systems thinking and a sustainable development mindset. They will effectively apply their knowledge to engineering practices such as primary resource development, comprehensive utilization of secondary resources (e.g., "urban minerals"), clean production and circular economy, and resource recycling planning and management. They will also exhibit innovative capabilities in these fields.

Objective 3 (Professional Integrity):

Graduates will achieve well-rounded development in moral, intellectual, physical, aesthetic, and labor education. They will embody patriotism, social commitment, proper ethnic perspectives, high professional ethics, a strong sense of social responsibility, and sound humanistic and scientific literacy. They will demonstrate coordination and collaboration skills with regulatory authorities,

industry peers, and interdisciplinary teams, along with an international perspective and cross-cultural communication skills.

Objective 4 (Developmental Potential):

Graduates will cultivate lifelong learning and critical thinking abilities. They will stay abreast of the latest theories, technologies, and international frontiers in Resource Recycling Science and Engineering, engage in continuous self-directed learning, and adapt to the diverse developmental demands of society and industry.

三、毕业要求

Ⅲ Basic requirements for Cultivation

本专业学生学习数学、自然科学、人工智能、资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等方面的基本理论和专业知识，进行应用基础研究和技术开发方面的科学思维和实验训练，掌握工程测量、设计、实验和测试等方面的实践技能，能够运用数学、自然科学、人工智能、资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等相关基础理论和基本技能，分析解决本专业及相关领域实际工程问题，具有从事本专业及相关领域科学研究和规划管理的基本能力。

毕业生应获得以下几方面的知识、能力和素养：

1. 工程知识：能够将数学、自然科学、人工智能、工程基础知识，资源加工、“城市矿产” 等二次资源再生循环、化工、冶金、遥感和地理信息系统等专业知识用于解决复杂工程问题。

1.1 掌握数学、自然科学、人工智能、遥感、地理信息系统、工程基础知识与基本方法，并能应用于表述复杂工程问题。

1.2 能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关复杂工程问题，构建恰当的数学模型，并进行求解。

1.3 能够将相关知识和数学方法用于资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等专业相关复杂工程问题解决方案的比较和综合。

2. 问题分析：能够应用数学、自然科学、工程科学、遥感和地理信息系统等的基本原理，识别、表达、并通过文献研究分析资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题，综合考虑可持续发展的要求，以获得有效结论。

2.1 能够应用数学、自然科学和工程科学的基本原理，识别和表达资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关的复杂工程问题。

2.2 能够通过文献研究，对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关的复杂工程问题进行分析，综合考虑可持续发展的要求，获得有效结论。

3. 设计/开发解决方案：能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关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。

3.1 能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题设计和开发解决方案，掌握设计方法和技术。

3.2 能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题，进行具体的工程设计，并能够在设计环节中体现创新意识。

3.3 能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题，在具体的工程设计中，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。

4. 研究：能够基于科学原理并采用科学方法，对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关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 能够基于科学原理，通过调研和分析，确定资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关复杂工程问题的研究路线和实验方案。

4.2 能够根据设计的实验方案，安全地开展实验研究，正确采集、收集和测量数据。

4.3 能够对实验结果进行分析和解释，通过信息综合分析得到合理有效的结论。

5. 使用现代工具：能够针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的模拟，并能够理解其局限性。

5.1 了解和掌握资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等方面常用的现代仪器、信息技术工具和相关软件的原理和使用方法。

5.2 能够选择与使用恰当的技术、资源和工具，用于资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关复杂工程问题的分析、计算和设计，并理解其局限性。

5.3 能够开发、选择和使用现代工具，用于资源加工、“城市矿产” 等二次资源再生循环、化工、冶金相关复杂工程问题的模拟，并理解其局限性。

6. 工程与可持续发展：在解决资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题时，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。

6.1 在解决资源加工、“城市矿产” 等二次资源再生循环、化工、冶金有关的复杂工程问题时，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。

6.2 能够客观评价资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等相关工程方案对社会、经济、安全、法律、环境以及文化的影响并理解应承担的责任。

7. 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，履行责任。

7.1 树立和践行社会主义核心价值观，理解个人与社会的关系，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。

7.2 理解诚实公正、诚信守则的工程职业道德和规范，并能在资源循环科学与工程实践遵守工程职业道德、规范和相关法律，履行责任。

7.3 理解工程师对公众的安全、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。

8. 个人和团队：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。

8.1 具有良好的人际交往能力，具有一定执行能力，能够在多样化、多学科背景下的团队中承担个体角色，并发挥个体优势。

8.2 具有一定的组织能力，能够在团队中承担成员及负责人的角色，并发挥管理、协调作用。

9. 沟通：能够就本专业复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。理解、尊重语言和文化差异。

9.1 针对资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等复杂工程问题，具备口头和书面等多种形式的表达能力。

9.2 能够理解和尊重文化的差异，能够就资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等相关的复杂工程问题与业界同行与社会公众进行有效沟通和交流。

9.3 具备宽广的国际视野和外语交流能力，能在跨文化背景下交流资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等相关问题。理解、尊重语言和文化差异。

10. 项目管理：理解并掌握与工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用。

10.1 理解并掌握与工程项目相关的管理原理与经济决策方法。

10.2 理解资源加工、“城市矿产” 等二次资源再生循环、化工、冶金等相关复杂工程问题中的工程管理与经济决策问题。

10.3 能在多学科环境下，掌握和运用工程项目管理及成本控制原理方法，具备较强的项目管理能力。

11. 终身学习：具有自主学习终身学习和批判性思维的意识和能力，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。

11.1 具有自主学习终身学习和批判性思维的意识和能力。

11.2 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。

Students majoring in this discipline study fundamental theories and professional knowledge in mathematics, natural sciences, artificial intelligence, resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy. They receive scientific thinking and experimental training in applied basic research and technology development, master practical skills in engineering surveying, design, experimentation, and testing. They are able to apply relevant basic theories and fundamental skills in mathematics, natural sciences, artificial intelligence, resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy to analyze and solve practical engineering problems in this major and related fields, and possess the basic capabilities for scientific research and planning management in this major and related fields.

Graduates should acquire the following knowledge, capabilities, and qualities:

1. Engineering Knowledge: Be able to apply mathematics, natural sciences, artificial intelligence, basic engineering knowledge, and professional knowledge in resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, metallurgy, remote sensing, and geographical information systems to solve complex engineering problems.

1.1 Master mathematics, natural sciences, artificial intelligence, remote sensing, geographical information systems, basic engineering knowledge and fundamental methods, and be able to apply them to describe complex engineering problems.

1.2 Be able to construct appropriate mathematical models for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, and solve them.

1.3 Be able to use relevant knowledge and mathematical methods for the comparison and synthesis of solutions to complex engineering problems in resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

2. Problem Analysis: Be able to apply the basic principles of mathematics, natural sciences, engineering sciences, remote sensing, and geographical information systems to identify, express, and analyze complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy through literature research, and comprehensively consider the requirements of sustainable development to obtain effective conclusions.

2.1 Be able to apply the basic principles of mathematics, natural sciences, and engineering sciences to identify and express complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

2.2 Be able to analyze complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy through literature research, comprehensively consider the requirements of sustainable development, and obtain effective conclusions.

3. Design/Development of Solutions: Be able to design and develop solutions for complex engineering problems related to resource processing, recycling of secondary resources such as

"urban minerals", chemical engineering, and metallurgy, design systems, units, or process flows that meet specific requirements, 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.

3.1 Be able to design and develop solutions for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, and master design methods and technologies.

3.2 Be able to conduct specific engineering designs for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, and demonstrate innovative awareness in the design process.

3.3 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 in the specific engineering design for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

4. Research: Be able to conduct research on complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy based on scientific principles and using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information integration.

4.1 Be able to determine the research routes and experimental plans for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy through investigation and analysis based on scientific principles.

4.2 Be able to safely carry out experimental research according to the designed experimental plans, correctly collect, gather, and measure data.

4.3 Be able to analyze and interpret experimental results and obtain reasonable and effective conclusions through comprehensive information analysis.

5. Use of Modern Tools: Be able to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, including the simulation of complex engineering problems, and understand their limitations.

5.1 Understand and master the principles and usage methods of commonly used modern instruments, information technology tools, and related software in resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

5.2 Be able to select and use appropriate technologies, resources, and tools for the analysis, calculation, and design of complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, and understand their limitations.

5.3 Be able to develop, select, and use modern tools for the simulation of complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, and understand their limitations.

6. Engineering and Sustainable Development: When solving complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, be able to analyze and evaluate the impacts of engineering practices on health, safety, environment, law, as well as economic and social sustainable development based on engineering - related background knowledge, and understand the responsibilities to be assumed.

6.1 When solving complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy, be able to analyze and evaluate the impacts of engineering practices on health, safety, environment, law, as well as economic and social sustainable development based on engineering - related background knowledge.

6.2 Be able to objectively evaluate the impacts of engineering solutions related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy on society, economy, safety, law, environment, and culture, and understand the responsibilities to be assumed.

7. Engineering Ethics and Professional Norms: Have the awareness of serving the country and benefiting the people through engineering, possess humanistic and social science literacy and a sense of social responsibility, be able to understand and practice engineering ethics, abide by engineering professional ethics, norms, and relevant laws in engineering practice, and fulfill responsibilities.

7.1 Establish and practice socialist core values, understand the relationship between individuals and society, have the awareness of serving the country and benefiting the people through engineering, possess humanistic and social science literacy and a sense of social responsibility.

7.2 Understand the engineering professional ethics and norms of honesty, fairness, and integrity, and be able to abide by engineering professional ethics, norms, and relevant laws in the practice of resource recycling science and engineering, and fulfill responsibilities.

7.3 Understand the social responsibilities of engineers for public safety, health, well - being, and environmental protection, and be able to consciously fulfill them in engineering practice.

8. Individual and Team: Be able to assume the roles of an individual, team member, and team leader in a team with a diverse and multi - disciplinary background.

8.1 Have good interpersonal skills and certain execution ability, be able to assume the role of an individual in a team with a diverse and multi - disciplinary background, and give play to individual advantages.

8.2 Have certain organizational ability, be able to assume the roles of a team member and team leader in a team, and play management and coordination roles.

9. Communication: Be able to effectively communicate and interact with industry peers and the public on complex engineering problems in this major, including writing reports and design

documents, making presentations, clearly expressing or responding to instructions. Have a certain international perspective and be able to communicate and interact in a cross - cultural context. Understand and respect language and cultural differences.

9.1 Have the ability to express in various forms such as oral and written for complex engineering problems in resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

9.2 Be able to understand and respect cultural differences, and be able to effectively communicate and interact with industry peers and the public on complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

9.3 Have a broad international perspective and foreign language communication ability, and be able to communicate on issues related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy in a cross - cultural context. Understand and respect language and cultural differences.

10. Project Management: Understand and master management principles and economic decision - making methods related to engineering projects, and be able to apply them in a multi - disciplinary environment.

10.1 Understand and master management principles and economic decision - making methods related to engineering projects.

10.2 Understand the engineering management and economic decision - making problems in complex engineering problems related to resource processing, recycling of secondary resources such as "urban minerals", chemical engineering, and metallurgy.

10.3 Be able to master and apply the principles and methods of engineering project management and cost control in a multi - disciplinary environment, and possess strong project management capabilities.

11. Lifelong Learning: Have the awareness and ability of self - 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.

11.1 Have the awareness and ability of self - learning, lifelong learning, and critical thinking.

11.2 Be able to understand the impacts of broad technological changes on engineering and society, and adapt to new technological changes.

四、毕业要求与培养目标对应矩阵

Ⅳ **Matrices of graduation requirements and cultivation objectives**

培养目标及毕业要求 Cultivation Objectives & Graduation Requirements	培养目标 1 Cultivation Objective I	培养目标 2 Cultivation Objective II	培养目标 3 Cultivation Objective III	培养目标 4 Cultivation Objective IV
毕业要求 1 Graduation Requirement I	√			
毕业要求 2 Graduation Requirement II		√		
毕业要求 3 Graduation Requirement III		√		
毕业要求 4 Graduation Requirement IV		√		
毕业要求 5 Graduation Requirement V		√		
毕业要求 6 Graduation Requirement VI			√	
毕业要求 7 Graduation Requirement VIII			√	
毕业要求 8 Graduation Requirement IX			√	√
毕业要求 9 Graduation Requirement X			√	√
毕业要求 10 Graduation Requirement XI			√	
毕业要求 11 Graduation Requirement XII				√

五、毕业要求实现矩阵（提示：1.每门课程支撑 1-3 个毕业要求；2.表Ⅳ和表Ⅴ的毕业要求内容和数量是否一致。）

Ⅴ Graduation requirement realization matrix

毕业要求	1）工程知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）工程与与可持续发展	7）工程伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
英语									H		M
体育											M
思想道德与法治							H				H
形式与政策						H					
中华民族共同体概论									H		
中国近现代史纲要						H					
马克思主义基本原理		H									H
毛泽东思想和中国特色社会主义理论体系概论						M					H
习近平新时代中国特色社会主义思想概论						H					
心理健康与安全									L		H
人文素养与写作									H		M
科学技术与科普						H			M		
艺术体验与审美									M		M
国际视野与世界									M		
中华文化与文明						L			M		L
分析化学		M		H							

毕业要求	1）工程知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）工程与与可持续发展	7）工程伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
分析化学实验		H			H						
无机化学		M									
无机化学实验		H			H						
有机化学				H							
有机化学实验		H		M							
物理化学	H			M							
物理化学实验		H		H							
现代环境分析		H									
现代环境分析实验		H			H			M			
大学物理	H										
大学物理实验		H						M			
高等数学	H										
线性代数	M										
概率论与数理统计	M										
画法几何&工程制图	H		H		H						
工程测量学	H		M								
电子电工学	M										
电子电工学实验		M									
人工智能与 Python 程序设计			H		H						

毕业要求	1）工程知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）工程与与可持续发展	7）工程伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
化工原理	H										
化工原理实验		M	H								
化学反应工程	H										
CAD 制图	H		M								
CAD 制图实验			H		H						
资源加工过程与装备	H										
资源加工过程与装备实验		M			H						
化工热力学	H					M					
地理信息系统与遥感应用		M			H						
冶金原理	H										
固体废物处置与资源化	H					H					
固体废物处置与资源化实验		M	M								
劳动教育							H	M			H
军事技能训练								H			
化工原理课程设计	M		H			M	M		L		
资源加工过程与装备课程设计	M		H			M	M		L		
工程测量学实习	M					H		M	L		
认识实习	M					H					
金工实习	M				M	M					

毕业要求	1）工程知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）工程与与可持续发展	7）工程伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
生产（或毕业）实习	H					H	L	L	L		
毕业设计（论文）	M		H	H				L	M	L	
创新教育		H	H								M
创业教育与就业指导			H				H	H		H	H
军事理论											M
国家安全教育							H		M		H
美育实践									M		L

注①不同学期的同一门课程只需填写一次；

②所有的课程和教学活动都要列入表格，包括集中实践性环节；

③表格要清晰展示每门课程与“毕业要求”中每项具体要求达成的关联度情况，关联度强的用“H” 表示，关联度中等的用“M” 表示，关联度弱的用“L” 表示。

六、核心课程

Ⅵ Core Courses

无机化学、分析化学、有机化学、物理化学、资源加工过程与装备、化工原理、冶金原理、分离工程、固体废物处置与资源化、清洁生产、环境工程学、工程测量学、画法几何&工程制图、CAD 制图、化学反应工程、化工热力学。

Inorganic Chemistry, Analytical Chemistry, Organic Chemistry, Physical Chemistry, Resource Processing Process and Equipment, Principles of Chemical Engineering, Principles of Metallurgy, Separation Engineering, Solid Waste Disposal and Resource Utilization, Clean Production, Environmental Engineering, Engineering Surveying, Descriptive Geometry & Engineering Drawing, CAD Drawing, Chemical Reaction Engineering, Chemical Engineering Thermodynamics.

七、主要实践性教学环节

Ⅶ Main Internship and Practical Training

化工原理实验、化工原理课程设计、资源加工过程与装备实验、资源加工过程与装备课程设计、固体废物处置与资源化实验、认识学习、工程训练、生产实习、毕业（设计）论文和创新创业训练。

Experiments of Chemical Engineering, Chemical Engineering Principle Design, Experiments of Resource Processing Process and Equipment, Resource Processing Process and Equipment Design, Experiments of Disposal and Reuse of Solid Waste, Knowledge Acquirement, Engineering Training, Producing Practice, Graduation Project, Innovation & Entrepreneurship.

八、学时与学分

Ⅷ Hours/Credits

学时学分构成表

Table of Hours and Credits

课程类别 Courses Classified			学时/周数 Period/Weeks	学分 Credits		学分比例 Proportion of Credits
				理论 Theory	实验（实践） Practice	
通识课程平台 General Courses Platform		必修 Compulsory	546	22	7	18.13%
		选修 Elective	112	7	(含创业 2)	4.38%
学科基础课程平台 Basic Courses Platform		必修 Compulsory	816	35	5.5	25.31%
专业课程平台 Major Courses Platform		必修 Compulsory	528	20	5.5	15.94%
		选修 Elective	424	22.5	3.0	15.94%
集中性实践课程平台 Practical Teaching Platform		必修 Compulsory	72+22.5w	/	**24.5**	**15.31%**
		选修 Elective				
素质拓展平台 Quality Development Platform	双创学分 Innovation & Entrepreneurship Credits	必修 Compulsory			2	12.5%
	其他学分 Other Credits			5	1	37.5%
小计 Amount	必修学分总数 Compulsory Credits	127.5	选修学分总数 Elective Credits	32.5	选修学分比例 Proportion of Elective Credits	**20.31%**
	理论学分总数 Theory Credits	109.5	实践学分总数 Practice Credits	48.5	实践教学环节比例 Proportion of Internship and Practical Training	30.31%
最低毕业学分 The Lowest Graduate Credits			**160**			

注：

①学分比例：各教学平台或教学环节占最低毕业学分的比例。

②实践教学环节，包括集中性实践教学环节和实验教学（不含体育）。集中性实践教学环节，包括培养方案内集中实施的实践、实习、课程设计、毕业设计、毕业论文、社会调查等；实验教学，包括课内实验和独立开设实验。

③必修学分总数=通必学分+学科基础学分+专必学分+实践必修学分+素质拓展学分；

选修学分总数=通选学分+专选学分+实践（选修）学分；

理论学分总数=所有平台理论学分之和（不包括双创学分）；

实践学分总数=所有平台实践学分之和（不包括双创学分）；

最低毕业学分=必修学分+选修学分=理论学分+实践学分+双创学分。

九、教学进程计划表 /IX Teaching Schedule Form

表一：通识课程平台 / Form Ⅰ: General Course Platform

表一（A）：通识必修课程/Form I (A):General Compulsory Courses (General Required)

课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
20W100000613	英语 1 English 1	2	32	32				1
218110000313	体育 1 Physical Education 1	0/1	26			26		1
217100014918	思想道德与法治 Moral Education and Rule of Law	2.5/0.5	52	40		12		2
217100015218	形势与政策 Situation and Policy	2	32	32				2
225100000118	中华民族共同体概论 The Introduction to Community for the Chinese Nation	1.5/ 0.5	36	24		12		2
20W100000713	英语 2 English 2	2	32	32				2
218110000213	体育 2 Physical Education 2	0/1	32			32		2
2171000122	中国近现代史纲要 Essentials of China Modern and Contemporary History	2.5/ 0.5	52	40		12		1
20W100001018	学术英语阅读与写作 Academic English Reading and Writing	2	32					3/4
20W100001318	高级媒体英语视听说 Advanced Media English: viewing, listening and speaking	2	32					3/4
20W100001518	英语国家社会与文化 Society and Culture ofEnglish-speaking Countries	2	32					3/4
20W100001618	中华文化导论（英文） Intoduction to Chinese Culture	2	32					3/4
20w100002623	跨文化交际 Intercultural Communication	2	32					3/4
20W100002523	中外文化比较 Comparison of Chinese and Foreign Cultures	2	32					3/4
218110015018	体育 3 Physical Education 3	0/0.5	16			16		3
217100012318	马克思主义基本原理 Basis Principles of Marxism	2.5/0.5	52	40		12		4
217100015818	毛泽东思想和中国特色社会主义理	2.5/0.5	52	40		12		3

	论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics							
217100015918	习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	2.5/0.5	52	40		12		5
218110014718	体育 4 Physical Education 4	0/0.5	16			16		4
218110014018	体育 5 Physical Education 5	0/0.5	16			16		5
218110015318	体育 6 Physical Education 6	0/0.5	16			16		6
学分要求：必修学分 29 Demand of Credits: Required 29								

注：大学英语扩展课程包括学术英语阅读与写作、高级媒体英语视听说、英语国家社会与文化、中华文化导论（英文）、跨文化交际（英文）、中外文化比较，要求在第 3,4 学期完成 2 学分即可。

表一（B）：通识选修课程（通选课）/Form I (B): General Elective Courses

模块 Module	**学分 Crs.**
心理健康与安全 Psychological Health and Safety	7 注：：1. 必修心理健康教育、大学生生命与财物防护实务和美育相关课程 2. 理工科专业学生必修文科类课程 1 门
人文素养与写作 Humanistic Accomplishment and Writing	
科学技术与工程 Science and Technology & Engineering	
艺术体验与审美 Art Appreciation and Aesthetics	
国际视野与世界 Contemporary China and the World	
中华文化与文明 Chinese Culture and Civilization	
创业素养与实践	
学分要求：选修学分 7 Demand of Credits: Elective 7	

表二：学科基础课程平台

Form II. Basic Course Platform

课程类别 Course Classified	课程编号 Courses Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学科基础必修 Basic Courses Require	213100035618	无机化学（B）Z Inorganic Chemistry (B) Z	3	48	48				1	
	213110035818	无机化学实验（C） Inorganic Chemistry Experiments (C)	0/0.5	16		16			1	
	2101000113	高等数学 A(1) Higher Mathematics A (1)	4	80	64			16	1	
	2101000118	线性代数 Linear Algebra	2	48	32			16	1	
	213103005213	分析化学（B） Analytical Chemistry (B)	2	32	32				1	
	213110036418	分析化学实验（B） Analytical Chemistry Experiments (B)	0/1	32		32			1	
	209100064918	人工智能与 Python 程序设计 Artificial Intelligence and Python Programming Design	1.5/1	56	24		32		1	人工智能课程
	2241000067	工程测量学 Engineering Surveying	2	32	32				2	
	210100025623	高等数学 A(2) Higher Mathematics A (2)	4.5	96	72			24	2	
	211100011318	大学物理 C College Physics C	3	56	48			8	2	
	211110021318	大学物理实验（1） University Physics Experiments （1）	0/0.5	16		16			2	
	224100000913	画法几何&工程制图 Descriptive Geometry & Engineering Drawing	2	32	32				3	
	2101000112	概率论与数理统计 Probability Theory and Mathematical Statistics	2.5	56	40			16	3	
学科基础必修 Require	213100035218	有机化学（C） Organic Chemistry (C)	3	48	48				3	

课程类别 Course Classified	课程编号 Courses Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	213110036118	有机化学实验（B） Organic Chemistry Experiments (B)	0/1	32		32			3	
	213100034518	物理化学（B） Physical chemistry (B)	3.5	56	56				3	
	213110034618	物理化学实验 Physical Chemistry Experiments	0/1	32		32			3	
	212100018318	电子电工学 Electronic Engineering	2	32	32				3	
	2241100071	电子电工学实验 Electronics and Electrotechnics Experiments	0/0.5	16		16			3	
学分要求：必修学分 40.5 **Demand of Credits: Required:40.5**										

表三：专业课程平台

Form III: Major Courses Platform

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes	
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb			
专业必修 Required Courses	224100024518	CAD 制图 Computer Aided Design	1/1.5	64	16	48			4		
	224100013818	化工原理（A1） Chemical Engineering（A1）	3	48	48				4	铸牢中华民族共同体意识课程	
	224110014018	化工原理实验（A1） Experiments of Chemical Engineering（A1）	0/1	32		32			4		
	224100019818	化学反应工程 Chemical Reaction Engineering	2	32	32				4		
	224100014518	资源加工过程与装备 Resource Processing Process and Equipment	3	48	48				4	铸牢中华民族共同体意识课程	
	224110014618	资源加工过程与装备实验 Experiments of Resource Processing Process and Equipment	0/1	32		32			4		
	224100013918	化工原理（A2） Chemical Engineering（A2）	3	48	48				5		
	224110014118	化工原理实验（A2） Experiments of Chemical Engineering（A2）	0/1	32		32			5		
	224100014718	化工热力学 Chemical Engineering Thermodynamics	3	48	48				5		
	224100014818	冶金原理 Metallurgical Principle	3	48	48				5		
专业必修 Required Courses	224100014918	固体废物处置与资源化 Disposal and Reuse of Solid Waste	2	32	32				6		

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes	
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb			
	224110015018	固体废物处置与资源化实验 Experiments of Disposal and Reuse of Solid Waste	0/1	32		32			6		
专业选修 Elective courses	224100019918	矿石学 Ore Science	1.5	24	24				3（限选	共选修25.5个学分，其中实验学分不少于3学分。第3学期最少选修4.5个学分（包括1个实验学分），第4学期最少选修4.5个学分（包括1个实验学分），第5学期最少选修7.5个学分（包括0.5个实验学分），第6学期最少	铸牢中华民族共同体意识课程
	224100020818	资源微生物学 Resource Microbiology	2	32	32				3（限选		
	224110015318	资源微生物学实验 Experiments of Resource Microbiology	0/1	32		32			3（限选		
	213103024513	环境生态学（B） Environmental Ecology（B）	2	32	32				4		
	224100028323	现代环境分析 C Modern Environmental Analysis C	2	32	32				4（限选		
	2241100074	现代环境分析实验 Experiments of Modern Environmental Analysis	0/1	32		32			4（限选		
	224100024218	清洁生产 Clean Production	1.5	24	24				4（限选		
	224100023718	地理信息系统与遥感应用 Geographic Information System and Remote Sensing Application	2	32	32				5（限选		人工智能课程
	224100015118	环境工程学（B） Environmental Engineering	2	32	32				5（限选		
	224100027923	人工智能在资源环境中的应用 Applications of Artificial Intelligence in the Resource Environment	1	16	16				5（限选		人工智能课程

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes	
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb			
	224100028423	遥感技术与应用 Remote Sensing Technology and Application	2/0.5	48	32	16			5（限选	选修 8 个学分，第 7 学期最少选修 1 个学分包括 0.5 个实验学分）	人工智能课程
	213103029713	环境规划与管理 Environmental Plans and Management	2	32	32				6（限选		
	224100015418	分离工程 Separation Engineering	2	32	32				6（限选		
	224100028023	环境监测（C） Environmental Monitoring (C)	2	32	32				6（限选		
	224100018318	生物化学 Biochemistry	2	32	32				4		
	224100019518	资源循环科学与工程专业英语 Professional English for Resource Recycling Science and Engineering	1.5	24	24				6		
	224100016218	化工工艺学 Chemical technology	2	32	32				6		
	224100015818	化工设备机械基础 Fundamental Chemical Process Equipment	2	32	32				6		
	224100027823	胶体表面化学 Colloid surface chemistry	2	32	32				6		
	224100027623	浮选药剂溶液化学 Solution chemistry of flotation reagent	2	32	32				6		
	224100015918	结晶学与工业结晶 Crystallography and Industrial Crystallization	2	32	32				6		

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classification				开课学期 Semester	备注 Notes	
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb			
	224100015718	固废处理与生态材料 Solid Waste Disposal and Ecological Materials	1.5	24	24				6		
	224100022118	文献检索及科技论文写作 Literature Retrieval and Scientific Paper Writing	0.5/0.5	24	8	16			7（限选		
	224100023618	碳中和与清洁能源技术 Carbon Neutrality and Clean Energy Technology	2	32	32				7		
	224100016118	资源循环加工工厂设计 Resource Recycling Processing Plant Design	1.5	24	24				7		
专业选修 Elective courses	224100015518	化工安全与环保 Chemical Safety and Environmental Protection	2	32	32				7		
	2241000098	废弃机电电子电器资源化利用技术 Recycling Technology of Waste Electrical and Electronic Equipment	2	32	32				7		
	2241000105	生物质转化与利用 Biomass Conversion and Utilization	2	32	32				7		
	224100016518	生物冶金原理与技术 Principle and Technology of Biological Metallurgy	2	32	32				7		
	224100016618	再生金属冶金学 Regenerated Metal Metallurgy	2	32	32				7		
学分要求：51，其中必修 25.5，选修 25.5 **Demand of Credits 51, Required 25.5, Elective 25.5**											

表四：集中性实践课程平台

Form IV: Practical Teaching Platform

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Name	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 PeriodClassified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实践 TeachingPractice	实践 Teaching Practice	必修 Compulsory Courses	112110010718	劳动教育 Labor Education	1	36	√		1-7
			109110000318	军事技能训练 Military Skill Training	/2	36	√		1
	课程设计 Project Design	必修 Compulsory Course	224110024918	化工原理课程设计 Chemical Engineering Principle Design	1	1W			5
			22410024618	资源加工过程与装备课程设计 Resource Processing Process and Equipment Design	1	1W			6
	小计 Amount				5	72+2W			
实习 Teaching Exercitation	专业实习 Teaching Exercitation	必修 Compulsory Course	2241100080	工程测量学实习 Engineering Surveying Practice	0.5	0.5W			2
			224110006213	认识实习 Cognition Practice	1	1W		√	4
			701110000118	工程训练 A Engineering Training A	1	1W		√	5
	毕业实习 Graduation Practice	必修 Compulsory Course	224110000313	生产（或毕业）实习 Production (or Graduation) Practice	3	3W		√	7
	毕业论文（设计） Graduation Thesis (Project)	必修 Compulsory Course	224110017718	毕业设计（论文） Graduation Project （Thesis）	14	14W			8
	小计 Amount				19.5	17W			
学分要求：必修学分 24.5 Demand of Credits: Required 24.5									

表五：素质拓展平台

Form V: Quality Development Platform

课程编号 Course Code	课程/模块名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
109100000418	军事理论 Military Theory	2	36	36				1
109100000818	国家安全教育 National Security Education	1	16	16				2
	美育实践	1	24			24		1-7
/	创新教育 Innovation Education	2	/					
115100000213	大学生职业生涯与发展规划 Career and Development Planning of University Students	1	16					1
115100000113	就业指导 Employment Guidance	1	16	16				6
学分要求：必修学分 8 **Demand of Credits: Required 8**								

执笔人:　　审核人:

学院盖章:　　完成日期:

水文与水资源工程专业本科人才培养方案

Undergraduate Program for Hydrology and Water Resources Engineering

一、培养规格

I Cultivation Standards

I）学制

Length of Schooling

修业年限：4 年

Duration:　4 years

II）学位

Degree

授予学位：工学学士学位

Degrees conferred:　Bachelor of Engineering

二、培养目标

II Education Objectives

本专业以立德树人为根本任务，以铸牢中华民族共同体意识为主线，以服务地方经济社会发展为导向，培养德智体美劳全面发展，具有良好的思想品德、人文素养、职业道德和敬业精神，具备扎实的基础知识，富有创新精神和持续学习能力的水文与水资源工程专业高级专门人才。学生毕业后 5 年左右，能够在水利（水务）、国土、能源、交通、城建、农林、环保、地矿等部门从事水文、水资源及水环境领域的勘测、评价、规划、设计、预测预报、管理和科学研究等方面的工作，并达到以下目标：

目标 1（知识能力）：能够掌握水文与水资源工程专业相关技术发展现状，融会贯通工程数理基础知识和水文与水资源工程专业知识，具备独立发现、研究与解决复杂工程问题的能力。

目标 2（实践能力）：具备系统思维和可持续发展理念，能将知识有效运用到水文、水资源及水环境相关的勘测评价、规划设计、预测预报的实践中，并具备一定的创新能力。

目标 3（职业素养）：具备家国情怀、高尚的职业道德、社会责任感和良好的人文科学素养，具有与主管部门、业界同行、相关专业的配合和协调能力，具有一定的国际视野和文化交流能力。

目标 4（发展潜能）：具有终身学习的能力，具有一定的批判性思维能力，能及时了解水文与水资源工程专业最新理论、技术及国际前沿动态，有效地持续自主学习以适应社会和行业的多样性发展。

To promote moral education as the fundamental task, to strengthen the sense of community of the Chinese nation as the main task, to serve local economic and social development as the guide, this major aims at cultivating senior engineering professionals who meet the needs of economic and social development of the country, region or ethnic minority, have good moral education, humanistic quality, professional ethics and professionalism, solid basic knowledge, innovative spirit and ability to continue learning. After graduating 5 years, students can be engaged in surveying, evaluating, planning, designing, predicting and forecasting, managing and researching in the field of hydrology, water resources, water environment and hydroecology in the departments of water conservancy, water affairs, land, energy, transportation, urban construction, agriculture and forestry, environmental protection, geology and mineral and achieve the following goals:

Cultivation Objective I (knowledge capability): Be able to grasp the development status of technologies in hydrology and water resources engineering, master the basic knowledge of engineering, mathematics and professional knowledge, and have the ability to discover, research and solve complex engineering problems independently.

Cultivation Objective II (practical ability): Have the systematic thinking and idea of sustainable development, can effectively apply knowledge to the practice of surveying and evaluating, planning and designing, predicting and forecasting, and have the innovation ability.

Cultivation Objective III (professional quality): Patriotic, noble professional ethics, social responsibility and good humanities literacy, have the ability to cooperate and coordinate with competent authorities, industry peers, and related majors, and have certain international vision and cultural exchange ability.

Cultivation Objective IV (potential for development): Have the ability of lifelong learning and certain critical thinking skills, able to keep abreast of the latest theories, technologies and international cutting-edge developments in hydrology and water resources engineering, and can study independently, effectively and continuously to adapt to the diverse development of society and industry.

三、毕业要求

III Basic Requirements for Graduation

本专业学生学习数学、自然科学和水文水资源、水环境等方面的基本理论和专业知识，进行应用基础研究和技术开发方面的科学思维和科学实验训练，掌握工程测量、科学运算、实验和测试等方面的实践技能，能够运用数学、自然科学和水文水资源、水环境方面的基础理论和基本技能，分析解决本专业及相关领域实际问题，具有从事本专业及相关领域科学研究和组织管理的基本能力。

毕业生应获得以下几方面的知识、能力和素养：

1. 工程知识：能够将数学、自然科学、计算、工程基础知识，水文、水资源、水环境专业知识用于解决复杂工程问题。

1.1 掌握数学、自然科学、工程基础知识与基本方法，基于大数据、人工智能与计算思维，将数学、计算机等知识应用于表述复杂工程问题。

1.2 能够针对水文、水资源及水环境相关复杂工程问题，构建恰当的数学模型，并进行推演和求解。

1.3 能够将相关知识和数学模型方法用于水文、水资源及水环境等专业相关复杂工程问题解决方案的比较和综合。

2. 问题分析：能够应用数学、自然科学、工程科学的基本原理，识别、表达并通过文献研究分析水文、水资源及水环境有关的复杂工程问题，以获得有效结论。

2.1 能够应用数学、自然科学和工程科学的基本原理，识别和表达水文、水资源及水环境相关的复杂工程问题。

2.2 能够通过文献研究，对水文、水资源及水环境相关的复杂工程问题进行分析，获得有效结论。

3. 设计/开发解决方案：能够针对水文、水资源及水环境有关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、法律与伦理及社会与文化等角度考虑可行性。

3.1 能够针对水文、水资源及水环境有关的复杂工程问题，掌握设计方法和技术。

3.2 能够针对水文、水资源及水环境有关的复杂工程问题，进行具体的工程设计，并能够在设计环节中体现创新意识。

3.3 能够针对水文、水资源及水环境有关的复杂工程问题，在具体的工程设计中，综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素。

4. 研究：能够基于科学原理并采用科学方法，对水文、水资源及水环境有关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 能够基于科学原理，通过调研和分析，确定水文、水资源及水环境相关复杂工程问题的研究路线和实验方案。

4.2 能够根据设计的实验方案，安全地开展实验研究，正确采集、收集和测量数据。

4.3 能够对实验结果进行分析和解释，通过信息综合分析得到合理有效的结论。

5. 使用现代工具：能够针对水文、水资源及水环境有关的复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂工程问题的预测与模拟，并能够理解其局限性。

5.1 了解和掌握水文、水资源及水环境等方面常用的现代仪器、信息技术工具和相关软件的原理和使用方法。

5.2 能够选择与使用恰当的技术、资源和工具，用于水文、水资源及水环境相关复杂工程问题的分析、计算和设计，并理解其局限性。

5.3 能够开发、选择和使用现代工具，用于水文、水资源及水环境相关复杂工程问题的模拟与预测，并理解其局限性。

6. 工程与可持续发展：熟悉国家和地方涉水的政策和法律法规，在解决复杂的工程问题时，能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对健康、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。

6.1 了解国家和地方涉水的政策和法律法规，熟悉相关的技术标准体系，理解民族、风俗、宗教等文化对涉水工程的影响。

6.2 能够客观评价水文、水资源及水环境相关的工程方案对健康、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。

7. 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，在水文、水资源工程实践中遵守工程职业道德、规范和相关法律，履行责任。

7.1 具有爱党敬国、敬业奉献和服务人民的意识，具有人文社会科学素养和社会责任感。

7.2 理解工程伦理的核心理念，熟悉水文水资源工程师的职业性质和责任，在工程实践中能自觉遵守职业道德、规范和相关法律，履行责任。

8. 个人和团队：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。

8.1 具有良好的人际交往能力，具有一定执行能力，能够在多样化、多学科背景下的团队中承担个体角色，并发挥个体优势。

8.2 具有一定的组织协调能力，能够在多样化、多学科背景下的团队中承担团队成员及负责人的角色，并发挥管理、协调作用。

9. 沟通：具备良好的文字及语言表达能力、辩论能力、倾听能力、外语应用能力，能够就水文、水资源及水环境有关的复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。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；

9.1 针对水文、水资源及水环境的复杂工程问题，具备口头和书面等多种形式的表达能力。

9.2 能够理解和尊重语言、文化的差异，能够就水文、水资源及水环境相关的复杂工程问题与业界同行与社会公众进行有效沟通和交流。

9.3 具备宽广的国际视野和外语交流能力，能在跨文化背景下交流水文、水资源及水环境相关问题。

10. 项目管理：理解并掌握与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。

10.1 理解并掌握工程管理原理与经济决策方法。

10.2 理解水文、水资源及水环境相关复杂工程问题中的工程管理与经济决策问题。

10.3 能在多学科环境下，掌握和运用工程项目管理及成本控制原理方法，具备较强的项目管理能力。

11. 终身学习：具有自主学习、终身学习和批判性思维的意识和能力，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。

11.1 能认识不断探索和学习的必要性，具有自主学习、终身学习和批判性思维的意识和能力；

11.2 掌握自主学习的方法和拓展知识、提高能力的途径，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。

Students in this major learn the basic theories and professional knowledge of mathematics, natural science, hydrology and water resources, water environment, etc., conduct scientific thinking and scientific experimental training in applied basic research and technology development, master the practical skills of engineering measurement, scientific arithmetic, experiments and tests, etc., and be able to apply the basic theories and skills in mathematics, natural science, hydrology and water resources, water environment to analyze and solve the practical problems in this profession and related fields, and have the basic ability to engage in scientific research and organization management in this profession and related fields.

Graduates should acquire the following knowledge, abilities and qualities:

1. Engineering knowledge: Be able to apply mathematics, natural sciences, computing, basic engineering knowledge, hydrology, water resources, and water environment expertise to solve complex engineering problems.

1.1 Master mathematics, natural sciences, and basic engineering knowledge and basic methods, and apply mathematics, computer and other knowledge to describe complex engineering problems based on big data, artificial intelligence and computational thinking.

1.2 Be able to construct appropriate mathematical models for complex engineering problems related to hydrology, water resources and water environment, and to derive and solve them.

1.3 Be able to apply relevant knowledge and mathematical modeling methods to the comparison and synthesis of solutions to complex engineering problems related to hydrology, water resources and the environment.

2. Problem Analysis: Be able to apply the basic principles of mathematics, natural sciences, and engineering sciences to identify, express, and analyze complex engineering problems related to

hydrology, water resources, and water environment through literature research, and to obtain valid conclusions.

2.1 Be able to apply basic principles of mathematics, natural sciences, and engineering sciences to identify and express complex engineering problems related to hydrology, water resources, and water environment.

2.2 Be able to analyze complex engineering problems related to hydrology, water resources, and water environment through literature research to obtain valid conclusions.

3. Design/development of solutions: Ability to design and develop solutions for complex engineering problems related to hydrology, water resources and water environment, design systems, units or process flows that meet specific needs, reflect 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.

3.1 Be able to master design methods and techniques for complex engineering problems related to hydrology, water resources and water environment.

3.2 Be able to carry out specific engineering designs for complex engineering problems related to hydrology, water resources and water environment, and be able to demonstrate a sense of innovation in the design process.

3.3 Ability to comprehensively consider health, safety and environment, life cycle cost and net zero carbon requirements, law and ethics, society and culture in specific engineering designs for complex engineering problems related to hydrology, water resources and water environment.

4. Research: Be able to apply scientific principles and methods to research complex engineering problems related to hydrology, water resources, and water environment, including designing experiments, analyzing and interpreting data, and synthesizing information to reach reasonable and valid conclusions.

4.1 Be able to determine the research route and experimental protocol for complex engineering problems related to hydrology, water resources and water environment through research and analysis based on scientific principles.

4.2 Be able to safely conduct experimental research and properly collect, gather and measure data according to the designed experimental protocol.

4.3 Be able to analyze and interpret experimental results and obtain reasonable and valid conclusions through comprehensive analysis of information.

5. Use modern tools: Be able to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for complex engineering problems related to hydrology, water resources and water environment, including prediction and simulation

of complex engineering problems, and be able to understand their limitations.

5.1 Understand and master the principles and usage of modern instrumentation, information technology tools and related software commonly used in hydrology, water resources and water environment.

5.2 Be able to select and use appropriate techniques, resources and tools for the analysis, calculation and design of complex engineering problems related to hydrology, water resources and water environment, and understand their limitations.

5.3 Be able to develop, select and use modern tools for the simulation and prediction of complex engineering problems related to hydrology, water resources and water environment, and understand their limitations.

6. Engineering and sustainable development: Be familiar with national and local water-related policies and laws and regulations. When solving complex engineering problems, be able to make reasonable analysis based on engineering-related background knowledge, evaluate the impact of professional engineering practices and solutions to complex engineering problems on health, safety, environment, law, and economic and social sustainable development, and understand the responsibilities that should be assumed.

6.1 Understand national and local water-related policies and laws and regulations, be familiar with relevant technical standard systems, and understand the impact of ethnicity, customs, religion and other cultures on water-related projects.

6.2 Be able to objectively evaluate the impact of engineering solutions related to hydrology, water resources and water environment on health, safety, environment, law, and economic and social sustainable development, and understand the responsibilities that should be assumed.

7. Engineering ethics and professional norms: Have the awareness of serving the country and benefiting the people through engineering, have humanities and social science literacy and social responsibility, be able to understand and practice engineering ethics, abide by engineering professional ethics, norms and relevant laws in the practice of hydrology and water resources engineering, and fulfill responsibilities.

7.1 Have the awareness of loving the party and respecting the country, dedicating oneself to work and serving the people, have humanities and social science literacy and social responsibility.

7.2 Understand the core concepts of engineering ethics, be familiar with the professional nature and responsibilities of hydrological and water resources engineers, and consciously abide by professional ethics, regulations and relevant laws in engineering practice and fulfill responsibilities.

8. Individuals and teams: Be able to assume the roles of individuals, team members and leaders in a diverse and multidisciplinary team.

8.1 Have good interpersonal skills, have certain execution capabilities, be able to assume individual roles in a diverse and multidisciplinary team, and give full play to individual advantages.

8.2 Have certain organizational and coordination skills, be able to assume the roles of team members and leaders in a diverse and multidisciplinary team, and play a management and coordination role.

9. Communication: Have good writing and language expression skills, debate skills, listening skills, and foreign language application skills, and be able to communicate and exchange effectively with industry peers and the public on complex engineering issues related to hydrology, water resources and water environment, including writing reports and design manuscripts, making statements, and clearly expressing or responding to instructions. Ability to communicate and exchange in a cross-cultural context, understand and respect language and cultural differences;

9.1 Ability to express in various forms, including oral and written, on complex engineering problems related to hydrology, water resources and water environment.

9.2 Ability to understand and respect language and cultural differences, and be able to communicate and exchange effectively with industry peers and the public on complex engineering problems related to hydrology, water resources and water environment.

9.3 Ability to have a broad international perspective and foreign language communication skills, and be able to communicate on issues related to hydrology, water resources and water environment in a cross-cultural context.

10. Project management: Understand and master the management principles and economic decision-making methods related to engineering projects, and be able to apply them in a multidisciplinary environment.

10.1 Be able to articulate in a variety of forms, both oral and written, for complex engineering problems in hydrology, water resources, and water environment.

10.2 Be able to understand and respect cultural differences and communicate effectively with people of the same professionin and the public on complex engineering problems related to hydrology, water resources, and water environment.

10.3 Have a broad international perspective and foreign language communication skills to communicate in a cross-cultural context on problems related to hydrology, water resources and water environment.

11. Lifelong learning: Have the awareness and ability of independent learning, lifelong learning and critical thinking, be able to understand the impact of extensive technological changes on engineering and society, and adapt to new technological changes.

11.1 Be able to recognize the necessity of continuous exploration and learning, and have the

awareness and ability of independent learning, lifelong learning and critical thinking;

11.2 Master the methods of independent learning and ways to expand knowledge and improve abilities, be able to understand the impact of extensive technological changes on engineering and society, and adapt to new technological changes.

四、毕业要求与培养目标对应矩阵

IV **Matrices of Graduation Requirements and Education Objectives**

培养目标及毕业要求 Cultivation Objectives & Graduation Requirements	培养目标 1 Cultivation Objective I	培养目标 2 Cultivation Objective II	培养目标 3 Cultivation Objective III	培养目标 4 Cultivation Objective IV
毕业要求 1 Graduation Requirement I	√			
毕业要求 2 Graduation Requirement II		√		
毕业要求 3 Graduation Requirement III		√		
毕业要求 4 Graduation Requirement IV		√		
毕业要求 5 Graduation Requirement V		√		
毕业要求 6 Graduation Requirement VI			√	
毕业要求 7 Graduation Requirement VII			√	
毕业要求 8 Graduation Requirement VIII			√	√
毕业要求 9 Graduation Requirement IX			√	√
毕业要求 10 Graduation Requirement X			√	
毕业要求 11 Graduation Requirement XI				√

五、毕业要求实现矩阵

V Graduation requirement realization matrix

课程及毕业要求	1. 工程知识			2. 问题分析		3. 设计/开发解决方案			4. 研究			5. 使用现代工具			6. 工程与可持续发展		7. 工程伦理与职业规范		8. 个人和团队			9. 沟通			10. 项目管理			11. 终身学习	
	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2
英语																								H					
体育																			M			M							
思想道德与法治																	H												
形势与政策															M				H		H					M			
中华民族共同体概论															M								M						
中国近现代史纲要																M					H					M			
马克思主义基本原理															M				H				M						
毛泽东思想和中国特色社会主义理论体系概论															M						H	M				M			
习近平新时代中国特色社会主义思想概论															M						H	M				M			
无机化学			H						M								M												
无机化学实验		M			H				M			H																	
分析化学		H			H																								
分析化学实验									M			H																	
高等数学	H																												
线性代数	H																												

课程及毕业要求	1. 工程知识			2. 问题分析		3. 设计/开发解决方案			4. 研究			5. 使用现代工具			6. 工程与可持续发展		7. 工程伦理与职业规范		8. 个人和团队			9. 沟通			10. 项目管理			11. 终身学习	
	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2
大学物理	M				H						M																		
大学物理实验					M						H	M																	
工程测量学										M		H																	
概率论与数理统计	H				H				M			M																	
人工智能与 Python 程序设计	H				M			L						H															
程序设计语言（Matlab）		M			M			L						H															
水利工程制图		M										H			L														
水利工程制图实验		M										H			L														
自然地理学	M			M																									
气象学	M			M																									
水利工程概论	M															L													
水力学	H				M																								
水力学实验						M				H																			
工程力学	H		M						M																				
水文学原理	M			H					M																				
水文学原理实验									M			M																	
水文统计			H								M																		
水文测验										H		M																	
水文测验实验										H		M																	
水环境监测					M				M									M											
水环境监测实验						M							H				M												
水文预报		H											M																

课程及毕业要求	1. 工程知识			2. 问题分析		3. 设计/开发解决方案			4. 研究			5. 使用现代工具			6. 工程与可持续发展		7. 工程伦理与职业规范		8. 个人和团队			9. 沟通			10. 项目管理			11. 终身学习	
	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2
水文预报实验			H											M															
水文分析与计算			H			H							M																
地下水水文学	M			M																									
河流动力学			M			M			M																				
水动力学实验						M				M																			
水利经济			M																							H			
水环境化学	M			M													M												
水环境化学实验						M							M				M												M
水利计算			H			H							M																
水资源利用								H	H									M											
水环境保护			H									M					M												
地理信息系统与遥感应用		M				M			M																				
地理信息系统与遥感应用实验						M						H																	
地下水污染与防治			H					M				M																	
地下水污染与防治实验						M					H						M												
水文地球化学				M				M									M												
水文地质勘查	M															M													
水文水资源专业英语																								H					
文献检索及科技论文写作														H															M

课程及毕业要求	1. 工程知识			2. 问题分析		3. 设计/开发解决方案			4. 研究			5. 使用现代工具			6. 工程与可持续发展		7. 工程伦理与职业规范		8. 个人和团队			9. 沟通			10. 项目管理			11. 终身学习	
	1.1	1.2	1.3	2.1	2.2	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	6.1	6.2	7.1	7.2	8.1	8.2	8.3	9.1	9.2	9.3	10.1	10.2	10.3	11.1	11.2
劳动教育																			M			H			M				
军事技能训练																				H									
水文测验课程设计										H		M																	
水文统计课程设计			H								M																		
水文预报课程设计		H											M																
水文分析与计算课程设计				M		H				M																			
地下水水文学课程设计							M						M																
水利计算课程设计				M		H						M													H				
水资源利用课程设计				M			H																						
水环境保护课程设计							L				H						M												
工程测量学实习									M			H									M				M				
认识实习															H								M			L			
工程训练														H															
生产（或毕业）实习																		H					H						H
毕业设计（论文）								H		H	H		M									H							M
军事理论																				H									
国家安全教育																				H									
艺术实践																										M			
就业指导																	M			H									

六、核心课程

VI Core Courses

自然地理学 Physical Geography、气象学 Meteorology、水力学 Hydraulics、水文学原理 Principles of Hydrology、水文统计 Hydrological Statistics、水文测验 Hydrometry、水文预报 Hydrological Forecasting、水文分析与计算 Hydrological Analysis and Computation、水利计算 Water Conservancy Computation、水资源利用 Water Resources Utilization、水环境保护 Protection of Water Environment、地下水水文学 Groundwater Hydrology、水环境化学 Aqueous Environmental Chemistry、地理信息系统与遥感应用 Geographic Information System and Remote Sensing Applications

七、主要实践性教学环节

VII Main Internship and Practical Training

水力学实验 Hydraulics Experiments、水文测验实验 Hydrometry Experiments、水文学原理实验 Experiments for Principles of Hydrology、水文预报实验 Experiments of Hydrological Forecasting、水环境化学实验 Experiments of Aqueous Environmental Chemistry、水环境监测实验 Experiments of Water Environmental Monitoring、水动力学实验 Experiments of Water Dynamics、地理信息系统与遥感应用实验 Experiments of Geographic Information System and Remote Sensing Applications、地下水污染与防治实验 Experiments of Groundwater Contamination and Protection、水文测验课程设计 Project Design for Hydrometry、水文统计课程设计 Project Design for Hydrological Statistics、水文预报课程设计 Project Design for Hydrological Forecasting、地下水水文学课程设计 Project Design for Groundwater Hydrology、水文分析与计算课程设计 Project Design for Hydrological Analysis and Computation、水利计算课程设计 Project Design for Water Conservancy Computation、水资源利用课程设计 Project Design for Water Resources Utilization、水环境保护课程设计 Project Design for Protection of Water Environment、工程训练 Engineering Training、认识实习 Cognition Practice、生产（或毕业）实习 Production (or Graduation) Practice、毕业设计（论文）Graduation Project (Thesis)

八、学时与学分

VIII Hours/Credits

学时学分构成表

Table of Hours and Credits

<table>
<tr><th colspan="3" rowspan="2">课程类别
Course Classified</th><th rowspan="2">学时/周数
Period/Weeks</th><th colspan="2">学分
Credits</th><th rowspan="2">学分比例
Proportion of Crs.</th></tr>
<tr><th>理论
Theory</th><th>实践（双创）
Practice（I&E Crs.)</th></tr>
<tr><td colspan="2" rowspan="2">通识课程平台
General Course Platform</td><td>必修
Compulsory</td><td>546</td><td>26</td><td>3</td><td>18.13%</td></tr>
<tr><td>选修
Elective</td><td>112</td><td>7</td><td>（含创业 2）</td><td>4.37%</td></tr>
<tr><td colspan="2">学科基础课程平台
Basic Course Platform</td><td>必修
Compulsory</td><td>896</td><td>39.5</td><td>5.5</td><td>28.13%</td></tr>
<tr><td colspan="2" rowspan="2">专业课程平台
Major Course Platform</td><td>必修
Compulsory</td><td>664</td><td>31.5</td><td>5</td><td>22.81%</td></tr>
<tr><td>选修
Elective</td><td>104</td><td>5.5</td><td>0.5</td><td>3.75%</td></tr>
<tr><td colspan="2" rowspan="2">集中性实践课程平台
Practical Teaching Platform</td><td>必修
Compulsory</td><td>68+8W</td><td>0</td><td>28.5</td><td rowspan="2">17.81%</td></tr>
<tr><td>选修
Elective</td><td>/</td><td>/</td><td>/</td></tr>
<tr><td rowspan="2">素质拓展平台
Quality Developme nt Platform</td><td>双创学分
Innovation & Entrepreneursh ip Credits</td><td rowspan="2">必修
Compulsory</td><td>/</td><td>/</td><td>2</td><td>12.5%</td></tr>
<tr><td>其他学分
Other Credits</td><td></td><td>5</td><td>1</td><td>3.75%</td></tr>
<tr><td rowspan="2">小计
Amount</td><td colspan="2">必修学分总数
Compulsory Credits</td><td>147</td><td>选修学分总数
Elective Credits</td><td>13</td><td>选修学分比例
Proportion of Elective Credits</td><td>8.13%</td></tr>
<tr><td colspan="2">理论学分总数
Theory Credits</td><td>112.5</td><td>实践学分总数
Practice Credits</td><td>47.5</td><td>实践教学环节比例
Proportion of Internship and Practical Training</td><td>29.69%</td></tr>
<tr><td colspan="3">最低毕业学分
The Lowest Graduate Credits</td><td colspan="5">160</td></tr>
</table>

注：

ϕ学分比例：各教学平台或教学环节占最低毕业学分的比例。

□实践教学环节，包括集中性实践教学环节和实验教学（不含体育）。集中性实践教学环节，包括培养方案内集中实施的实践、实习、课程设计、毕业设计、毕业论文、社会调查等；实验教学，包括课内实验和独立开设实验。

□必修学分总数=通必学分+学科基础学分+专必学分+实践必修学分+素质拓展学分；

选修学分总数=通选学分+专选学分+实践（选修）学分；

理论学分总数=所有平台理论学分之和（不包括双创学分）；

实践学分总数=所有平台实践学分之和（不包括双创学分）；

最低毕业学分=必修学分+选修学分=理论学分+实践学分+双创学分。

九、教学进程计划表 /IX Teaching Schedule Form

表一：通识课程平台 / Form I: General Course Platform

表一（A）：通识必修课程/Form I (A):General Compulsory Courses (General Required)

课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
20W100000613	英语 1 English 1	2	32	32				1	
218110000313	体育 1 Physical Education 1	0/1	26			26		1	
217100014918	思想道德与法治 Moral Education and Rule of Law	2.5/0.5	52	40		12		2	
217100015218	形势与政策 Situation and Policy	2	32	32				2	
225100000118	中华民族共同体概论 Education of Chinese Minzu Community Consciousness	1.5/ 0.5	36	24		12		2	
20W100000713	英语 2 English 2	2	32	32				2	
218110000213	体育 2 Physical Education 2	0/1	32			32		2	
2171000122	中国近现代史纲要 Essentials of China Modern and Contemporary History	2.5/ 0.5	52	40		12		1	
20W100001018	学术英语阅读与写作 Academic English Reading and Writing	2	32	32				3/4	6 门课程，要求在第 3 或 4 学期完成 2 学分
20W100001318	高级媒体英语视听说 Advanced Media English: viewing, listening and speaking	2	32	32				3/4	
20W100001518	英语国家社会与文化 Society and Culture ofEnglish-speaking Countries	2	32	32				3/4	
20W100001618	中华文化导论（英文） Intoduction to Chinese Culture	2	32	32				3/4	
20w100002623	跨文化交际 Intercultural Communication	2	32	32				3/4	
20W100002523	中外文化比较 Comparison of Chinese and Foreign Cultures	2	32	32				3/4	
218110015018	体育 3 Physical Education 3	0/0.5	16			16		3	
217100012318	马克思主义基本原理 The Basic Principles of Marxism	2.5/0.5	52	40		12		4	
217100015818	毛泽东思想和中国特色社会主义理	2.5/0.5	52	40		12		3	

	论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics								
217100015918	习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	2.5/0.5	52	40		12		5	
218110014718	体育 4 Physical Education 4	0/0.5	16			16		4	
218110014018	体育 5 Physical Education 3	0/0.5	16			16		5	
218110015318	体育 6 Physical Education 3	0/0.5	16			16		6	
学分要求：必修学分 29 Demand of Credits: Required 29									

注：大学英语扩展课程包括学术英语阅读与写作、高级媒体英语视听说、英语国家社会与文化、中华文化导论（英文）、跨文化交际（英文）、中外文化比较，要求在第 3,4 学期完成 2 学分即可。

表一（B）：通识选修课程（通选课）/Form I (B): General Elective Courses

模块 Module	**学分 Crs.**
心理健康与安全 Psychological Health and Safety	7 **注：** 1. 必修心理健康教育、大学生生命与财物防护实务和美育相关课程 2. 理工科专业学生必修文科类课程 1 门
人文素养与写作 Humanistic Accomplishment and Writing	
科学技术与工程 Science and Technology & Engineering	
艺术体验与审美 Art Appreciation and Aesthetics	
国际视野与世界 Contemporary China and the World	
中华文化与文明 Chinese Culture and Civilization	
创业素养与实践	
学分要求：选修学分 7 Demand of Credits: Elective 7	

表二：学科基础课程平台

Form II. Basic Course Platform

课程类别 Course Classified	课程编号 Courses Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学科基础必修 Basic Courses Required	213100035618	无机化学（B）Z Inorganic Chemistry (B) Z	3	48	48				1	
	213110035818	无机化学实验（C） Inorganic Chemistry Experiments (C)	0.5	16		16			1	
	213103005213	分析化学（B） Analytical Chemistry (B)	2	32	32				1	
	213110036418	分析化学实验（B） Analytical Chemistry Experiments (B)	1	32		32			1	
	2101000113	高等数学 A(1) Higher Mathematics A (1)	4	80	64			16	1	
	2101000118	线性代数 Linear Algebra	2	48	32			16	1	
	210100025623	高等数学 A(2) Higher Mathematics A (2)	4.5	96	72			24	2	
	211100011318	大学物理 C College Physics C	3	56	48			8	2	
	211110021318	大学物理实验(1) University Physics Experiments (1)	0.5	16		16			2	
	2241000067	工程测量学 Engineering Surveying	2	32	32				2	
	2101000112	概率论与数理统计 Probability Theory and Mathematical Statistics	2.5	56	40			16	3	
	209100064918	人工智能与 Python 程序设计	2.5	56	24		32		1	人工智能类课程
	209100031518	程序设计语言（Matlab） Programming Language (Matlab)	1/0.5	32	16	16			3	人工智能类课程
学科基础必修 Basic Courses	224100027723	水利工程制图 Hydraulic Engineering Drawing	2	32	32				3	
	224110028223	水利工程制图实验	1.5	48		48			3	

课程类别 Course Classified	课程编号 Courses Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	224100003313	自然地理学 Physical Geography	2	36	32	4			3	铸牢中华民族共同体融入课程
	224100016718	气象学 Meteorology	2	36	32	4			3	
	213103015513	水利工程概论 An Introduction to Water Conservancy Engineering	2	32	32				3	
	213103015913	水力学 Hydraulics	4	64	64				4	
	213113015113	水力学实验 Hydraulics Experiments	0.5	16		16			4	
	224100021518	工程力学 Engineering Mechanics	2	32	32				4	
学分要求：必修学分 45 **Demand of Credits: Required 45**										

表三：专业课程平台

Form III: Major Courses Platform

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
专业必修 Required Courses	213103014913	水文学原理 Principles of Hydrology	4	64	64				4	人工智能类课程
	224110020518	水文学原理实验 Experiments for Principles of Hydrology	0.5	16		16			4	
	224100020118	水文统计 Hydrological Statistics	1.5	24	24				4	
	224100017018	水文测验 Hydrometry	2	32	32				4	
	224110017118	水文测验实验 Hydrometry Experiments	0.5	16		16			4	
	224100016818	水环境监测 Water Environmental Monitoring	1	16	16				3	
	224110016918	水环境监测实验 Experiments of Water Environmental Monitoring	0.5	16		16			3	
	2241000120	水文预报 Hydrological Forecasting	3	48	48				5	铸牢中华民族共同体融入课程
	2241100121	水文预报实验 Experiments of Hydrological Forecasting	0.5	16		16			5	
	2241000113	水文分析与计算 Hydrological Analysis and Computation	2	32	32				5	
	224100017218	地下水水文学 Groundwater Hydrology	2.5	40	40				5	
	213103017013	河流动力学 River Dynamics	2	32	32				5	
	2241100118	水动力学实验 Experiments of Water Dynamics	0.5	16		16			5	
	224100019118	水利经济 Economics of Water Conservancy	1.5	24	24				6	
	213103016413	水环境化学 Aqueous Environmental Chemistry	2	32	32				6	
	213113019013	水环境化学实验 Experiments of Aqueous Environmental Chemistry	0.5	16		16			6	
	2241000114	水利计算 Water Conservancy Computation	2	32	32				6	铸牢中华民族共同体融入课程
	213103032313	水资源利用 Water Resources Utilization	2	32	32				6	

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	213103017313	水环境保护 Protection of Water Environment	2	32	32				6	
专业必修 Required Courses	224100023718	地理信息系统与遥感应用 Geographic Information System and Remote Sensing Application	2	32	32				4	
	224110024318	地理信息系统与遥感应用实验 Experiments of Geographic Information System and Remote Sensing Application	1	32		32			4	
	213103032213	地下水污染与防治 Groundwater Contamination and Protection	2	32	32				6	
	224110020618	地下水污染与防治实验 Experiments of Groundwater Contamination and Protection	1	32		32			6	
专业选修 Elective courses	2241000122	水文地球化学 Hydro-geochemistry	2	32	32				5	要求选修6学分，其中第5学期最少选修2学分，第6学期最少选修1.5学分，第7学期最少选修2.5学分，其中实验最少选修0.5学分《人工智能在资源环境中的应用》课程属于人工智能类课程
	213103024513	环境生态学（B） Environmental Ecology (B)	2	32	32				5	
	224100027923	人工智能在资源环境中的应用 Application of AI in Resource and Environment	1	16	16				5	
	224100019718	水文地质勘察 Hydrogeological Survey	1.5	24	24				6	
	213103021413	生态水文学 Ecological Hydrology	1.5	24	24				6	
	213103029813	水文水资源专业英语 Professional English for Hydrology and Water Resources	1.5	24	24				7	
	213103017413	水灾害防治 Water-related Disaster Prevention and Control	1.5	24	24				7	
	224100022118	文献检索及科技论文写作 Literature Retrieval and Scientific Paper Writing	0.5/0.5	24	8	16			7	
	224100021718	流域水文模型 Hydrological Model of Watershed	0.5/0.5	24	8	16			7	
学分要求: 42.5，其中必修学分 36.5，选修学分 6 Demand of Credits: 43, Required 37, Elective 6										

表四：集中性实践课程平台

Form IV: Practical Teaching Platform

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Names	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 PeriodClassified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实践 Teaching Practice	实践 Teaching Practice	必修 Compulsory Courses	112110010718	劳动教育 Labor Education	1	32	√		1
			109110000318	军事技能训练 Military Skill Training	2	36	√		1
	课程设计 Project Design	必修 Compulsory Course	213113031413	水文测验课程设计 Project Design for Hydrometry	1	1W	√		4
			224110023518	水文统计课程设计 Project Design for Hydrological Statistics	1	1W	√		4
			2241100129	水文预报课程设计 Project Design for Hydrological Forecasting	1	1W	√		5
			2241100115	水文分析与计算课程设计 Project Design for Hydrological Analysis and Computation	1	1W	√		5
			224110023118	地下水水文学课程设计 Project Design for Groundwater Hydrology	1	1W	√		5
			2241100116	水利计算课程设计 Project Design for Water Conservancy Computation	1	1W	√		6
			213113029513	水资源利用课程设计 Project Design for Water Resources Utilization	1	1W	√		6
			224110000813	水环境保护课程设计 Project Design for Protection of Water Environment	1	1W	√		6
	小计 Amount				11	68+8W			
实习 Teaching Exercitation	专业实习 Teaching Exercitation	必修 Compulsory Course	2241100080	工程测量学实习 Engineering Surveying Practice	0.5	0.5W		√	2
			224110006213	认识实习 Cognition Practice	1	1W		√	4
			701110000118	工程训练 A Engineering Training	1	1W		√	5

课程类别 CourseClassified			课程编号 CourseCode	实践教学名称 Course Names	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 PeriodClassified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实习 Teaching Exercitation	毕业实习 Graduation Practice	必修 Compulsory Course	224110000313	生产（或毕业）实习 Production (or Graduation) Practice	3	3W		√	7
	毕业论文（设计） Graduation Thesis (Project)	必修 Compulsory Course	224110017618	毕业设计（论文） Graduation Project (Thesis)	12	12W		√	8
	小计 Amount				17.5	17.5W			
学分要求: 28.5，其中必修学分 28.5，选修学分 0 **Demand of Credits: 29.5, Required 29.5, Elective 0**									

表五：素质拓展平台

Form V: Quality Development Platform

课程编号 Course Code	课程/模块名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
109100000418	军事理论 Military Theory	2	36	36				1
109100000818	国家安全教育 National Security Education	1	16	16				2
	美育实践	1	24			24		1-7
/	创新教育 Innovation Education	2	/					
115100000213	大学生职业生涯与发展规划 Career and Development Planning of University Students	1	16					1
115100000113	就业指导 Employment Guidance	1	16	16				6
学分要求：必修学分 8 **Demand of Credits: Required 8**								

执笔人:　　审核人:

学院盖章:　　完成日期:

环境科学专业本科人才培养方案

Undergraduate Program for Environmental Science

一、培养规格

I Cultivation Standards

I）学制

Length of Schooling

修业年限：4 年

Duration:　4 years

II）学位

Degree

授予学位：理学学士学位

Degrees conferred:　Bachelor of Science

二、培养目标

II Education Objectives

以立德树人为根本任务，以铸牢中华民族共同体意识为主线，以服务地方经济社会发展为导向，培养学生德智体美劳全面发展，具有扎实的基础知识，系统掌握环境科学的基本理论与基本技能，熟悉污染物在环境介质中的迁移转化与控制治理，具备从事环境监测、环境影响评价、环境咨询与管理以及科学研究的能力，能在政府、企业与教学科研单位从事环境保护相关工作的创新型高级技术骨干和管理人才。

具体培养目标可以归纳为以下四个方面：

目标 1（知识能力）：能够掌握环境科学专业相关知识在环境监测和管理中的应用和发展现状，融会贯通数理基础知识和环境科学专业知识，分析研究复杂环境问题，提供整体解决方案。

目标 2（实践能力）：具备系统思维和可持续发展理念，能将知识有效运用到环境的监测、评价、治理和管理实践中，并具备一定的研究和管理能力。

目标 3（职业素养）：具备家国情怀、高尚的职业道德、社会责任感和良好的人文科学素养，具有与主管部门、业界同行、相关专业的配合和协调能力，具有一定的国际视野和文化交流能力。

目标 4（发展潜能）：具备较强的获取知识和综合应用知识的能力，能及时了解环境科学专业最新理论、技术以及国际前沿动态，有效地持续自主学习以适应社会和行业的发展变

化。

Taking moral education as the fundamental task, forging a sense of community for the Chinese nation as the mainline, and serving local economic and social development as the guidance, the students will be educated adapting “all-around” idea through moral, intellectual, physical, aesthetics and labor education, have a solid foundation of basic knowledge, master basic theories and knowledge relevant to environmental science, be familiar with the migration and transformation as well as control and management of pollutants in various ambient medium, and be skilled in monitoring, assessing, consulting and managing of environmental pollution as well as scientific research. They are qualified to take jobs related to environmental protection in governments, enterprises, colleges and scientific institutes, and grow up to be innovative senior talents in technology and management.

Cultivation Objective I (knowledge capability): Be able to grasp the application and development status of environmental science related knowledge in environmental monitoring and management, integrate mathematical basic knowledge and environmental science professional knowledge, analyze and study complex environmental problems, and provide overall solutions.

Cultivation Objective II (practical ability): Having systematic thinking and sustainable development concepts, able to effectively apply knowledge to environmental monitoring, evaluation, governance, and management practices, and possessing certain research and management capabilities.

Cultivation Objective III (professional quality): Posses family and country feelings, noble professional ethics, social responsibility and good humanities literacy, have the ability to cooperate and coordinate with competent authorities, industry peers, and related majors, and have certain international vision and cultural exchange ability.

Cultivation Objective IV (potential for development): Have the consciousness of lifelong learning and ability to apply associated knowledge comprehensively, able to keep abreast of the latest theories, technologies and international cutting-edge developments in environmental science so as to adapt to the development of society and industry.

三、毕业要求

Ⅲ Basic requirements for Cultivation

本专业学生主要学习自然科学和环境科学的基本理论和基础知识，接受环境科学专业技能的基本训练，培养系统地识别、分析与解决环境问题的素质和能力，具有从事本专业及相关领域科学研究和管理工作的基本能力。

1. **科学知识**：能够利用数学、物理、化学等自然科学、计算和环境科学专业知识解决环境监测、环境影响评价等项目的设计、运行和管理等复杂环境科学问题。

1.1 理解掌握数学、自然科学、计算等科学基础知识与基本方法，并能应用于表述复杂

科学问题；

1.2 能够相关科学基础知识与基本方法，构建环境污染和环境监测等复杂环境问题的数学模型，并进行预测和环境影响评价；

1.3 能够将环境学、环境化学、环境监测、环境影响评价、环境毒理学等环境科学基础知识应用于环境项目的设计、运行和管理。

2. **问题分析**：能够利用数学、自然科学和环境科学相关的基础理论和知识以及文献资料对环境问题进行识别、表达和分析，综合考虑可持续发展的要求，以获得有效结论。

2.1 能够运用数学、自然科学和环境科学的基本原理和专业知识，识别和判断复杂环境科学问题的关键点和参数；

2.2 能通过数学、自然科学和环境科学专业的概念、原理、方法，分析环境污染、监测、评价和管理中的关键环节和参数，并给予表述；

2.3 综合考虑可持续发展的要求，能够运用环境科学相关的基础理论和知识结合文献，分析环境污染、监测、评价和管理过程的影响因素及采用相关技术，并获得有效结论。

3. **设计/开发解决方案**：能够应用环境学、环境化学、环境监测、环境影响评价、环境土壤学、环境生态学、环境毒理学和环境规划与管理的基本原理和方法，设计、开发满足环境监测、环境影响评价和环境规划及管理的方案，并能够在方案中体现创新性，综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素。

3.1 能够根据环境污染的特征和监测及评价要求提出复杂环境科学问题的解决方案；

3.2 能够对所提出的解决方案及其科学可行性进行初步分析与论证；

3.3 能够进行环境监测、环境影响评价和环境规划及管理的方案设计，体现创新性，并在设计中综合考虑健康、安全与环境、全生命周期成本与净零碳要求、法律与伦理及社会与文化等因素，进而优化设计方案。

4. **研究**：能够基于科学原理并采用科学方法，开展试验研究，预测、分析环境监测、评价和管理中的问题，为解决环境保护中的复杂科学问题提供合理有效的结论。

4.1 掌握现代分析方法，能够识别复杂环境问题中的各种制约条件，分析研究对象的基本特征；

4.2 能够基于环境科学专业理论，根据环境污染对象特征，选择合适的研究路线、设计可行的研究方案；

4.3 能正确采集、整理研究数据，对研究结果进行关联、分析处理，获取合理有效的结论。

5. **现代工具的使用**：能够针对复杂环境科学问题，开发、选择与使用恰当的环境科学专业领域相关的计算机辅助设计、计算机模拟仿真等技术、资源和工具，熟练使用现代分析检测仪器，具备预测、模拟及优化环境监测、评价和管理实践中的复杂科学问题的能力，并能够理解其局限性。

5.1 理解和掌握环境监测、环境影响评价和环境规划及管理等方面的现代仪器、信息技术工具和相关软件的原理和方法；

5.1 能够基于复杂环境科学问题的分析，选择、使用和开发合适的现代分析仪器和计算机辅助设计软件等现代工具；

5.3 能够运用现代分析仪器和计算机辅助设计软件等现代工具，分析、预测、模拟和评价复杂环境问题，并理解各种方法的局限性。

6. **项目与可持续发展**：能够基于环境科学相关背景知识，在解决复杂项目问题的同时，分析和评价项目建设对健康、安全、环境、法律及经济和社会可持续发展的影响，并理解其承担的责任。

6.1 理解环境科学和社会可持续发展的内涵和意义，熟悉环境科学领域相关的技术规范、法律法规和区域政策；

6.2 能够基于环境科学相关背景知识，分析和评价环境污染及环境保护项目建设对健康、安全、环境、法律及经济和社会可持续发展的影响，并理解其承担的责任。

7. **学术伦理和职业规范**：具有科学报国、为民造福的意识，具有人文科学素养和社会责任感，能够理解和践行学术伦理，在环境监测、评价和管理等相关实践中遵守学术伦理、职业道德、规范和相关法律，履行责任。

7.1 树立和践行社会主义核心价值观，理解个人与社会的关系，有科学报国、为民造福的意识，具有人文社会科学素养和社会责任感；

7.2 理解学术伦理的核心理念，树立追求真理、潜心研究的科学精神和诚实公正、诚信守则的职业道德和规范，并能在环境监测、评价和管理等相关实践中遵守职业道德、规范和相关法律，履行责任。

8. **个人和团队**：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。

8.1 能在多样化、多学科背景下的团队合作中承担自己的角色，听取不同意见，具有一定组织管理能力，能够综合团队成员的建议，并进行合理决策；

8.2 具有较强的团队协作和人际交往能力，能同其他成员进行有效交流，并妥善处理组织内外关系。

9. **沟通**：能够就本专业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。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。

9.1 针对环境分析监测、环境影响评价和环境规划及管理等问题，具备良好的文字及语言表达能力、辩论能力、倾听能力；

9.2 能够就环境分析监测、环境影响评价和环境规划及管理等问题与业界同行及社会公众进行有效沟通和交流；

9.3 能够掌握环境科学专业及相关领域的发展动态，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。

10. **项目管理**：能够理解和掌握环境监测、环境影响评价等项目相关的管理原理和经济决策方法，并能在多学科环境中应用。

10.1 理解和掌握环境科学实践活动中涉及的项目管理原理与经济决策方法；

10.2 能够在多学科环境中应用项目管理的原理和经济决策的方法。

11. **终身学习**：具有自主学习终身学习和批判性思维的意识和能力，能够理解广泛的技术变革对科学和社会的影响，有不断学习和适应发展的能力。

11.1 具有自主学习、终身学习和批判性思维的意识和能力；

11.2 能够理解广泛的技术变革对科学和社会的影响，有不断学习和适应发展的能力。

The students of this major will learn basic theories and knowledge of natural science and environmental science, and take part in basic professional skill training. They are qualified to be skilled in recognizing, analyzing and resolving environmental problems, and have basic ability to engage in scientific research and management in this field and related fields.

1. Scientific knowledge: Be able to use professional knowledge in natural sciences such as mathematics, physics, chemistry, computing, and environmental science to solve complex environmental science problems such as the design, operation, and management of environmental monitoring, environmental impact assessment, and other projects.

1.1 Understand and master the basic knowledge and methods of mathematics, natural sciences, computing, and other sciences, and be able to apply them to express complex scientific problems;

1.2 Be able to apply basic scientific knowledge and methods, construct mathematical models for complex environmental problems such as environmental pollution and monitoring, and make predictions and environmental impact assessments;

1.3 Be able to apply basic knowledge of environmental science such as environmental science, environmental chemistry, environmental monitoring, environmental impact assessment, and environmental toxicology to the design, operation, and management of environmental projects.

2. Problem analysis: Be able to identify, express, and analyze environmental issues using fundamental theories and knowledge related to mathematics, natural sciences, and environmental sciences, as well as literature, comprehensively considering the requirements of sustainable development to obtain effective conclusions.

2.1 Be able to apply the basic principles and professional knowledge of mathematics, natural sciences, and environmental sciences to identify and judge the key points and parameters of complex environmental science problems;

2.2 Be able to analyze key links and parameters in environmental pollution, monitoring, evaluation, and management through concepts, principles, and methods in mathematics, natural sciences, and environmental sciences, and provide explanations;

2.3 Taking into account the requirements of sustainable development, being able to apply basic theories and knowledge related to environmental science combined with literature, analyze the influencing factors of environmental pollution, monitoring, evaluation, and management processes, adopt relevant technologies, and obtain effective conclusions.

3. Design/develop solutions: Be able to apply the basic principles and methods of environmental science, environmental chemistry, environmental monitoring, environmental impact assessment, environmental soil science, environmental ecology, environmental toxicology, and environmental planning and management, design and develop solutions that meet environmental monitoring, environmental impact assessment, and environmental planning and management, and can reflect innovation in the solutions, comprehensively considering factors such as health, safety and environment, full life cycle cost and net zero carbon requirements, legal and ethical, and social and cultural.

3.1 Be able to propose solutions to complex environmental scientific problems based on the characteristics of environmental pollution and monitoring and evaluation requirements;

3.2 Be able to conduct preliminary analysis and demonstration of the proposed solution and its scientific feasibility;

3.3 Be able to conduct environmental monitoring, environmental impact assessment, environmental planning and management scheme design, reflecting innovation, and comprehensively considering factors such as health, safety and environment, full life cycle cost and net zero carbon requirements, legal and ethical, and social and cultural aspects in the design, in order to optimize the design scheme.

4. Research: Be able to conduct experimental research based on scientific principles and using scientific methods, predict and analyze problems in environmental monitoring, evaluation, and management, and provide reasonable and effective conclusions for solving complex scientific problems in environmental protection.

4.1 Master modern analytical methods, be able to identify various constraints in complex environmental problems, and analyze the basic characteristics of research objects;

4.2 Be able to select appropriate research routes and design feasible research plans based on the professional theory of environmental science and the characteristics of environmental pollution objects;

4.3 Be able to correctly collect and organize research data, correlate and analyze research

results, and obtain reasonable and effective conclusions.

5. Use of modern tools: Be able to develop, select and use appropriate computer-aided design, computer simulation and other technologies, resources and tools related to the professional field of environmental science for complex environmental science problems, proficiently use modern analytical and testing instruments, have the ability to predict, simulate and optimize complex scientific problems in environmental monitoring, evaluation and management practices, and understand their limitations.

5.1 Understand and master the principles and methods of modern instruments, information technology tools, and related software in environmental monitoring, environmental impact assessment, and environmental planning and management;

5.1 Be able to analyze complex environmental scientific problems, select, use, and develop suitable modern analytical instruments and computer-aided design software and other modern tools;

5.3 Be able to use modern tools such as analytical instruments and computer-aided design software to analyze, predict, simulate, and evaluate complex environmental problems, and understand the limitations of various methods.

6. Project and Sustainable Development: Be able to analyze and evaluate the impact of project construction on health, safety, environment, law, and economic and social sustainable development while solving complex project problems based on background knowledge of environmental science, and understand the responsibilities it undertakes.

6.1 Be able to understand the connotation and significance of environmental science and social sustainable development, be familiar with relevant technical specifications, laws and regulations, and regional policies in the field of environmental science;

6.2 Be able to analyze and evaluate the impact of environmental pollution and environmental protection project construction on health, safety, environment, law, and sustainable economic and social development based on relevant background knowledge of environmental science, and understand their responsibilities.

7. Academic ethics and professional norms: Possess the awareness of serving the country scientifically and benefiting the people, possess humanities literacy and social responsibility, understand and practice academic ethics, abide by academic ethics, professional ethics, norms and relevant laws in environmental monitoring, evaluation and management practices, and fulfill responsibilities.

7.1 Establish and practice socialist core values, understand the relationship between individuals and society, have a scientific sense of serving the country and benefiting the people, possess humanistic and social science literacy, and a sense of social responsibility;

7.2 Understand the core concepts of academic ethics, establish the scientific spirit of pursuing truth and devoted research, and the professional ethics and norms of honesty, justice, and integrity, and be able to abide by professional ethics, norms, and relevant laws in environmental monitoring, evaluation, and management practices, and fulfill responsibilities.

8. Individual and Team: Able to take on the roles of individual, team member, and leader in a diverse and multidisciplinary team.

8.1 Be able to take on their own roles in diverse and multidisciplinary team collaboration, listen to different opinions, possess certain organizational and management skills, be able to integrate team members' suggestions, and make reasonable decisions;

8.2 Possess strong teamwork and interpersonal communication skills, able to effectively communicate with other members, and handle internal and external relationships properly.

9. Communication: Be able to effectively communicate and exchange ideas with industry peers and the general public on complex issues in this field, including writing reports and design documents, presenting speeches, and clearly expressing or responding to instructions. And possess a certain international perspective, able to communicate and exchange ideas in cross-cultural contexts.

9.1 Possess good writing and language expression skills, debate skills, and listening skills for environmental analysis and monitoring, environmental impact assessment, and environmental planning and management issues;

9.2 Be able to to effectively communicate and exchange ideas with industry peers and the general public on issues related to environmental analysis and monitoring, environmental impact assessment, and environmental planning and management;

9.3 Be able to to grasp the development trends of environmental science and related fields, able to communicate and interact in cross-cultural contexts, understand and respect language and cultural differences.

10. Project management: Be able to understand and master the management principles and economic decision-making methods related to environmental monitoring, environmental impact assessment, and other projects, and be able to apply them in multidisciplinary environments.

10.1 Be able to understand and master the project management principles and economic decision-making methods involved in environmental science practice activities;

10.2 Be able to apply the principles of project management and methods of economic decision-making in a multidisciplinary environment.

11. Lifelong learning: Possess the awareness and ability of self-directed learning, lifelong learning, and critical thinking, able to understand the impact of extensive technological changes on

science and society, and have the ability to continuously learn and adapt to development.

11.1 Possess awareness and ability for self-directed learning, lifelong learning, and critical thinking;

11.2 Be able to understand the impact of extensive technological changes on science and society, and have the ability to continuously learn and adapt to development.

四、毕业要求与培养目标对应矩阵

IV Matrices of Graduation Requirements and Education Objectives

培养目标及毕业要求 Cultivation Objectives & Graduation Requirements	培养目标 1 Cultivation Objective I	培养目标 2 Cultivation Objective II	培养目标 3 Cultivation Objective III	培养目标 4 Cultivation Objective IV
毕业要求 1 Graduation Requirement I	√	√	√	√
毕业要求 2 Graduation Requirement II	√	√		√
毕业要求 3 Graduation Requirement III	√	√		
毕业要求 4 Graduation Requirement IV	√	√		√
毕业要求 5 Graduation Requirement V	√	√		√
毕业要求 6 Graduation Requirement VI			√	
毕业要求 7 Graduation Requirement VII			√	
毕业要求 8 Graduation Requirement VIII			√	
毕业要求 9 Graduation Requirement IX			√	
毕业要求 10 Graduation Requirement X	√	√	√	
毕业要求 11 Graduation Requirement XI				√

五、毕业要求实现矩阵

V Matrices of relations of courses and Graduation Requirements

课程及毕业要求	1）科学知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）项目与与可持续发展	7）学术伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
英语									H		
体育											M
思想道德与法治							H				H
形式与政策						M					
中华民族共同体概论									H		
中国近现代史纲要						M					
马克思主义基本原理		H									M
毛泽东思想和中国特色社会主义理论体系概论						M					M
习近平新时代中国特色社会主义思想概论						H					
学术英语阅读与写作									M		
高级媒体英语视听说									H		M
英语国家社会与文化						H			M		
中华文化导论（英文）									M		M
跨文化交际（英文）									M		
中外文化比较						L			M		L
心理健康与安全									M		L

课程及毕业要求	1）科学知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）项目与与可持续发展	7）学术伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
人文素养与写作									M		L
科学技术与工程	M					L				M	
艺术体验与审美									M		
国际视野与世界									M		
中华文化与文明									M		
创业素养与实践								L	M	L	
分析化学（B）	H	M		H							
分析化学实验（B）	H	H			H						
无机化学（C）	H	M									
无机化学实验（C）	H	H			H						
有机化学（C）	H			H							
有机化学实验（B）	H	H		M							
物理化学（B）	H			M							
物理化学实验	H	H		H							
大学物理 C	H										
大学物理实验(1)	H	H									
高等数学 A（2）	H										
线性代数	M										
概率论与数理统计	M										
画法几何&工程制图	H		H		H						

课程及毕业要求	1）科学知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）项目与与可持续发展	7）学术伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
工程测量学	H		M					M			
环境学	H		M		M						
环境微生物学	M										
环境微生物学实验	H										
人工智能与 Python 程序设计					H						
CAD 制图	H		M								
现代环境分析（A）	H	H									
现代环境分析实验	H	H			H						
环境化学	H	M	M	H							
环境化学实验	H	M	M	M							
环境监测（A）	H	M	M		H						
环境监测实验（A）	H	M	M		H						
环境土壤学	H	M									
环境土壤学实验	H	M			H						
环境工程学（A）	H	M	M								
环境工程学实验	H	M	M								
环境生态学（A）	H	M		M							

课程及毕业要求	1）科学知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）项目与与可持续发展	7）学术伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
环境影响评价	H	M	M								
环境规划与管理	H							M		H	
环境科学综合实验	M			H				H		M	
环境数据分析方法	M	M			H						
物理性污染控制工程	M	M									
固体废物处置与资源化	M	M									
环境毒理学	M	M									
环境经济学	M	M									
环境法学	M	M									
环境样品前处理技术	M	M									
清洁生产	H	M				H	M				
环境科学专业英语				H					M		
环境纳米材料	M			M							
水环境保护	M										
生态监测与评价	M										
环境监测设备及应用	M										
文献检索及科技论文写作	M						H				

课程及毕业要求	1）科学知识	2）问题分析	3）设计/开发解决方案	4）研究	5）现代工具使用	6）项目与与可持续发展	7）学术伦理和职业规范	8）个人和团队	9）沟通	10）项目管理	11）终身学习
高级氧化技术	M	M		M							
人工智能在环境科学中的应用					H						
膜处理技术	M	M									
劳动教育							H	M			H
军事技能训练								H			
环境影响评价课程设计	M	M	M							M	
工程训练 D					M					M	
工程测量学实习	M					H					
环境监测实习	M				M	H					
认识实习	M	M				M					
生产（或毕业）实习	H	M				H	M				
毕业设计（论文）		M	H	H							
创新教育		H	H	H							M
创业教育与就业指导			H				H	H		H	H
军事理论											M
国家安全教育							H		M		H
美育实践									M		L

注①不同学期的同一门课程只需填写一次；

□所有的课程和教学活动都要列入表格，包括集中实践性环节；

□表格要清晰展示每门课程与“毕业要求”中每项具体要求达成的关联度情况，关联度强的用“H”表示，关联度中等的用“M”表示，关联度弱的用“L”表示。

六、核心课程

VI Core Courses

环境学 Environmental Science、环境化学 Environmental Chemistry、现代环境分析 Modern Environmental Analysis、环境监测 Environmental Monitoring、环境影响评价 Environmental Impact and Assessment、环境生态学 Environmental Ecology、环境微生物学 Environmental Microbiology、环境土壤学 Environmental Soil Science、环境工程学 Environmental Engineering

七、主要实践性教学环节

VII Main Internship and Practical Training

认识实习 Knowledge Acquirement、环境监测实习 Environmental Monitoring Practice、工程训练 D Engineering Training、环境影响评价课程设计 Environmental Impact and Assessment: Course Design、生产（或毕业）实习 Factory （or Graduation） Practice、毕业设计（论文） Graduation Project (Thesis)、现代环境分析实验 Experiments of Modern Environmental Analysis、环境化学实验 Experiments of Environmental Chemistry、环境微生物学实验 Experiments of Environmental Microbiology、环境监测实验 Experiments of Environmental Monitoring、环境土壤学实验 Experiments of Environmental Soil Science、环境工程学实验 Experiments of Environmental Engineering、环境科学综合实验 Comprehensive Experiments

八、学时与学分

VIII Hours/Credits

学时学分构成表

Table of Hours and Credits

<table>
<tr><th colspan="3" rowspan="2">课程类别
Course Classified</th><th rowspan="2">学时/周数
Period/Weeks</th><th colspan="2">学分
Credits</th><th rowspan="2">学分比例
Proportion of Credits</th></tr>
<tr><th>理论
Theory</th><th>实践（双创）
Practice (I&E Crs.)</th></tr>
<tr><td colspan="2" rowspan="2">通识课程平台
General Course Platform</td><td>必修
Compulsory</td><td>576</td><td>22</td><td>7</td><td>18.1%</td></tr>
<tr><td>选修
Elective</td><td>112</td><td>7</td><td>（含创业 2）</td><td>4.4%</td></tr>
<tr><td colspan="2">学科基础课程平台
Basic Course Platform</td><td>必修
Compulsory</td><td>768</td><td>37</td><td>5.5</td><td>26.6%</td></tr>
<tr><td colspan="2" rowspan="2">专业课程平台
Major Course Platform</td><td>必修
Compulsory</td><td>664</td><td>20.5</td><td>10.5</td><td>19.4%</td></tr>
<tr><td>选修
Elective</td><td>344</td><td>19.5</td><td>1</td><td>12.8%</td></tr>
<tr><td colspan="2" rowspan="2">集中性实践课程平台
Practical Teaching Platform</td><td>必修
Compulsory</td><td>22w</td><td></td><td>22</td><td rowspan="2">13.75%</td></tr>
<tr><td>选修
Elective</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">素质拓展平台
Quality Development Platform</td><td>双创学分
Innovation & Entrepreneurship Credits</td><td rowspan="2">必修
Compulsory</td><td>/</td><td>/</td><td>2</td><td>12.5%</td></tr>
<tr><td>其他学分
Other Credits</td><td>108</td><td>5</td><td>1</td><td>3.75%</td></tr>
<tr><td rowspan="2">小计
Amount</td><td colspan="2">必修学分总数
Compulsory Credits</td><td>139.5</td><td>选修学分总数
Elective Credits</td><td>20.5</td><td>选修学分比例
Proportion of Elective Credits</td><td>12.8%</td></tr>
<tr><td colspan="2">理论学分总数
Theory Credits</td><td>111</td><td>实践学分总数
Practice Credits</td><td>49</td><td>实践教学环节比例
Proportion of Internship and Practical Training</td><td>30.6%</td></tr>
<tr><td colspan="3">最低毕业学分
The Lowest Graduate Credits</td><td colspan="5">160</td></tr>
</table>

注：

Φ学分比例：各教学平台或教学环节占最低毕业学分的比例。

□实践教学环节，包括集中性实践教学环节和实验教学（不含体育）。集中性实践教学环节，包括培养方案内集中实施的实践、实习、课程设计、毕业设计、毕业论文、社会调查等；实验教学，包括课内实验和独立开设实验。

□必修学分总数=通必学分+学科基础学分+专必学分+实践必修学分+素质拓展学分；

选修学分总数=通选学分+专选学分+实践（选修）学分；

理论学分总数=所有平台理论学分之和（不包括双创学分）；

实践学分总数=所有平台实践学分之和（不包括双创学分）；

最低毕业学分=必修学分+选修学分=理论学分+实践学分+双创学分。

九、教学进程计划表 /IX Teaching Schedule Form

表一：通识课程平台 / Form Ⅰ: General Course Platform

表一（A）：通识必修课程/Form I (A):General Compulsory Courses (General Required)

课程编号 Course Code	课程名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
20W100000613	英语 1 English 1	2	32	32				1	
218110000313	体育 1 Physical Education 1	0/1	26			26		1	
217100014918	思想道德与法治 Moral Education and Rule of Law	2.5/0.5	52	40		12		2	
217100015218	形势与政策 Situation and Policy	2	32	32				2	
225100000118	中华民族共同体概论 Education of Chinese Minzu Community Consciousness	1.5/0.5	36	24		12		2	
20W100000713	英语 2 English 2	2	32	32				2	
218110000213	体育 2 Physical Education 2	0/1	32			32		2	
2171000122	中国近现代史纲要 Essentials of China Modern and Contemporary History	2.5/0.5	52	40		12		1	
218110015018	体育 3 Physical Education 3	0/0.5	16			16		3	
217100012318	马克思主义基本原理 The Basic Principles of Maxism	2.5/0.5	52	40		12		4	
218110014718	体育 4 Physical Education 4	0/0.5	16			16		4	
20W100001018	学术英语阅读与写作 Academic English Reading and Writing	2	32	32				3/4	6门课程，要求在第3或4学期完成2学分
20W100001318	高级媒体英语视听说 Advanced Media English: viewing, listening and speaking	2	32	32				3/4	
20W100001518	英语国家社会与文化 Society and Culture ofEnglish-speaking Countries	2	32	32				3/4	
20W100001618	中华文化导论（英文） Intoduction to Chinese Culture	2	32	32				3/4	
20w100002623	跨文化交际 Intercultural Communication	2	32	32				3/4	

20W100002523	中外文化比较 Comparison of Chinese and Foreign Cultures	2	32	32				3/4	
17100015818	毛泽东思想和中国特色社会主义理论体系概论 Introduction to MAO Zedong Thought and Socialist Theoretical System with Chinese Characteristics	2.5/0.5	52	40		12		3	
217100015918	习近平新时代中国特色社会主义思想概论 Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	2.5/0.5	52	40		12		5	
218110014018	体育 5 Physical Education 3	0/0.5	16			16		5	
218110015318	体育 6 Physical Education 3	0/0.5	16			16		6	
学分要求：必修学分 29 Demand of Credits: Required 29									

注：大学英语扩展课程包括学术英语阅读与写作、高级媒体英语视听说、英语国家社会与文化、中华文化导论（英文）、跨文化交际（英文）、中外文化比较，要求在第 3,4 学期完成 2 学分即可。

表一（B）：通识选修课程（通选课）/Form I (B): General Elective Courses

模块 Module	**学分 Crs.**
心理健康与安全 Psychological Health and Safety	7 **注：** 1. 必修心理健康教育、大学生生命与财物防护实务和美育相关课程 2. 理工科专业学生必修文科类课程 1 门
人文素养与写作 Humanistic Accomplishment and Writing	
科学技术与工程 Science and Technology & Engineering	
艺术体验与审美 Art Appreciation and Aesthetics	
国际视野与世界 Contemporary China and the World	
中华文化与文明 Chinese Culture and Civilization	
创业素养与实践	
学分要求：选修学分 7 Demand of Credits: Elective 7	

表二：学科基础课程平台

Form II. Basic Course Platform

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
学科基础必修 Basic Courses Required	213100035618	无机化学（B） Inorganic Chemistry (B) Z	3	48	48				1	
	213110035818	无机化学实验（C） Inorganic Chemistry Experiments (C)	/0.5	16		16			1	
	2101000113	高等数学 A(1) Higher Mathematics A (1)	4	80	64			16	1	
	2101000118	线性代数 Linear Algebra	2	48	32			16	1	
	213103005213	分析化学（B） Analytical Chemistry (B)	2	32	32				1	
	213110036418	分析化学实验（B） Analytical Chemistry Experiments (B)	/1	32		32			1	
	209100064918	人工智能与 Python 程序设计 Artificial Intelligence and Python Programming Design	1.5/1	56	24		32		1	人工智能类课程
	210100025623	高等数学 A(2) Higher Mathematics A (2)	4.5	96	72			24	2	
	211100011318	大学物理 C College Physics C	3	56	48			8	2	
	211110021318	大学物理实验(1) University Physics Experiments (1)	/0.5	16	0	16			2	
	2241000067	工程测量学 Engineering Surveying	2	32	32				2	
	224100000913	画法几何&工程制图 Descriptive Geometry & Engineering Drawing	2	32	32				3	

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	2101000112	概率论与数理统计 Probability Theory and Mathematical Statistics	2.5	56	40			16	3	
	213100035218	有机化学（C） Organic Chemistry (C)	3	48	48				3	
	213110036118	有机化学实验（B） Organic Chemistry Experiments (B)	/1	32		32			3	
	213100034518	物理化学（B） Physical chemistry (B)	3.5	56	56				3	
	213110034618	物理化学实验 Physical Chemistry Experiments	/1	32		32			3	
	224100017818	环境学 Environmental Science	2	32	32				3	铸牢中华民族共同体意识课程
	214103026713	环境微生物学 Environmental Microbiology	2	32	32				4	
	214113026613	环境微生物学实验 Experiments of Environmental Microbiology	/0.5	16	0	16			4	
学分要求：必修学分 42.5 Demand of Credits: Required 42.5										

表三：专业课程平台

Form III: Major Course Platform

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
专业必修 Compulsor Courses	224100024418	现代环境分析 Modern Environmental Analysis	2.5	40	40				4	
	2241100074	现代环境分析实验 Experiments of Modern Environmental Analysis	/1	32	0	32			4	
	224100017918	环境化学 Environmental Chemistry	3	48	48				4	
	213113018813	环境化学实验 Experiments of Environmental Chemistry	/1.5	48		48			4	
	224100024518	CAD 制图 Computer Aided Design	1/1.5	64	16	48			4	
	213103022413	环境监测（A） Environmental Monitoring (A)	3	48	48				5	铸牢中华民族共同体意识课程
	213113023713	环境监测实验（A） Experiments of Environmental Monitoring (A)	/1.5	48		48			5	
	213103016013	环境土壤学 Environmental Soil Science	2	32	32				5	
	213113031313	环境土壤学实验 Experiments of Environmental Soil Science	/1	32		32			5	
	224100018018	环境工程学（A） Environmental Engineering (A)	4	64	64				5	
	224110022518	环境工程学实验 Experiments of Environmental Engineering	/2	64		64			5	
	224100018118	环境生态学（A） Environmental Ecology (A)	3	48	48				5	
	224100005113	环境影响评价 Environmental Impact and Assessment	2	32	32				6	
	224110004113	环境科学综合实验 Comprehensive Experiments	/2	64		64			6	
专业选修 courses	224100022818	环境数据分析方法 Methods of Environmental Data Analysis	1.5/0.5	40	24	16			4	专业选修总学分 20.5 分，其中：实践学分不低于 1 学分。第四学期至少选修 5.5 学分；第六学
	2241000124	物理性污染控制工程 Physical Pollution Control	2	32	32				4	
	224100024218	清洁生产 Cleaner Production	1.5	24	24				4	

课程类别 Course Classified	课程编号 Course Code	课程名称 Course Name	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester	备注 Notes
					理论 The.	实验 Exp.	实践 Pra.	习题 Ueb		
	224100028123	人工智能在环境科学中的应用 Application of AI in Environmental Science	1/0.5	32	16	16			4	期至少选修13.5学分；第七学期至少选修1.5学分。《环境数据分析方法》《人工智能在环境科学中的应用》《文献检索及科技论文写作》课程属于人工智能类课程；《水环境保护》课程属于铸牢中华民族共同体意识课程
	224100014918	固体废物处置与资源化 Disposal and Reuse of Solid Waste	2	32	32				6	
	213103022013	环境毒理学 Environmental Toxicology	2	32	32				6	
	224100025118	环境经济学 Environmental Economy	2	32	32				6	
	224100022418	环境法学 Environmental Laws	2	32	32				6	
	213103020913	环境样品前处理技术 Pre-treating Methods for Environmental Samples	1.5	24	24				6	
	213103029713	环境规划与管理 Environmental Plans and Management	2	32	32				6	
	224100024118	环境科学专业英语 Specialized English	2	32	32				6	
	224100022618	环境纳米材料 Environmental nanomaterials	2	32	32				6	
	224100024018	高级氧化技术 Advanced Oxidizing Technology	2	32	32				6	
	213103017313	水环境保护 Protection of Water Environment	2	32	32				6	
	213103024313	膜处理技术 Membrane Treatment Technology	1.5	24	24				6	
	224100023818	生态监测与评价 Ecological Monitoring and Assessment	1.5	24	24				7	
	224100019618	环境监测设备及应用 Environmental Monitoring Instruments and Application	1.5	24	24				7	
	2241000078	文献检索及科技论文写作 Document Retrieval and Scientific Paper Writing	1/0.5	32	16	16			7	
学分要求: 51.5 (其中必修学分 31，选修学分 20.5) Demand of Credits: 52.0 (Required 31, Elective 20.5)										

表四：集中性实践课程平台

Form IV: Practical Course Platform

课程类别 Course Classified			课程编号 Course Code	课程名称 Course Name	学分 Crs.	周数/学时数 Total Period/Hrs.	学时类型 Period Classified		开课学期 Semester
							实践 Exp.	实习 Pra.	
实践 Practice	实践 Course Practice	必修 Compulsory Courses	112110010718	劳动教育 Labor Education	1	32	√		1
			109110000318	军事技能训练 Military Skill Training	2	36	√		1
	课程设计 Project Design	必修 Compulsory Course	224110024818	环境影响评价课程设计 Environmental Impact and Assessment: Course Design	2.5	2.5			6
	小计 Amount		5.5						
实习 internship	专业实习 Course internship	必修 Compulsory Course	2241100080	工程测量学实习 Engineering Surveying Practice	0.5	0.5			2
			224110006213	认识实习 Knowledge Acquirement	1	1			4
			224110018818	环境监测实习 Environmental Monitoring Practice	1	1			5
			701110000118	工程训练 A Engineering Training	1	1W		√	5
	毕业实习 Graduation internship	必修 Compulsory Course	224110000313	生产（或毕业）实习 Production (or Graduation) Practice	3	3			7
	毕业论文（设计） Graduation Thesis (Project)	必修 Compulsory Course	224110000113	毕业设计（论文） Graduation Project（Thesis）	10	10			8
	小计 Amount		16.5						
学分要求: 22（必修学分 22，选修学分 0） Demand of Credits: 22 (Required 22, Elective 0)									

表五：素质拓展平台

Form V: Quality Development Platform

课程编号 Course Code	课程/模块名称 Course Names	学分数 Crs.	总学时 Hrs.	学时类型 Period Classified				开课学期 Semester
				理论 The.	实验 Exp.	实践 Pra.	习题 Ueb	
109100000418	军事理论 Military Theory	2	36	36				1
109100000818	国家安全教育 National Security Education	1	16	16				2
	美育实践	1	24			24		1-7
/	创新教育 Innovation Education	2	/					
115100000213	大学生职业生涯与发展规划 Career and Development Planning of University Students	1	16					1
115100000113	就业指导 Employment Guidance	1	16	16				6
学分要求：必修学分 8 **Demand of Credits: Required 8**								

执笔人:　　审核人:

学院盖章:　　完成日期:

环境科学专业（第二学士学位）本科培养方案

Undergraduate Program for Environmental Science

(Second Bachelor's Degree)

一、培养规格

I Cultivation Standards

I）学制

Length of Schooling

修业年限：2 年

Duration: 2 years

II）学位

Degree

授予学位：理学学士学位

Degrees conferred: Bachelor of Science

二、培养目标

II Education Objectives

培养系统掌握环境科学的基本理论与基本技能，熟悉污染物在环境介质中的迁移转化与控制治理，具备从事环境监测、环境影响评价、环境咨询与管理以及科学研究的能力，能在政府、企业与教学科研单位从事环境保护相关工作的创新型高级技术骨干和管理人才。

To cultivate innovative senior technical backbone and management talents who master the basic theories and skills of environmental science, are familiar with the migration, transformation, and control of pollutants in environmental media, possess the ability to engage in environmental monitoring, environmental impact assessment, environmental consulting and management, and scientific research, and can engage in environmental protection related work in government, enterprises, and educational research institutions.

三、毕业要求

Ⅲ Basic requirements for Cultivation

本专业学生主要学习环境科学的基本理论和基础知识，接受环境科学专业技能的基本训练，培养系统地识别、分析与解决环境问题的素质和能力。

1、具有宽厚的自然科学基础知识、良好的思想品德与人文素养；

2、掌握全面扎实的环境科学专业的基本理论与基础知识；

3、掌握环境科学专业的基本实验方法和操作技能，初步具备环境监测、环境影响评价以及环境咨询与管理的能力；

4、熟悉国家环境保护、资源利用、可持续发展等方面的相关政策、法律法规、标准和规范；

5、 具备较强的获取知识和综合运用知识的能力，初步具备创新性开展科学研究的能力。

Students in this major mainly study the basic theories and knowledge of environmental science, receive basic training in environmental science professional skills, and cultivate the quality and ability to systematically identify, analyze, and solve environmental problems.

1. Having a broad foundation in natural sciences, good moral character and humanistic literacy;

2. Master the basic theories and knowledge of comprehensive and solid environmental science majors;

3. Master the basic experimental methods and operational skills of environmental science major, and have preliminary abilities in environmental monitoring, environmental impact assessment, and environmental consulting and management;

4. Familiar with relevant policies, laws, regulations, standards, and norms related to national environmental protection, resource utilization, and sustainable development;

5. Strong ability to acquire knowledge and apply knowledge comprehensively, and preliminary ability to conduct innovative scientific research.

四、核心课程

IV Core Courses

环境学、环境工程 CAD、环境化学、现代环境分析、环境监测、环境影响评价、环境生态学、环境微生物学、环境土壤学、环境工程学、环境规划与管理、环境数据分析方法。

五、主要实践性教学环节

V Main Internship and Practical Training

环境监测实习、环境影响评价课程设计、毕业设计（论文）、现代环境分析实验、环境化学实验、环境微生物学实验、环境监测实验、环境土壤学实验、环境工程学实验、环境科学综合实验。

六、学时与学分

VI Hours/Credits

课程类别 \ 各学期学分分配		学期			
		一	二	三	四
学科基础课	理论课	2	9.5	0	0
	实验课	0	5.0	0	0
专业必修课	理论课	8	4	4	0
	实验课	2.5	0	2	2
专业选修课	理论课	0.5	2	4	2
	实验课	0.5	0	0	0
实践环节	实践课	0	2	0	0
毕业环节	毕业论文	0	0	0	10
小计		14	22.5	10	14
最低毕业学分		60			

七、教学进程计划表

VII Teaching Schedule Form

课程类别	课程编号	课程名称	学分数	总学时	学时类型			开课学期
					理论	实验	实践	
学科基础课	224100017818	环境学	2	32	32			1
	224100024518	CAD 制图	1/1.5	64	16	48		2
	224100022818	环境数据分析方法	1.5/0.5	40	24	16		2
	214103026713	环境微生物学	2	32	32			2
	214113026613	环境微生物学实验	0.5	16	0	16		2
	2241000073	现代环境分析	2	32	32			2
	2241100074	现代环境分析实验	1	32	0	32		2
	224100017918	环境化学	3	48	48			2
	213113018813	环境化学实验	1.5	48		48		2
专业必修课	213103022413	环境监测（A）	3	48	48			1
	213113023713	环境监测实验（A）	1.5	48		48		1
	213103016013	环境土壤学	2	32	32			1
	213113031313	环境土壤学实验	1	32		32		1
	224100018118	环境生态学（A）	3	48	48			1
	224100005113	环境影响评价	2	32	32			2
	213103029713	环境规划与管理	2	32	32			2
	224110022518	环境工程学实验	2	64		64		3
	224100018018	环境工程学（A）	4	64	64			3
	224110004113	环境科学综合实验	2	64		64		4
专业选修课	224100022118	文献检索及科技论文写作	0.5/0.5	24	8	16		1
	2241000124	物理性污染控制工程	2	32	32			2
	213103018913	污染控制微生物工程	1.5	24	24			2
	213103022013	环境毒理学	2	32	32			3
	213103020913	环境样品前处理技术	1.5	24	24			3
	224100024218	清洁生产	1.5	24	24			3
	224100024118	环境科学专业英语	2	32	32			3
	224100022618	环境纳米材料	2	32	32			3
	213103015413	水化学(A)	2	32	32			3
	224100001713	地理信息系统	2	32	32			3
	224100024018	高级氧化技术	2	32	32			3

	213103017313	水环境保护	2	32	32			4
	224100014918	固体废物处置与资源化	2	32	32			4
实践环节	224110001113	环境影响评价课程设计	2	2W				2
毕业环节	224110000113	毕业设计（论文）	10	10W				4

执笔人:　　审核人:

学院盖章:　　完成日期: