

环境工程专业（地质环境调查方向）卓越计划培养方案

专业名称与代码：环境工程专业 082502

专业培养目标：

本专业培养具备良好道德品质、文化修养和创新实践能力的环境工程卓越工程师；掌握环境工程和地球科学跨学科交叉专业的基础知识，具有应用现代化工具和信息技术手段在矿山、湖泊、城市等环境敏感区从事专业工作的能力，具有良好的科学人文素质、国际化视野、创新实践能力和组织领导能力；能够在生态环境和自然资源领域从事环境工程和环境地质方向的调查、评价、设计和管理的应用型人才，毕业五年后在相关工程单位可以作为项目主管或项目骨干，具有较强的综合管理能力与现场应急处置能力。

培养目标可以分解为如下5个子目标：

目标1：具有高尚的职业道德和高度的社会责任感，了解国家及相关法律法规、法规和规章；

目标2：具有良好的自然科学与人文科学素养，具备地学、数学、物理、化学、计算机、外语和管理等方面的应用基础，系统地掌握本专业的基本理论、基础知识与技能，经过实践，具备工程师的基本素质；

目标3：具有继续学习能力，了解本专业技术发展状况，具有较丰富的专业知识和技术工作经验，能够处理较复杂的技术问题；

目标4：具备开展水、土、矿山等环境介质的调查、监测、评估与规划等方面的能力；

目标5：能够运用各种技术手段，完成环境修复工程项目技术设计、咨询、评估及管理工程项目的组织实施能力。

专业发展历史沿革：

1. 学校定位

中国地质大学（武汉）是教育部直属全国重点大学，是国家批准设立研究生院的大学，是国家“211 工程”、国家“双一流”建设高校。学校以地球科学为主要特色，学科涵盖理学、工学、文学、管理学、经济学、法学、教育学、艺术学等门类，拥有地质学、地质资源与地质工程 2 个“双一流”建设学科。学校全面落实立德树人根本任务，以培养“品德高尚、基础厚实、专业精深、知行合一”的优秀人才为目标，努力构建跨学科专业交叉融合、教学与科研实践融合、创新创业教育与专业教育融合的“三融合”人才培养模式。

2. 专业发展历程：

环境工程专业由 1994 年设立的我国第一个环境地质学硕士点演化而来；2000 年获批环境工程博士点，并被列为湖北省重点学科，是湖北省第一个环境工程博士学位授予权点；2003 年获批设立“环境科学与工程”博士后流动站；2005 年获批环境科学与工程一级学科博士点，第四轮学科评估结果为 B⁺。2011 年环境工程专业入选国家特色专业，2013 年入选教育部卓越工程师计划，2014 年进入全球生态/环境领域 ESI 排名的前 1%，2019 年入选国家一流专业，2022 年获批环境工程专业（环境地质方向）教育部首批虚拟教研室，2022 年第五轮学科评估结果保持 B⁺。2023 年进入全球生态/环境领域 ESI 排名的前 1%。

专业毕业要求：

1. **基础知识：**掌握环境工程原理、水-土-气-固废等环境问题调查、评价、监测、防治和管理等专业理论和工作方法；掌握环境地质的基础理论知识和工作方法。

2. **问题分析：**掌握水污染控制工程、固体废物处理与处置、地下水污染防治、地质环境调查评价、矿山地质环境治理等技术方法；能够应用自然科学、环境工程和环境地质学的基本原理，识别、表达、并通过文献研究分析复杂环境问题，以获得有效结论。

3. **设计/开发解决方案：**具有从事环境工程调查、分析、评价、设计和制图的基本技能，具有综合分析和解决工程实际问题的能力，具有系统的工程实践学习经历；能够设计针对复杂地质环境问题的解决方案，设计满足规范和技术要求，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。

4. **研究：**掌握环境工程专业基础知识和专业理论，掌握地质环境工作的技术方法，能在矿山、湖泊和城市等环境敏感区开展调查与研究；具备设计和实施具体研究方案的能力，能够对研究结果进行科学分析，并得到合理有效的结论。

5. **使用现代工具：**针对环境工程的专业问题，能够开发和现代工程工具和信息科学技术进行表达、分析和展示，包括对复杂地质环境问题的预测与模拟。

6. **工程与社会：**了解与本专业相关的职业和行业的生产、设计、研究与开发、环境保护和可持续发展等方面的方针、政策和法律法规；能正确认识工程对于客观世界和社会的影响，发扬“艰苦朴素、求真务实”的校训精神；能够基于工程相关背景知识进行合理分析，理解和评价针对复杂工程问题的专业工程实践对环境、健康、安全、法律、文化以及社会可持续发展的影响，并理解应承担的责任。

7. **环境和可持续发展：**能够理解和评价针对复杂工程问题的专业工程实践对环境、社会可持续发展的影响；

8. **职业规范：**具有人文社会科学素养、社会责任感，具有本学科专业所应具有的职业技能、职业行为、职业作风和职业意识；具备较高的综合素质，包括身体素质、心理素质、文化素质和专业素质，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。

9. **个人和团队：**能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色，履行职责，促进发展，具有组织管理能力和团队合作精神。

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

11. **沟通交流：**能够就本学科专业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；具备一定的国际视野，较强的英语综合运用能力，能熟练阅读本专业的英文技术文献，能够在跨文化背景下进行沟通和交流。具有良好的沟通能力，能够开展管理协调、技术洽谈工作。

12. **终身学习：**树立终身学习思想；掌握文献检索、资料查询及运用现代信息技术获取相关信息的基本方法；具有较强的自我获取知识的能力，具备不断拓展自身知识面和终身获取新知识的能力，有不断学习和适应发展的能力。

毕业要求实现及途径：

序号	毕业要求	实现途径（教学过程）
1	基础知识：能够将数学、自然科学、工程基础和专业知用于解决复杂地质环境问题。	① 课堂教学：高等数学、大学物理、物理实验、线性代数、概率论与数理统计、大学化学、大学化学实验 ② 课外学习：专题讲座、学术报告等。
2	问题分析：能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析复杂地质环境问题，以获得有效结论。	① 课堂教学：普通地质学、矿物岩石学、构造地质学、地貌学及第四纪地质学、岩体力学、土力学、地质认识实习（北戴河）、地质教学实习（周口店）、环境地质教学实习（秭归） ② 课外学习：课程作业、大学生科研立项、学科前沿调研报告等。
3	设计/开发解决方案：能够设计针对复杂环境问题的解决方案，设计满足特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。	① 课堂教学：流体力学、水文地质学基础、水文地球化学、地下水防治与防治、土壤污染与防治、环境地质学、环境地球化学、环境系统工程、污染控制类课程 ② 课外学习：课程作业、大学生科研立项、学科前沿调研报告等。
4	研究：能够基于科学原理并采用科学方法对复杂环境问题进行研究，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。	① 课堂教学：GIS 原理与应用、地下水污染与防治、土壤污染和防治、环境监测、环境影响评价、环境同位素原理与技术、环境地球化学、污染控制类课程 ② 课外学习：课程作业、大学生科研立项、学科前沿调研报告、学科竞赛、发明创造、科研报告等。
5	使用现代工具：能够针对复杂地质环境问题，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。	① 课堂教学：Python、数值模拟技术与应用、分析化学、GIS、环境地质大数据与机器学习。 ② 课外学习：课程作业、大学生科研立项、学科前沿调研报告等。
6	工程与社会：能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。	① 课堂教学：创新创业、工程伦理与环境法规、环境工程原理、环境系统工程等。 ② 课外学习：课程作业、大学生科研立项、专题讲座等。
7	环境和可持续发展：能够理解和评价针对复杂工程问题的专业工程实践对环境、社会可持续发展的影响。	① 课堂教学：环境监测、环境影响与评价、环境规划与管理、环境系统工程 ② 课外学习：工程作业、大学生科研立项、专题讲座等。

序号	毕业要求	实现途径（教学过程）
8	职业规范：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。	① 课堂教学：思想道德修养与法律基础、工程伦理与环境法规。 ② 课外学习：入学教育、大学生心理健康教育、形势与政策教育、就业指导、毕业教育、班主任和辅导员的专题讲座、学术讲座等。
9	个人和团队：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。	① 课堂教学：地质认识实习（北戴河）、地质教学实习（周口店）、环境地质教学实习（秭归）、毕业实习和设计/论文。 ② 课外学习：入学教育、大学生心理健康教育、形势与政策教育、就业指导、毕业教育、班主任和辅导员的专题讲座、学术讲座等。
10	沟通：能够就复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。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。	① 课堂教学：大学英语、各种野外实习。 ② 课外学习：学科前沿调研报告、科技论文报告会、学术讲座、撰写科技论文、参加教师科研项目等。
11	项目管理：理解并掌握工程管理原理与经济决策方法，并能在多学科环境中应用。	① 课堂教学：工程伦理与环境法规、工程招标投标与概预算、工程管理、环境系统工程② 课外学习：大学生科研立项、参加教师科研项目等。
12	终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。	① 课堂教学：毕业实习和设计/论文、社会调查、企业实践 ② 课外学习：课程作业、学科竞赛、发明创造、科研报告、大学生科研立项等。

本专业学生毕业要求对培养目标的支撑关系矩阵

培养目标 毕业要求	目标 1	目标 2	目标 3	目标 4	目标 5
(1) 基础知识		√		√	√
(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) 专业与社会	√	√	√	√	√
(7) 环境和可持续发展	√	√	√	√	√
(8) 职业规范	√			√	√
(9) 个人和团队	√			√	√
(10) 沟通	√		√	√	√
(11) 项目管理					√
(12) 终身学习：		√	√		

主干学科：环境科学与工程、地下水科学与工程、水文与水资源、地质工程。

专业核心课程：环境微生物学、环境工程原理、水污染控制工程、环境监测、环境影响评价、环境规划与管理、水文地质学基础、环境地球化学、流体力学、地下水污染防治、土壤污染防治、矿山地质环境保护与治理等。

主要专业实验：环境监测实验、水文地质学基础系列实验、土壤污染防治实验、地下水动力学实验、水化学分析实验、地下水污染防治实验。

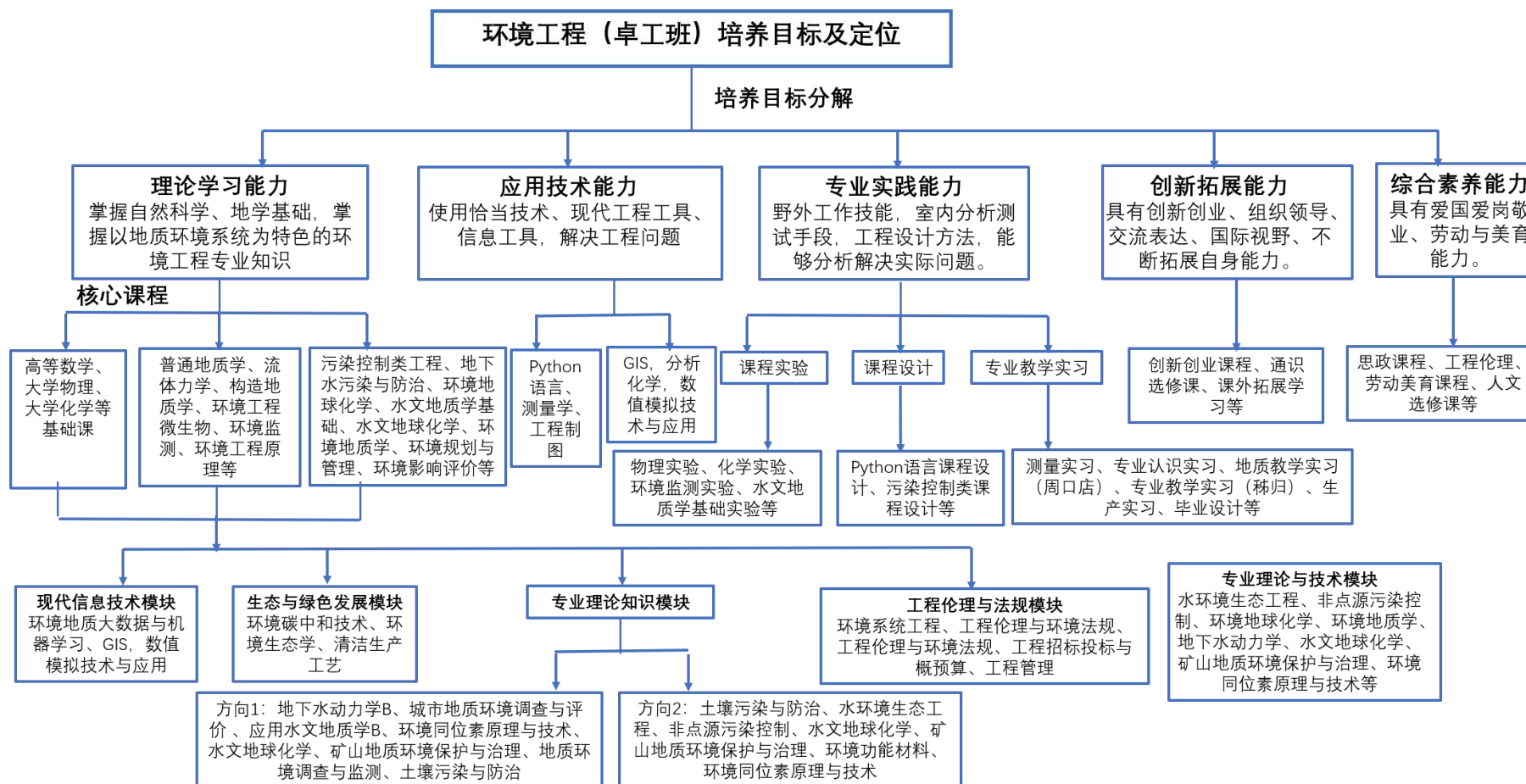
主要实践性教学环节：地质环境认识实习、地质教学实习、专业教学实习、水污染控制专业课程设计、城市地质环境调查与评价课程设计、矿山地质环境保护与治理课程设计、企业生产实践与毕业设计等。

毕业学分要求：不少于 170 学分。

学制与学位：四年，工学学士。

本专业学生可以辅修的其他专业：管理工程、环境设计。

相近专业：环境科学、生态学、地下水科学与工程、水文与水资源



Program for Excellent Engineer Class in Environmental Engineering (Geological Environment Survey)

Specialty and Code: Environmental Engineering 082502

Education Objectives:

The program aims at cultivating excellent engineers with high morals quality, culture background and innovation ability. The graduates are expected to master essential knowledge related to environmental engineering, and have education background in geology. The graduates are also expected to be able to use modern tools and information to conduct professional work in the regions where it is sensitive to the environment change such as the mine, lake and city. In addition, the program also aims at improving qualities and abilities of students on scientific and humanistic quality, international vision, innovative ability and organizational leadership ability, to insure them can be engaged in the investigation, evaluation, design and management of environmental engineering and environmental geology in the field of ecological environment and natural resources.

The education objectives can be decomposed into four sub-objectives as follow:

(1) Have noble professional ethics and a high sense of social responsibility, understand the laws, regulations, and rules of the country and related industries;

(2) Have good natural science and humanities scientific literacy, have applied foundation in geosciences, mathematics, physics, chemistry, computers, foreign languages and management, systematically master the basic theories, basic knowledge and skills of the specialty, and have the basic quality of engineers through practice;

(3) Have the ability to continue learning, understand the technical development status of this major, have rich professional knowledge and technical work experience, and be able to handle complex technical problems;

(4) Possess the ability to conduct investigations, monitoring, evaluation, and planning of environmental media such as water, soil, and mines;

Objective 5: Be able to use various technical means to complete the organization and implementation of technical design, consultation, evaluation and management of environmental remediation projects.

History of professional development:

1. School positioning: China University of Geosciences (Wuhan) is a national key university directly under the Ministry of Education, a university approved by the state to set up graduate schools, and a national "211 project" and national "double first-class" construction university. The school is characterized by earth science, covering science, engineering, literature, management, economics, law, education, art and other disciplines. It has two "double first-class" construction disciplines of geology, geological resources and geological engineering. The school fully implements the fundamental task of cultivating people with

morality, and aims to cultivate outstanding talents with noble morality, solid foundation, profound specialty, and unity of knowledge and practice. It strives to build a "three-integration" talent training model that integrates interdisciplinary majors, teaching and research practice, innovation and entrepreneurship education and professional education.

2. History of professional development:

Environmental Engineering evolved from China's first Master's program in Environmental Geology established in 1994; In 2000, it was approved as a doctoral program in environmental engineering and listed as a key discipline in Hubei Province, making it the first doctoral degree granting authority in environmental engineering in Hubei Province; In 2003, it was approved to establish a postdoctoral mobile station for "Environmental Science and Engineering"; In 2005, it was approved as a doctoral program in the first level discipline of Environmental Science and Engineering, and the fourth round of discipline evaluation results were B+. In 2011, the Environmental Engineering major was selected as a national characteristic major. In 2013, it was selected as the Excellent Engineer Program of the Ministry of Education. In 2014, it entered the top 1% of the global ESI ranking in the ecological/environmental field. In 2019, it was selected as a national first-class major. In 2022, it was approved as one of the first virtual teaching and research rooms of the Ministry of Education for the Environmental Engineering major (environmental geology direction). In 2022, the fifth round of subject evaluation results maintained a B+. In 2023, it entered the top 1‰ of ESI rankings in the global ecological/environmental field.

Graduation Requirements:

Students are expected to have the following abilities,

1. Basic Knowledge: master the basic theoretical knowledge and working methods of environmental engineering, pollution and control for water-soil-air-solid waste, survey, assessment and monitoring as well as planning and management related to environmental engineering. The students are also expected to have the fundamental theoretical knowledge and learn the basic working methods in the field of environmental geology.

2. Problem Analysis: master the fundamental theories, methods, techniques in water pollution control engineering, solid waste treatment and disposal, groundwater pollution control, survey and assessment of geological environment, control and protection for geological environment in mine. The students are also expected to be able to apply the fundamental theories of natural science, environmental engineering, and environmental geology to identify, express, and analyze problems on complex geological environment.

3. Design/Development Solution: possess the basic abilities and techniques of survey, analysis, assessment, design, mapping, and computation for practical engineering problems. In addition, students are expected to have professional training experiences to ensure them

capable of designing comprehensive solutions to the problems on complex geological environment. The designed solutions should fulfill the system or unit requirements in terms of processing procedure and method. It is encouraged for students to keep innovation in mind during the design process by considering variable factors including society, health, safety, rules, culture and environment, etc.

4. Research: master the fundamental specialized knowledge and theories in environmental engineering, and have the basic working methods for environmental geology in order to fulfill the study and research in regions where it is very sensitive to the geological environment such as a mine or a city. Students are also expected to acquire the ability to design, to conduct experiment, to analyze the experiment results in the field and to draw reasonable and reliable conclusions through information synthesis.

5. Modern Tool Application: develop, select and use appropriate technology, resources, modern engineering tools and information technology tools for specialized problems in the field of environmental geology, including predictions and simulations for problems on complex geological environmental.

6. Engineering and Society: understand the policies, laws and regulations on production, design, research, development, environmental protection and sustainable development of occupations and industries related to the profession; understand the impact of engineering on the world and society, carrying forward the spirit of "hardworking, plain-living, truth-seeking, being pragmatic ". Students are also expected to conduct reasonable analysis based on engineering-related background knowledge, evaluate the impact of professional engineering practice for complex engineering problems on environment, health, safety, law, culture and sustainable development, and understand the relevant social responsibility.

7. Environment and Sustainable Development: understand and evaluate the impacts of professional engineering practice for the complex engineering problems in hydrology and water resources on environment and sustainable development of society.

8. Professional Norms: have humanities and social science literacy, social responsibility, the professional skills and conduct, professional ethics and professional awareness of this major; have an all-round development of physical, psychological, cultural and professional quality; be capable of understanding the responsibility and abiding by engineering ethics and norms in engineering practice.

9. Individual and Teamwork: be capable of taking the roles of individuals, team members, and leaders in a multidisciplinary team, fulfilling responsibility, and promoting the development and show competence in management and teamwork.

10. Project Management: understand and master the engineering management principles and economic decision-making methods, and apply them in multi-disciplinary context.

11. Communication: be capable of effectively communicating with industry peers and the

public on professional issues of this discipline, including report composition and design, statement presentation, instruction giving and responding. Students are also expected to be proficient in English and competent in reading English research literature concerning this major, and show competence in communication, coordination and negotiation with an international vision.

12. Lifelong learning: have the awareness of lifelong learning; master the basic methods of literature research, data injury and application of modern information technology to obtain relevant information; be capable of autonomous learning, expanding and acquiring new knowledge, and constant learning and adaptation.

Graduation Requirements and Pathways:

No.	Graduation requirements	Pathways (Teaching Process)
1	Basic Knowledge: To master the basic theoretical knowledge and working methods of environmental engineering, pollution and control for water-soil-air-solid waste, survey, assessment and monitoring as well as planning and management related to environmental engineering. The students are also expected to have the fundamental theoretical knowledge and learn the basic working methods in the field of environmental geology.	① Classroom Teaching: Advanced Mathematics, College Physics, Physics Experiments, Linear Algebra, Probability and Mathematics Statistics, College Chemistry, College Chemistry Experiments ② Extracurricular Learning : Lectures on special topics, Academic report, etc.
2	Problem Analysis: To master the fundamental theories, methods, techniques in water pollution control engineering, solid waste treatment and disposal, groundwater pollution control, survey and assessment of geological environment, control and protection for geological environment in mine. The students are also expected to be able to apply the fundamental theories of natural science, environmental engineering, and environmental geology to identify, express, and analyze problems on complex geological environment.	① Classroom Teaching: General Geology, Mineralogy and Petrology, Tectonics, The Geomorphology and Quaternary Geology, Rock Mass Mechanics, Soil Mechanics, Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian), Environmental Geology Teaching Practice (Zigui) ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Survey Report of Academic Frontier, etc.
3	Design/Development Solution: To possess the basic abilities and techniques of survey, analysis, assessment, design, mapping, and computation for practical engineering problems. In addition, students are expected to have professional training experiences to ensure them capable of designing comprehensive solutions to the problems on complex geological environment. The designed solutions should fulfill the system or unit requirements in terms of processing procedure and method. It is encouraged for students to keep innovation in mind during the design process by considering variable factors including society, health, safety, rules, culture and environment, etc.	① Classroom Teaching: Hydraulics, The Fundamental of Hydrogeology, Groundwater Hydraulics, Hydro-Geochemistry, Vadose Zone Hydrogeology, Water Resources Exploitation and Protection, Groundwater Prevention Technology and Methods, Soil Mechanics, Rock Mechanics, Rock and Soil Testing Techniques, Environmental Geology, Introduction of Environmental Science ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Survey Report of Academic Frontier, etc.

No.	Graduation requirements	Pathways (Teaching Process)
4	Research: To master the fundamental specialized knowledge and theories in environmental engineering, and have the basic working methods for environmental geology in order to fulfill the study and research in regions where it is very sensitive to the geological environment such as a mine or a city. Students are also expected to acquire the ability to design, to conduct experiment, to analyze the experiment results in the field and to draw reasonable and reliable conclusions through information synthesis.	① Classroom Teaching: Principles and Applications of GIS, Groundwater Contamination and Prevention, Investigation and Survey Skills for Groundwater and Geoengineering, Environment Isotope Principles and Technology, Control Engineering for Geo-disasters, Soil Pollution and Remediation, Groundwater Environmental Impact Assessment ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Survey Report of Academic Foreland, Contest, Invention, Innovation and Research Presentation, etc.
5	Modern Tool Application: To develop, select and use appropriate technology, resources, modern engineering tools and information technology tools for specialized problems in the field of environmental geology, including predictions and simulations for problems on complex geological environmental.	① Classroom Teaching: Computer program design with C Language (B), Course Design for Computer program design with C Language (B), Numerical Simulation Technique and application ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Lectures on special topics, Survey Report of Academic Frontier, etc.
6	Specialty and Society: To understand the policies and regulations on production, design, research, development, environmental protection and sustainable development of occupations and industries related to the specialty. The students are also expected to be well aware that human should live in harmony with nature and environment and to have the spirit of shouldering the contemporaneous responsibility.	① Classroom Teaching: General Earth System Science; General Ecology; Environmental Evaluation; Environmental Planning and Management; ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Lectures on special topics, etc.
7	Environment and Sustainable Development: To understand and evaluate impacts of professional engineering practice for the complex geological engineering problems on environment and sustainable development of society.	① Classroom Teaching: Monitoring Technology of Geological Environment, Survey and Assessment of Geological Environment, Numerical Simulation of Geological Environment ② Extracurricular Learning : Course Assignment, Student Research Training Plan, Lectures on special topics, etc.
8	Professional Norms: To obtain the accomplishment of humanities and social sciences as well as social responsibility, to be able to understand and comply with the engineering ethics and standards in the practice of geological engineering, and to fulfill the responsibility.	① Classroom Teaching: Principles of Marxism, Morality Education and Fundamentals of Law, Engineering Instruction and Engineering Ethics ② Extracurricular Learning : Entrance Education, Student Psychologically Healthy Education, Policy and Situation Education, Guide for Career, Education for Graduation, Special Lectures by Class Leader and Counselor, Academic Lecture, etc.

No.	Graduation requirements	Pathways (Teaching Process)
9	Individual and Teamwork: To assume the role of individual, team member, and the leader in charge in the multidisciplinary team.	① Classroom Teaching: Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian), Environmental Geology Teaching Practice (Zigui), Practice and Thesis for Graduation ② Extracurricular Learning: Course Assignment, Student Research Training Plan, etc.
10	Communication: To effectively communicate and exchange with industry peers and the public on problems of complex geological engineering. They will be competent in report writing, document designing, statement presenting, opinion expressing and instruction responding. Students are also expected to have wide international perspective, and can exchange and communicate ideas in the cross-cultural background.	① Classroom Teaching: College English, Field Training ② Extracurricular Learning: Survey Report of Academic Foreland, Meeting on Scientific Research, Academic Lectures, Writing on Scientific Research, Taking part in Scientific Research Projects, etc.
11	Project Management: To understand and master the engineering management principles and economic decision-making methods, and apply them in multi-disciplinary environment.	① Classroom Teaching: Environmental Law, Engineering Budget and Bidding, Environmental System Engineering, Engineering Management ② Extracurricular Learning: Student Research Training Plan, Taking part in Scientific Research Projects, etc.
12	Lifelong Learning: To establish the concept of lifelong learning and master the basic methods of literature search, data inquiry and application of modern information technology to obtain relevant information, possess the ability of strong self-acquisition, continuously to expand their knowledge, and acquire new knowledge for life with the ability of constant learning and development adapting.	① Classroom Teaching: Graduation Practice, Graduation Design (Thesis), Social Investigation, Enterprise practice. ② Extracurricular Learning : Course Assignment, Subject contest, Invention and creation, Research report, Student Research Training Plan, etc.

The support relationship matrix of the graduation requirements of the students to the training objectives

training objectives graduation requirements	Objective 1	Objective 2	Objective3	Objective 4	Objective 5
graduation requirements (1)		√		√	√
graduation requirements (2)		√	√	√	√
graduation requirements (3)		√		√	√
graduation requirements (4)		√	√	√	√
graduation requirements (5)		√		√	√
graduation requirements (6)	√	√	√	√	√
graduation requirements (7)	√	√	√	√	√
graduation requirements (8)	√			√	√
graduation requirements (9)	√			√	√
graduation requirements (10)	√		√	√	√
graduation requirements (11)					√
graduation requirements (12)		√	√		

Major Disciplines: Environmental Science and Engineering, Groundwater Science and Engineering, Geological Engineering.

Core Courses: Environmental Microbiology, Principles of Environmental Engineering, Water pollution and control, Environmental Monitoring, Environmental Assessment, Environmental Design and Management , Hydrogeology, Groundwater Hydrodynamics, Groundwater Contamination and Prevention, Environmental Isotopes, Investigation and Assessment of City Geo-environment, Investigation and Assessment of Mine Geo-environment.

Lab Experiments: Experiment for water pollution and control, experiment for environment monitoring, Hydrodynamics Testing, Hydrochemistry Testing, Water Chemistry Analysis, Groundwater Water Contamination and Prevention.

Practical Work: Introduction of Earth Environmental Ecology, Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian), Professional Teaching Practice (The Three Gorges), Professional Course of Water Pollution Control, Course Design for Investigation and Assessment of City Geo-environment, Course Design for Investigation and Assessment of Mine Geo-environment, Graduation Practice and Design, Enterprise Practice.

Requirements for Graduation Credits: 170

Duration& Degree Granted: Four years, Bachelor of Engineering;

Recommended minor: Management Engineering; Environmental Design;

Related Specialties: Environmental Science; Ecology; Groundwater Science and Engineering

环境工程专业（地质环境调查方向）卓越工程师班课程教学计划表

Course Descriptions of Excellent Engineer Class in Environmental Engineering

课程类别 Classification		课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits								
						课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th	
						讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp										
通识教育课 Liberal Education Courses	必修 Compulsory	12007800	马克思主义基本原理 Principles of Marxism	3	48	48						3								
		12008100	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Tse-tung Thought and the Theoretical System of Socialism with Chinese Characteristics	2	32	32								2						
		12008000	习近平新时代中国特色社会主义思想概论 Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	3	48	48									3					
		11711800	中国近现代史纲要 The Essentials of Modern Chinese History	2	32	32								2						
		12007900	思想道德与法治 Ideological morality and rule of law	3	48	48							3							
		12005300	形势与政策 Situation and Policy	2	32	32							每学期平均分配							
		113076*0	体育 Physical Education	4	144	144							1	1	1	1				
		109234*0	大学英语 College English	9	144	144					48		3	3	3					
		14300300	军事理论 Military Theory	2	32	32							2							
	12008200	劳动教育（理论课） Labor Education	1	16	16							1								
		选修 Elective	包括美育、心理健康教育课程（各不少于2学分）、生态学概论总计12学分，跨学科选修课不低于4学分		12	192	192													
	小计 Sum			43	768	768				48		13	6	9	1					
平台课程 Platform Courses	大类平台课	20441300	地球系统科学概论(含大类导论与系统工程) Introduction to Environmental Earth Sciences	1.5	24	24				8		1.5								
		20441400	微生物学基础 Foundations in Microbiology	1	16	16				8			1							
		212127*2	高等数学 B Advanced Mathematics B	10	160	160						4	6							

	21212 802	线性代数 B Linear Algebra B	2.5	40	40							2.5					
	21213 0*3	大学物理 C College Physics C	6	96	96							3.5	2.5				
	21220 802	物理实验 B Physical Experiments B	1	32	4	28						1					
	20326 903	大学化学 C College Chemistry C	3	48	48						3						
	20327 003	大学化学实验 C College Chemistry Experiment C	1	24		24					1						
	21947 400	Python 语言程序设计 Python Language Programming	2.5	40	40		16					2.5					
	20119 600	普通地质学 Physical Geology	2.5	40	40		8				2.5						
	21130 401	测量学 A Surveying A	2	32	32		16					2					
	小计 Sum		33	552	500	52	40	16				12	16	5	0	0	0
Disciplinary Fundamental Courses 学科基础课	21213 502	概率论与数理统计 B Probability and Statistics B	2.5	40	40								2.5				
	20124 100	矿物岩石学 C Mineralogy and Lithology	2	32	10	22	16					2					
	20123 402	构造地质学 B Structure Geology B	2	32	32		16						2				
	20101 600	地貌学及第四纪地质学 Geomorphology and Quaternary Geology	2.5	40	36	4							2.5				
	20327 303	有机化学 C Organic Chemistry B	2	32	32								2				
	20327 102	分析化学 B Analytical Chemistry B	1.5	24	24								1.5				
	20327 202	分析化学实验 B Analytical Chemistry Experiment B	1	16		16							1				
	20732 100	工程制图 Architecture Drawing	2	32	32		2						2				
	小计 Sum		15.5	248	206	42	34					2	2	11.5			
Main Specialty Courses 专业主干课	20520 700	流体力学 Fluid Mechanics	2.5	40	40		8						2.5				
	20446 002	环境工程微生物 B Environmental Microbiology B	1.5	24	24		24						1.5				
	20431 200	环境工程原理 Principle of Environmental Engineering	2.5	40	40								2.5				
	20437 700	水文地球化学 Hydro-Geochemistry	2	32	32		8		8					2			
	20447 802	土壤污染与防治 B Soil Pollution and Remediation B	1.5	24	24		12								1.5		

	20446 500	水污染控制工程 Water Pollution Control Engineering	2	32	32			8	8						2			
	20446 600	固体废物处理与处置* Solid Waste Treatment and Disposal	1.5	24	24		8		4						1.5			
	20445 600	水文地质学基础 Fundamental of Hydrogeology	2.5	40	40		16		4					2.5				
	20446 801	环境监测 A Environmental Monitoring A	2.5	40	24	16	8	4	8						2.5			
	20401 500	地下水污染与防治 Groundwater Pollution & Prevention	2	32	32		8	8							2			
	20446 702	环境影响评价 B Environmental Impact Assessment B	2	32	32			8	8						2			
	20445 800	环境地质学 Environmental Geology	2	32	32										2			
	20449 900	环境地球化学 Environmental Geochemistry	2	32	24	8		8	8							2		
	20447 100	环境规划与管理 Environmental Layout and Management	2	32	32				8							2		
	小计 Sum		28.5	456	432	24	92	36	56		0	0	0	9	14	5.5	0	0
专业选修课 Specialty Elective Courses		可按方向设课, 具体见专业选修课列表	11.5	184	184										5	7		
	合计 Sub-total		131.5	2208	2090	118	166	52	104	0	25	24	16	21.5	19	12.5	0	0
实践环节 Practical Work	44300 400	军事训练 Military Training	2	2 周							2							
	42008 300	劳动实践 Labor practice	1	1 周											1			
	41947 500	Python 语言课程设计 Course Design for Python Language	1.5	1.5 周								1						
	41120 901	测量教学实习 A Surveying Practice A	1	1 周								1						
	40438 800	地质与环境认识实习 (北戴河) Primary Field Training	3	3 周								3						
	40115 602	地质教学实习 (周口店) B Geological Field Training B	4	4 周										4				
	40421 402	专业教学实习 (三峡) B Professional Teaching Practice	4	4 周												4		
	40450 010	企业实习 1 Enterprise Practice	3	3 周			3 周									2	1	
	40437 400	毕业实习 (企业实习 2) Practice for Graduate	6	6 周			2 周										6	
	40421 700	毕业设计 Bachelor Thesis	8	8 周														8
	小计 Sum		33.5	33.5 周	0	0	5 周	0	0	0	2	5	0	4	0	0	7	7

创新创业自主学习 Freedom study	ZZ350 00S	社会调查 Social Investigation	2												2		
		其他(含创新创业课程、学科竞赛、发明创造、科研报告) Others (Start-up, Contest, Invention, Innovation and Research Presentation)	3												3		
	小计 Sum		5														
总计 Total			170	2208+ 33.5 周	2090	118	166+5 周	52	104	0	27	29	16	25.5	19	12.5	7 7
可开出专业选修课列表	方向 1 至少选 12 学分																
	模块 1 现代信息技术模块 (不少于 2.0 学分)																
	20449 800	地学与环境大数据分析机器学习 Big Data and Machine Learning for Environmental Geology	1.5	24	24			8						1.5			
	20447 500	GIS 原理与应用 Principles & Applications of GIS	2.0	32	24	8	8	2							2.0		
	20446 900	地下水数值模拟基础与应用 Groundwater Modeling and Application	1.5	24	24		8	4							1.5		
	模块 2 生态与绿色发展模块 (不少于 2.5 学分)																
	20437 800	环境生态学 Environmental Ecology	1.5	24	24			8							1.5		
	20450 100	环境功能材料学 Environmental Functional Materials	1.5	24	24			8							1.5		
	20439 800	碳中和技术概论 Introduction to Carbon-neutral Technology	1.5	24	24										1.5		
	20407 100	清洁生产工艺 Clean Manufacturing Techniques	1.5	24	24										1.5		
	模块 3 专业理论与技术模块 (不少于 6.5 学分)																
	20450 200	地下水动力学 Groundwater Hydraulics	2	32	24	8		4	4						2		
	20449 100	地质环境调查与监测 Survey and Assessment of Geological Environment	2	32	32			4							2		
	20447 002	应用水文地质学 B Applied Hydrogeology B	2	32	24	8	8	8							2		
	20405 700	环境同位素原理与技术 Environment Isotope Principles	2	32	28	4										2	

20447 700	地质环境保护与生态修复 Protection and Control of Geological Environment	2	32	32		12		4								2	
20553 000	岩土力学 Rock Mechanics B	2	32	32		8							2				
20407 300	生态水文学 Eco-hydrology	2	32	32												2	
模块4 工程伦理与法规模块（不少于1.5个学分）																	
20448 300	工程伦理与环境法规 Environmental Law	1	16	16												1	
20452 700	工程招标投标与概预算 Engineering Budget and Bidding	1	16	16												1	
20448 400	工程管理 Engineering Management	1	16	16												1	
方向2 至少选13学分																	
模块1 现代信息技术模块（不少于2.0学分）																	
21932 502	机器学习 B Machine Learning B	2	32	32		16										2	
20447 500	GIS 原理与应用 Principles & Applications of GIS	2	24	24	8	8		2								2	
20446 900	地下水数值模拟基础与应用 Groundwater Modeling and Application	1.5	24	24		8		4								1.5	
模块2 生态与绿色发展模块（不少于2.5学分）																	
20437 800	环境生态学 Ecology	1.5	24	24			8									1.5	
20439 800	碳中和技术概论 Introduction to Carbon-neutral Technology	1.5	24	24												1.5	
20407 100	清洁生产工艺 Clean Manufacturing Techniques	1.5	24	24												1.5	
模块3 专业理论与技术模块（不少于6.5学分）																	
20447 200	物理性污染控制 Physical pollution control	1.5	24	18	6	12								1.5			
20450 300	水环境生态工程 Aquatic Environment Ecological Engineering	1.5	24	24					#							1.5	
20423 300	非点源污染控制 Non-point source pollution control	1.5	24	24												1.5	
20450 100	环境功能材料学 Environmental Functional Materials	1.5	24	24			8									1.5	
20446 400	大气污染控制 Atmospheric Pollution Control	1.5	24	24			8	4						1.5			
20447 700	地质环境保护与生态修复 Protection and Control of Geological Environment	2	32	32		12	4									2	
20405 700	环境同位素原理与技术 Environment Isotope Principles	2	32	28	4											2	
模块4 工程伦理与法规模块（不少于1.5个学分）																	

20448 300	工程伦理与环境法规 Environmental Law	1	16	16													1	
20452 700	工程招标投标与概预算 Engineering Budget and Bidding	1	16	16													1	
20450 400	环境系统工程 Environmental System Engineering	1.5	24	24													1.5	
20448 400	工程管理 Engineering Management	1	16	16													1	

(Geological Environment Survey)

注：中英课程须在课程名称后打*标出，通识教育选修课学分未列入具体学期，学院须根据学校创新创业自主学习学分认定一览表制订实施细则。

环境工程（卓越工程师）专业课程分类统计

Course Classifications and Statistics of Environmental Engineering

课程类别 统计	通识教育课程 Liberal Education Courses		大类平台课+学科基础课 Platform & Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	专业选修课 Specialty Elective Courses	实践环节 Practical Work	创新创业 自主学习 Freedom Study	学时总计 Total Hours	学分总计 Total Credits
	必修	选修							
课内总学时 /学分	576/31	192/12	800/48.5	456/28.5	184/11.5	33.5 周 /33.5	5	2208+33.5 周	170
学分所占 比例	25.3%		28.5%	16.8%	6.8 %	19.7%	2.9%	100%	100%

附：

学校与企事业单位联合培养阶段实施方案

培养目标：主要介绍联合培养阶段的目标设定等。

通过校企联合培养，提升业务素质、强化动手能力、掌握先进技术、拓宽创新思维、了解行业法规，形成适应经济社会发展需要、能够承担环境修复和地质环境调查的技术型人才。

培训重点：主要从知识和技能、分析和研究能力、过程和方法等方面介绍。

着眼于社会发展对环境工程专业人才的需求，依托环境工程行业的校外企事业单位联合培养单位，加强学生综合运用理论知识、解决实际问题、沟通交流、团队合作、将知识转化为能力等综合素质的培养。具体包括：

- (1) 通过具体工程实践，将所学理论知识与实际问题进行深度结合；
- (2) 培养项目和工程管理的基本知识与能力；
- (4) 培养沟通交流、成果展现及获取知识的能力；
- (5) 培养良好的职业道德，提高社会责任感、历史使命感，具有时代担当精神。

培训阶段：主要介绍联合培养阶段基础训练、生产实训等阶段实施情况。

联合培养主要划分为三个阶段。

第一阶段 制定学习计划，了解行业法规。要求学生通过阅读资料、与企业导师交流等形式，了解所实践企业的基本概况、业务类型、主要项目、人员配备、技术实力等；根据在实习单位所参与项目的特点，与企业导师共同商定所需自学的专业技能选修课程。

第二阶段 在联合培养单位围绕具体工程和科研项目，培养综合专业能力。要求学生参与一项具体工程或科研项目的立项、设计、实施到报告编写，特别是项目实施和报告编写阶段的参与，培养综合运用理论知识、解决实际问题、沟通交流、团队合作、将知识转化为能力等综合素质。

第三阶段 完成毕业设计，培养系统分析问题和成果展现的能力。要求以企业实践的工程项目为背景，结合科学问题，在校内或企业指导老师的指导下，系统地开展分析计算、工程设计、科学讨论，并形成毕业论文，完成毕业论文答辩。

课程及学分设置： 主要介绍联合培养阶段的课程及学分如何设置。

联合培养阶段时间安排为 20 周学时，共计 20 学分。具体学分分布：

(1) 根据所参与项目需求，与企业导师商定自选选修课：6 学分，提交课程报告，企业导师给定成绩。

(2) 生产实习：6 学分，企业导师给定成绩。

(3) 企业实践报告编写及汇报，毕业论文写作：8 学分，企业导师给定成绩，毕业论文由答辩委员会给定成绩。

考核标准及成绩评定： 主要介绍联合培养阶段的考核标准及方法。

在企事业实践期间至少参与一个项目的论证、资料收集、野外调查、分析计算或报告编写等环节，掌握项目全过程的工作要点；具备独立完成各项工作的能力，能够与工作团队协作，遵守职业操守和相关法规；获得企事业出具的实践合格及以上成绩。

以企事业实际项目为依托，完成本科毕业论文，并且通过由校企双方共同组织的答辩委员会评审。

工作、生活及安全保障管理： 主要介绍联合培养阶段学生的相关管理要求。

学生在企业实习期间的工作、生活及安全保障写入学生、校、企三方合同，并按合同条款严格执行。

学校设立工作领导小组，由学院主管教学的副院长任组长，主管学生工作的副书记、环境工程专业负责人任副组长，教务科、学工组、实验中心负责人、各相关行业一线负责人参加。学院教务科负责处理日常工作，负责起草相关教学管理文件，协调落实卓越工程师教育培养方案的具体实施，包括师资聘请与培训、学生实习、教学质量监控等。

在各合作单位建立教育培养工作站，明确管理人员，具体负责学生在企事业单位实践期间的各项工作。

环境工程（卓工班）专业辅修课程教学计划表
Course Descriptions of Environmental Engineering (Minor)

课程类别 Classification	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时				一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp									
Disciplinary Fundamental Courses 学科基础课	20431200	环境工程原理 Principle of Environmental Engineering	2.5	40	40										2.5			
	20446801	环境监测 A Environmental Monitoring A	2	32	32		32		16					2				
	20520700	流体力学 Fluid Mechanics	2.5	40	40											2.5		
	20446002	环境工程微生物 B Environmental Microbiology B	1.5	24	24		24									1.5		
	20437800	环境生态学 Environmental Ecology	2	32	32		8								2			
	小计 Sum		10.5	168	168	0	64	0	16						4.5	2	4	
Main Specialty Courses 专业主干课	20446500	水污染控制工程 Water Pollution Control Engineering	2	32	32		16		8						2			
	20447802	土壤污染与防治 B Soil Pollution and Remediation B	2	32	32										2			
	20446600	固体废物处理与处置 Solid Waste Treatment and Disposal	2	32	32		8		8								2	
	20449900	环境地球化学 Environmental Geochemistry	3	48	48												3	
	20401500	地下水污染与防治 Groundwater Pollution & Prevention	2	32	32		12	2	2								2	
	小计 Sum		11	176	176		36	2	18							4		7
Practical Work 实践环节																		
	小计 Sum																	
总计 Total			21.5	344	344	0	92	2	34						4.5	6	4	7

环境工程 辅修专业课程分类统计

Course Classifications and Statistics of Environmental Engineering (Minor)

课程类别 统计	学科基础课 Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	实践环节 Practical Work	学时总计 Total Hours	学分总计 Total Credits
课内总学时 /学分	168/10.5	176/11		344/21.5	21.5
学分所占比例	48.8%	51.2%		100%	100%

