

地下水科学与工程专业培养方案

专业名称与代码：地下水科学与工程 081404T

专业培养目标：

本专业培养具有深厚人文素养、扎实科学知识、创新能力和综合素质，德、智、体、美、劳全面发展的地下水科学与工程领域的高级专门人才。毕业生不仅具有坚实的地学基础、地下水和生态环境方面的专业知识，同时掌握数值仿真技术、3S 技术、现代调查测试技术、大数据分析和国际交流等方面应用能力；能够在地下水开发保护、工程建设、地质环境保护和生态修复等领域从事规划评估、勘察设计、工程管理或教学科研等工作，毕业五年具备工程师或与之相当的专业技术能力；能够通过继续教育或其他终身学习等渠道增长知识、提升能力，为国内外水-工-环-生及相关事业服务。

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：具有良好的身体和心理素质、良好的人文素养，具备数学、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，了解本专业学科前沿和技术发展状况，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：具备开展地下水资源调查、勘察设计、分析、评价及开发利用等方面的能力，能理解和评价复杂地下水科学与工程问题对社会、环境和可持续发展的影响、具备较强的沟通和交流能力、组织管理能力和团队协作精神，并具备一定的国际视野和跨文化交流、竞争与合作的初步能力；

目标 5：能够运用各种技术手段，完成地下水工程项目技术设计、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：地下水科学与工程专业的前身是 1952 年建校之初的水文地质与工程地质专业。1981 年水文地质学为地矿部重点学科，同年经国务院批准成为首批硕士、博士学位授权点。1998 年教育部学科专业调整，“水文地质”专业被并入“水利工程”一级学科下的“水文学及水资源”。2007 年教育部批准我校等一些具有地学优势和特色的高校自主设立“地下水科学与工程”本科专业，培养更能适应社会需求、特色和优势鲜明的地下水领域的专门人才。2011 年“地下水科学与工程”专业正式列入最新一轮本科专业目录，属工学地质类特设专业，编号 081404S。1981、1994、2008、2012 年连续获批国土资源部、湖北省重点学科。此外，与本专业相关的“水文地质学”属“地质学”

国家一流学科下设的二级学科。2020 年该专业入选国家级一流本科专业建设点。

本专业现拥有 1 个“地下水与环境”国家教学团队、3 门国家级一流课程、3 门省级一流课程、2 门国家级精品课程、2 门省级精品课程、2 个省级教学团队、1 个湖北省实验教学示范中心、4 门专业慕课、2 本国家级规划教材。

专业毕业要求：

1. 基础知识：掌握数学、物理、化学、地质学、地下水和工程力学等基础理论知识，具有扎实的自然科学基础，具备土木和水利相近专业国家注册职业资格所需的基础理论知识。

2. 问题分析：掌握地下水系统、水资源、地质环境和生态有关的基础理论、专业知识和分析方法；能够应用地下水科学与工程的基本原理，识别、表达、并通过文献研究分析较复杂工程问题，以获得有效结论。

3. 设计/开发解决方案：具有本专业必需的调查、测试、分析、评价、设计计算、制图等基本技能，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；能够设计针对地下水、水环境、水灾害和水生态复杂工程问题的解决方案，设计满足特定需求的系统、技术发明或工艺工法，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：掌握地下水、工程、环境和生态方面的专业基础知识和专业理论，能从事地下水资源开发保护、环境监测评价、生态修复的科学研究和技术开发；具备设计和实施工程实验的能力，并能够对实验结果进行分析；能够基于科学原理、采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

5. 使用现代工具：掌握数值仿真、现代信息技术和大数据分析等新理论新技术，能够针对本专业复杂问题，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。

6. 专业与社会：了解与本专业相关的职业和行业的生产、勘察与设计、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，传承“人与自然和谐共生”的价值理念。

7. 环境和可持续发展：能够基于工程相关背景知识进行合理分析，理解和评价地下水系统和工程对环境、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。

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。

10. 沟通和表达：理解并掌握相关管理与决策方法，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。

11. 项目管理：理解并掌握相关管理与决策方法，具有良好的组织管理能力，能够

从事本学科专业的管理工作。

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：掌握数学、物理、化学、地质学、地下水、工程力学等方面基础理论知识，具有扎实的自然科学基础，良好的工程管理能力基础。	① 课堂教学 ：高等数学、大学物理、大学化学、线性代数、普通地质学、环境地球科学导论、矿物岩石学、构造地质学、水力学、水文学原理 B、工程力学等。 ② 课外学习 ：水力学实验、物理实验、化学实验、地学与环境认识实习、地质教学实习等。
2	问题分析：掌握地下水系统、水资源、水环境、生态环境有关的基础理论、基础知识和分析、设计方法；能够研究分析复杂工程问题，以获得有效结论。	① 课堂教学 ：水文地质学基础、地下水动力学、生态水文学、地下水污染与防治、岩土力学、环境地质学 A、水文地球化学/附水分析、应用水文地质学、同位素水文学等。 ② 课外学习 ：水文地质学基础课程设计、应用水文地质学、地下水动力学实验、应用水文地质学课程设计、地下水灾害防治课程设计、地下水数值模拟课程设计等。
3	设计/开发解决方案：具有本专业必需的调查、测试、调研、评价、制图、设计计算等基本技能	① 课堂教学 ：测量学、应用水文地质学、水文地球化学/附水分析、地质环境调查与监测、工程制图、工程招标投标与概预算、地质环境保护与生态修复等。 ② 课外学习 ：测量教学实习、地质教学实习，专业教学实习、水文地质学基础课程设计、应用水文地质学课程设计、地下水灾害防治课程设计、地下水数值模拟课程设计等。
4	研究：能从事地下水资源开发保护、环境监测评价、生态修复的科学研究和技术开发；具备设计和实施工程实验的能力，能够对实验结果进行分析；能够对复杂工程问题进行研究。	① 课堂教学 ：应用水文地质学、同位素水文学、地下水数值模拟基础与应用、岩溶水文地质学、包气带水文学、地质环境保护与生态修复、土壤污染和防治、生态水文学、生态地质学等。 ② 课外学习 ：水文地质学基础、应用水文地质学课程设计、专业教学实习、学科竞赛、发明创造、科研报告等。
5	使用现代工具：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	① 课堂教学 ：Python 语言程序设计、GIS 原理与应用、地下水数值模拟与应用、地下水溶质运移理论与水质模型等。 ② 课外学习 ：计算机课程设计、地下水数值模拟与应用课程设计等。
6	专业与社会：了解与本专业相关的职业和行业的方针、政策和法律法规	① 课堂教学 ：马克思主义基本原理概论、毛泽东思想和中国特色社会主义理论体系概论、习近平新时代中国特色社会主义思想概论、工程伦理与水资源法规、形式与政策等。 ② 课外学习 ：社会调查、引导关注地下水和环境及国家相关法律法规政策，鼓励学生参加职业技能培训及资格考试。

序号	毕业要求	实现途径（教学过程）
7	环境和可持续发展：能够基于学科专业相关背景知识分析、评价和解决对社会、环境、健康、安全、法律、文化以及可持续发展的影响	① 课堂教学 ：工程伦理与水资源法规、地质环境调查与监测、地质环境保护与生态修复、生态文明与生态工程、思想道德修养与法律基础、形式与政策等。 ② 课外学习 ：社会调查、毕业实习、引导关注地下水和环境及国家相关法律政策，鼓励学生参加职业技能培训及资格考试。
8	职业规范：具有本学科专业职业道德和规范	① 课堂教学 ：思想道德修养与法律基础、生涯规划与就业指导等。 ② 课外学习 ：引导学生树立正确的职业观、鼓励学生参与大学生职业规划大赛、求职方法讲座等活动。
9	个人和团队：正确理解个人和团队关系	① 课堂教学 ：环境地球科学导论、系统科学概论、应用水文地质学等。 ② 课外学习 ：社会调查、地质与环境认识实习、地质教学实习、专业教学实习等。
10	沟通和表达：就专业问题与业界同行及社会公众进行有效沟通，具备国际视野，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、文献信息检索等 ② 课外学习 ：毕业实习、鼓励学生参与英语演讲大赛、文献翻译大赛、科技论文报告会等活动，组织国际交流夏令营等。
11	项目管理：能够从事本学科专业的管理工作。	① 课堂教学 ：应用水文地质学、工程招标投标与概预算等 ② 课外学习 ：毕业实习、大学生科研立项、本科论文大赛、社团工作、毕业设计等。
12	终身学习：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	① 课堂教学 ：心理学与自我成长等 ② 课外学习 ：引导学生树立终身学习观念，鼓励学生参与学科竞赛、技能大赛等活动。

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
毕业要求（1）	√				
毕业要求（2）	√		√	√	√
毕业要求（3）	√	√	√	√	
毕业要求（4）	√		√	√	
毕业要求（5）	√		√	√	
毕业要求（6）		√		√	√
毕业要求（7）		√	√		
毕业要求（8）	√	√	√		
毕业要求（9）	√	√			√
毕业要求（10）	√		√	√	√
毕业要求（11）	√	√		√	√
毕业要求（12）			√		

主干学科：地质工程、水利工程、环境工程。

专业核心课程：矿物岩石学、构造地质学、地貌学及第四纪地质学、水力学、水文学原理 B、水文地质学基础、地下水动力学、水文地球化学/附水分析、应用水文地质学、环境地质学 A、同位素水文学、岩土力学、工程力学、地下水灾害防治等。

主要专业实验：水力学实验；水文地质学基础实验、地下水动力学实验；水化学分析实验等。

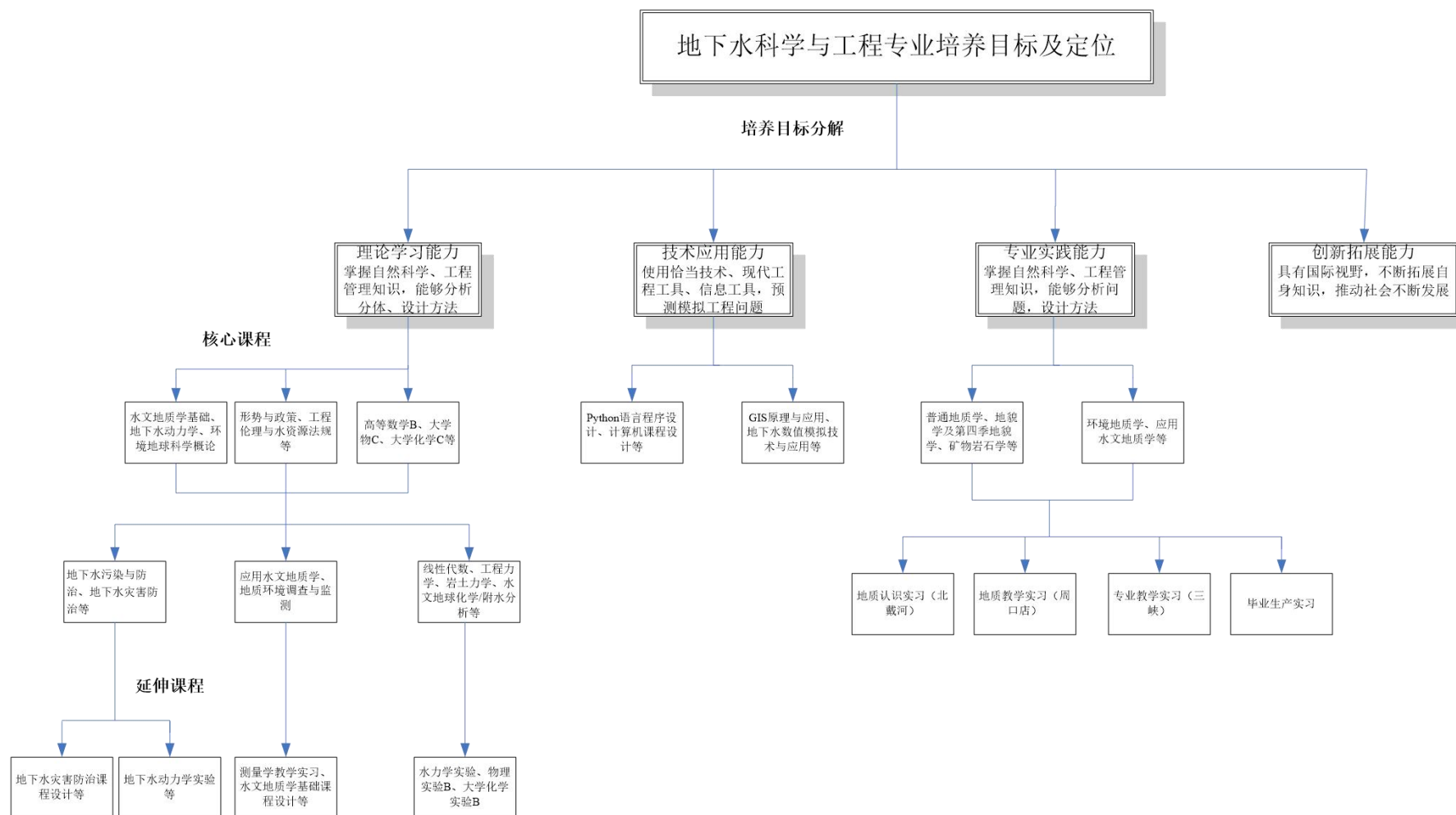
主要实践性教学环节：测量学实习、地质与环境认识实习、地质教学实习，专业教学实习、计算机语言编程课程设计、水文地质学基础课程设计、应用水文地质学课程设计、地下水灾害防治课程设计、地下水数值模拟课程设计、毕业实习与毕业设计等。

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：生态学、岩土工程、管理工程。

相近专业：环境工程、地质工程、水文与水资源工程。



Program for Groundwater Science and Engineering

Specialty and Code: Groundwater Science and Engineering 081404T

Introduction : Based on the former major of hydrogeology and engineering geology, Groundwater Science and Engineering of our university was independently established by the Ministry of Education in 2007. In 2020, it was selected as a national first-class undergraduate major construction site, and in 2022, it passed the engineering education certification.

Education Objectives: This program aims to train students to become innovative and research-typed engineers and specialists in fields of groundwater science and engineering with all around development of moral, intellectual, physical, aesthetic, and labor education. The graduates are expected to possess not only the specialized knowledge in geological and water resources engineering, but also the technology of computer simulation, groundwater simulation ‘3S’, modern analytical testing, foreign language, and groundwater numerical simulation and they can investigate, evaluate, study, and solve the problems in the fields of hydrogeology and engineering geology through the application of advanced technology in engineering. Graduates are capable of becoming engineers or equivalent within five years of graduation; Through continuing education or other channels of lifelong learning, they can enhance their knowledge and ability to serve water-industry-environment-health and related industries at home and abroad.

The training objectives can be divided into the following five sub-goals;

Goal 1 : Have noble professional ethics and a high degree of social responsibility, understand the laws, regulations and rules of the country and related industries;

Goal 2: To have good natural science and humanities literacy, with applied foundation in mathematics, physics, chemistry, computer, foreign language and management, systematically mastering the basic theory, basic knowledge and skills of the profession, and having the basic qualities of an engineer after practice;

Goal 3: Have the ability to continue to learn, understand the technical development of this major, have rich professional knowledge and technical work experience, and can deal with more complex technical problems;

Goal 4: To have the ability to carry out groundwater resources investigation, survey and design, analysis, evaluation and development and utilization;

Goal 5 : To be able to use various technical means to complete the organization and implementation capabilities of technical design, consulting, evaluation and management of groundwater engineering 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. Professional development course: the predecessor of groundwater science and engineering specialty is hydrogeology and engineering geology specialty at the beginning of 1952. In 1981, hydrogeology was a key discipline of the Ministry of Geology and Mineral Resources. In the same year, it was approved by the State Council as the first batch of master's and doctoral degree authorization points. In 1998, the discipline of the Ministry of Education was adjusted, and the "hydrogeology" specialty was incorporated into the "hydrology and water resources" under the first-level discipline of "water conservancy project". In 2007, the Ministry of Education approved the establishment of "Groundwater Science and Engineering" undergraduate majors in some universities with geological advantages and characteristics, such as our university, to cultivate specialized talents in the field of groundwater that can better adapt to social needs, characteristics and advantages. In 2011, "Groundwater Science and Engineering" was officially included in the latest round of undergraduate professional catalogue, which belongs to the special specialty of engineering geology, No.081404S. In 1981, 1994, 2008 and 2012, it was successively approved by the Ministry of Land and Resources and the key disciplines of Hubei Province. In addition, the "Hydrogeology" related to this major is a secondary discipline under the "Geology" national first-class discipline. In 2020, the specialty was selected as a national first-class undergraduate specialty construction point.

This major now has a "groundwater and environment" national teaching team, 3 national first-class courses, provincial first-class courses, 2 national excellent courses, 2 provincial excellent courses, 2 provincial teaching teams, 1 Hubei Province Experimental Teaching Demonstration Center, 4 professional MOOCs, 2 national planning textbooks.

Graduation Requirements:

Students are expected to

1. **Basic Knowledge:** master the basic theoretical knowledge in mathematics, physics, chemistry, hydraulics, hydrology, etc., to have solid foundation of natural science and excellent engineering management. Students are also expected to apply mathematics, natural science, engineering foundation and professional knowledge to solve complex engineering problems.

2. **Problem Analysis:** master the basic theories, basic knowledge, analysis, and design methods related to hydrology and water resources, water environment and groundwater. Students are capable of applying the basic principles of mathematics, natural science and

engineering science to identify, express, and analyse complex engineering through literature research to get a valid conclusion.

3. Solution Design/Development: possess the basic abilities and techniques of investigation, testing, research, evaluation, drawing, design calculation for practical engineering problems. In addition, students are expected to experience systematic engineering practice, and have the abilities to comprehensively analyse and solve practical problems of engineering. They can propose solutions for complex engineering problems related to groundwater, water environment, water-induced hazards, and water ecology by designing system, unit (component) or technical process meeting the specific needs, to embody the sense of innovation and to take the factors of society, health, safety, law, culture, and environment into consideration in the design processes.

4. Research: master the basic knowledge and professional theories of water resources and water environment (especially groundwater and its environment), and to be able to engage in the survey, planning, design, prediction, evaluation and management of surface water, groundwater resources and water environmental protection. Students have the ability to design and implement engineering experiments, to analyse experimental results, and to study complex engineering problems based on scientific principles and scientific methods, including design experiments, analysis and interpretation of data, and to draw reasonable and reliable conclusions through information synthesis.

5. Application of Modern Tools: develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools to solve out complex engineering problems in hydrology and water resources, including prediction and simulations of complex engineering problems and understanding the limitations of these methods and tools.

6. Specialty and Society: understand the policies and regulations on production, design, research, development, environmental protection and sustainable development of the occupations and industries related to the profession. Students are also expected to correctly understand the impact of engineering on the objective world and society, carrying forward the spirit of “hard struggle and simple, stay realistic and pragmatic”, to be capable of conducting reasonable analysis based on engineering-related background knowledge, to understand and evaluate impacts on society, health, safety, law and culture and sustainable development during the solution process of complex engineering problems, and to understand the responsibilities that should be borne.

7. Environment and sustainable development: ability to analyse, evaluate and address social, environmental, health, safety, legal, cultural and sustainable development impacts based on the relevant disciplinary background knowledge.

8. Professional Norms: obtain the accomplishment of humanities and social sciences as well as social responsibility, the professional skills, professional behaviour, professional style and professional awareness of the subject profession. In addition, students are expected to have high comprehensive qualities, including physical quality, psychological quality, cultural quality and professional quality, to understand and abide by engineering ethics and norms in engineering practice, and to fulfill the responsibility.

9. Individual and Teamwork: have the ability to play the roles of individuals, team members, and leaders in a multidisciplinary team, fulfilling responsibility to be undertaken, and promoting the development.

10. Communication and presentation: understand and master the related management and decision-making method, can the problem of academic disciplines and to communicate effectively with the industry peers and the social public communication, including writing reports and design documents, presentation speech, clear expression or respond to instructions; Have a certain international vision, strong comprehensive English ability, can read the English communication of the major: can effectively communicate and communicate with the industry and the public on the professional issues of the discipline.

11.project management: understand and master the related management and decision-making method, has the good organization and management ability, to engage in the management of the professional disciplines.

12. Lifelong learning: 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, to possess the ability of strong self-acquisition, to expand continuously their knowledge and to acquire new knowledge for life as well as to possess the ability of constant learning and development adapting.

Graduation Requirements and Pathways:

No.	Graduation requirements	Pathways (Teaching Process)
1	To master basic theory and knowledge of mathematics, physics, chemistry, hydraulics, and hydrology.	① Classroom Teaching: Advanced mathematics (B), College physics (C), College chemistry (C), linear algebra (C), Hydraulics, The Principles of Hydrology (B), Engineering Mechanics (B), Soil Mechanics, Rock Mechanics. ② Experiments: Hydraulic Testing, Hydrology test, Physical experiment (B), Chemical experiment etc.
2	To master basic theory, analysis and design method of water resources and water environment.	① Classroom Teaching: The Fundamental of Hydrogeology, Groundwater Dynamics, Ecological Hydrology, Groundwater Pollution and Prevention, etc. ② Extracurricular Learning : The Fundamental of Hydrogeology, Groundwater Dynamics Experiments, etc.
3	To possess basic skills necessary for investigation, testing, research, evaluation, mapping, design calculation, etc.	① Classroom Teaching: Survey and Monitoring of Geological Environment, Project Bidding and Budgeting, etc. ② Extracurricular Learning : Measurement Teaching Practice, Geological Field Training (Zhoukoudian), Professional Teaching Practice (The Three Gorges), etc.
4	To conduct the research and development in the areas of survey, planning, design, prediction,	① Classroom Teaching : Applied hydrogeology , Applied hydrogeology, Isotope Hydrology, Survey and Monitoring of Geological Environment, etc.

No.	Graduation requirements	Pathways (Teaching Process)
	evaluation and management of surface water, groundwater resources and water environmental protection.	② Extracurricular Learning : The Fundamental of Hydrogeology, Course Design for applied hydrogeology, etc.
5	To select and use the appropriate technologies, resources, modern engineering tools and information technology tools.	① Classroom Teaching : Python Language Programming, Mathematical Experiments, GIS Principles and Applications, Groundwater Numerical Simulation and Applications. ② Extracurricular Learning : Computer Course Design, Mathematics Experiment Computer Teaching, GIS Computer Teaching, Groundwater Numerical Simulation and Application Course Design.
6	To understand the policies, laws and regulations related to this major.	① Classroom Teaching : Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Engineering Ethics and Water Resource Regulations, Situation and Policy, etc. ② Extracurricular Learning : Students are guided to pay attention to water resources and environmental issues and relevant national laws and policies, and students are encouraged to participate in vocational skills training and qualification examinations.
7	To analyze, evaluate and address social, environmental, health, safety, legal, cultural and sustainable development impacts based on relevant disciplinary background knowledge	① Classroom Teaching : Engineering Ethics and Water Resource Regulations, Survey and Monitoring of Geological Environment, Ecological Civilization and Ecological Engineering, etc.. ② Extracurricular Learning : Social survey, Graduation Practice, guide student to pay attention to groundwater and environment and relevant national laws and policies, encourage students to participate in vocational skills training and qualification examination
8	To be capable of understanding and adhering to engineering ethics and practices in engineering practice.	① Classroom Teaching : Morality Education and Fundamentals of Law, Career Planning and Employment Guidance, etc. ② Extracurricular Learning : Students are guided to establish a correct career outlook and students are encouraged to participate in college career planning competitions, job search methods and other activities.
9	To be capable of assuming the roles of individuals, team members, and responsible individuals in a multidisciplinary team.	① Classroom Teaching : General Geology, Geomorphology and Quaternary Geology, etc. ② Extracurricular Learning : Social Survey, Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian),

No.	Graduation requirements	Pathways (Teaching Process)
		Professional Teaching Practice (The Three Gorges), etc.
10	To be capable of effectively communicating with industry peers and the public on professional issues in the discipline.	①Classroom Teaching : College English, Literature Information Retrieval, etc. ②Extracurricular Learning : Students are encouraged to participate in English speech contests, document translation contests, scientific paper conferences and other activities, to organize international exchange summer camps and so on.
11	To be able to engage in management work in the discipline.	①Classroom Teaching: Applied Hydrogeology, Engineering Ethics and Water Resource Regulations, etc. ②Extracurricular Learning : Graduation Filed Work, Undergraduate Research Project Approval, Undergraduate Thesis Competition, community work, graduation project, etc
12	To have strong self-acquisition ability, to be capable of continuously expanding their knowledge and acquiring new knowledge for life.	①Classroom Teaching: Psychology and Self-growth. ②Extracurricular Learning: Students are guided to establish a lifelong learning concept and students are encouraged to participate in academic competitions, geological skills competitions and other activities.

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: Geological Engineering, Hydraulic Engineering and Environmental Engineering, etc.

Core Courses: Physical Geology, Structural Geology, Geomorphology and Quaternary Geology, Hydraulics, The Fundamental of Hydrogeology, Groundwater Hydrodynamics, Hydro-geochemistry, Soil and Rock Mechanics, Applied Hydrogeology, Environmental Geology, etc.

Lab Experiments: Hydraulic Testing, Testing of the Fundamental of Hydrogeology Hydrodynamics Testing, Hydrochemistry Analysis Testing, etc.

Practical Work: Engineering Survey Practice, Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian), Professional Teaching Practice (the Three Gorges), Computer Program Design Practice, Course Project for the Fundamental of Hydrogeology, Course Project for Applied Hydrogeology, Course Project for Groundwater Disaster Prevention and Control, Course Design for Groundwater Modeling, Graduation Practice and Design. All the above field practice will require 36.5 weeks.

Required Credits for Graduation: 170 points.

Duration & Degree Granted: Four years, Bachelor of Engineering Science.

Recommended Minors: Ecology, Geotechnical Engineering, Management Engineering

Related Specialties: Environmental Engineering, Geological Engineering, Hydrology and Water Resources Engineering

地下水科学与工程专业课程教学计划表

Course Descriptions of Groundwater Science and 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概论 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	36	36					2								
		12008200	劳动教育 Labor Education	1	16	16					1								
	选修 Eletive	包括美育、心理健康课程（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	772	772				48		15	4	10.5	1	0	0	0	0
大类平台课		20441300	地球系统科学概论（含大类导论） Introduction to 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						
		21212802	线性代数 B Linear Algebra B	2.5	40	40								2.5					
		21213023	大学物理 C College Physics C	6	96	96							3.5	2.5					

[illegible]

[illegible]

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									
	40421700	毕业设计 Design for Graduation	8	8 周													8	
	小计 Sum		36.5	36.5 周	0	0	0	0	0	0	3	5.5	0	4	1	7	8 8	
创新创业自主学习 Freedom study	ZZ35000S	社会调查 Social Investigation	2												2			
		其他(学科竞赛、发明创造、科研报告) Others (Contest, Invention, Innovation and Research Presentation)	3															
	小计 Sum		5															
总计 Total			170	2164+ 36.5 周	2070	94	164	38	66	0	32	27.5	20	15	10.5	20.5	8 8	
开出专业选修课列表 Specialty Elective Courses	模块 1（至少选 1.5 学分）																	
	20449000	工程伦理与水资源法规 Engineering Ethics and Water Resource Regulations	1	16	16										1			
	20452700	工程招标投标与概预算 Engineering Budget and Bidding	1	16	16									1				
	20448400	工程管理 Engineering Management	1	16	16											1		
	模块 2（至少选 4 学分）																	
	20449500	地下水溶质运移理论与水质模型 Theory and Applied Modeling of Solute Transport in Subsurface Flow	2	32	32											2		
	20447500	GIS 原理与应用 Principles & Applications of GIS (Bilingual Teaching)	2	32	24	8	8		2							2		
	20435800	岩溶水文地质学 Karst Hydrogeology	1.5	24	24											1.5		
	20447602	地热资源勘查与开发 B Geothermal Resources Exploration and Development	1.5	24	24											1.5		
	20439800	碳中和技术概论 Introduction to Carbon-neutral Technology	1.5	24	24											1.5		
	模块 3（至少选 4.5 学分）																	
	20448602	工程水文学 B Engineering hydrology	2	32	32			8								2		
	20407300	生态水文学 Ecological Hydrology	2	32	32										2			
	20435900	生态地质学 Ecological Geology	1.5	24	24				8								1.5	

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									
	20436000	包气带水文学 Vadose Zone Hydrology	1.5	24	16	8			2							1.5		
	20447802	土壤污染与防治 B Soil Pollution and Remediation	1.5	24	24		12										1.5	
	21932502	机器学习 B Machine Learning B	2	32	32		16									2		
模块 4（至少选 3 学分）																		
	20449100	地质环境调查与监测 Survey and Monitoring of Geological Environment	2	32	32		8									2		
	20447700	地质环境保护与生态修复 Protection and Control of Geological Environment	2	32	32		12	4									2	
	20447900	生态文明与生态工程 Ecological Civilization and Ecological Engineering	2	32	22	10										2		
	20444600	湿地演化与生态修复 Wetland Evolution and Ecological Restoration	1.5	24	24										1.5			
	20405103	环境监测 C Environmental Monitoring	2	32	24	8	4											
	20405303	环境评价 C Environmental Assessment	2	32	32			8							2			

注：全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。

地下水科学与工程专业课程分类统计

Course Classifications and Statistics of Groundwater Science and 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 Hour	学分总计 Total Credits
	必修	选修							
学时/学分	580/31	192/12	552+232/33+14.5	400/25	208/13	36.5 周 +162/36.5 +10	5	2164 +36.5 周	170
学分所占比例	25.3%		27.9%	14.7%	7.6%	27.3%	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：

本专业培养具有坚实的自然科学基础，良好的人文社会科学基础，具备地下水科学与工程专业基础及工程应用能力，拥有良好的工程素质、较强的工程实践能力和创新精神，具有较强野外调查、分析评价、工程创新等能力，以及良好的团队协作、交流和沟通能力、组织管理能力的高级专门人才。

培训重点：

1. 在牢固地掌握课堂教学的基本理论、基本知识的同时，熟悉本专业相应的业务范围和性质、基本操作技能、工程设计、监测与检测、施工工艺、工程设备和机具、施工组织管理，培养学生在实际工作中分析问题，解决问题的独立工作能力。

2. 熟悉地下水科学与工程领域的技术标准，了解地下水科学与工程行业的相关政策、法律和法规。

3. 了解地下水科学与工程领域的新产品、新技术、新工艺以及技术发展趋势。

4. 运用适当的理论和实践方法解决地质工程实际问题的能力，在地下水科学与工程实际工程问题方面得到系统化训练。能对实践过程中出现的工程问题进行分析、判断，提出处理意见或解决方案。

5. 参与项目及工程管理，具有初步的项目和工程管理能力。具有较强的质量、环境、职业健康安全和法律意识，在法律法规规定的范畴内，按确定的相关标准和程序要求开展工作。

6. 培养有效的沟通与交流能力和较强的获取知识、终身学习的能力。具备收集、分析、判断、归纳和选择国内外相关技术信息的能力，不断补充自己的专业知识。

7. 具备良好道德和较强的责任感。自觉遵守所属职业体系的职业行为准则。在工作质量、工作效率、工作纪律、职业健康安全、维护企业形象、关注企业发展等方面体现对工作、对企业的责任。

培训阶段：

1. 地下水科学与工程生产实习

学生已完成基础课与部分专业理论课程学习及地质认知实习、地质教学实习、专业教学实习，在学习第四学年的专业理论课程和进行毕业设计之前进行生产实习。它是学生进行专业理论课学习和工程师基本训练的重要的实践教学环节之一。

要求学生跟班劳动，理论联系实际。在生产实习中，进一步深入理解水文地质调查、勘察和监测等工作的基本原理、基本方法，掌握地下水科学与工程专业野外第一手资源获取的主要方法，并学习相关数据和图件的处理与编制以及调查或监测报告的编制方法等，使学生对地下水科学与工程专业现场调查、勘察、监测工作的流程与工作方法有一

个系统的认识。

2. 毕业实习与设计/论文

毕业实习是本科毕业设计的重要部分，是毕业设计的准备阶段，也是四年专业知识学习的检验场。毕业实习是学生在生产实习的基础上，针对生产实习中的专门问题，进一步以毕业设计或毕业论文要求，深入开展的专门的野外调查、勘察、监测或资料收集等工作，并针对相关设计和论文题目要求完成毕业设计和毕业论文，进一步巩固和完善其专业知识，深刻理解所学的基础理论，并充分与实践结合，将所学知识转化为适应未来工作的综合能力而进行的实践性教学环节，是培养学生综合运用所学理论知识解决实际问题能力的训练。

企业为学生配备企业导师、学校配备指导老师。毕业实习与设计或论文，结合就业工作分散进行、或结合校内导师的研究课题、或结合与企业的横向合作项目为题，以野外生产、室内研究相结合的方式进行的。

课程及学分设置：

生产实习或毕业实习培养阶段时间安排为 8 周（8 学分）。

（1）对于在企业完成的生产实习或毕业实习，根据所参与项目需求，与企业导师商定生产实习和毕业实习的任务、实习内容和工作计划，完成相应的企业实践实习报告和毕业设计的资料收集，由企业导师给定成绩。

（2）对于在学校实验室完成的生产实习或毕业实习，根据所参与项目需求，与校内导师商定生产实习和毕业实习的任务、实习内容和工作计划，完成相应的实验实习报告和毕业设计的资料收集，由校内导师给定成绩。

考核标准及成绩评定：

由企业导师和学校导师联合，根据学生实习表现、提交的实习报告和答辩的情况等综合评定，考核成绩分为优、良、中、及格和不及格五个等级。

工作、生活及安全保障管理：

1. 工作、生活保障

企业提供学生完成生产和毕业实习的生活和实习现场；提供学生用于观察、剖析、操作、试验所需的生产设备、试验装置、测量测试设备等；提供用于学生学习、参考、分析的图纸、标准、规范、文件等资料。企业和系室联合为学生在企业的实训配备授课和指导教师，保障学生的安全高效完成企业实训。企业和学校配备的指导教师联合商定用于学生进行工程设计训练和毕业设计的项目或课题。

2. 学生管理制度

《学生纪律守则》

（1）指导老师应对实习全权负责，遇到意外事故应及时采取措施，保证学生实习的顺利进行。

（2）各学生必须遵照指导老师的安排，认真按计划完成各项工作，不得擅自行动，如果需要离开，应及时向指导老师和企业导师报告。

(3) 学生实习时，应衣着得体，举止文明，谦虚有礼，自觉维护中国地质大学（武汉）的声誉和形象，保持大学生应有的素质和健康的精神风貌，谦虚谨慎，不耻下问。

(4) 每位学生注意自身安全，不得擅自离开。在实习过程或日常生活应提高警惕，保管好自己的财务，注意个人饮食卫生和交通安全。

《安全性原则》

(1) 实习前系室召开实习动员会，布置实习相关事宜和安全指导。学生在出发前应有一定的心理准备，学生必须明确实习期间的艰苦。

(2) 学生在实习过程中的每一天的生活起居必须由自己独立完成。

(3) 如果有不适应当地生活条件，应当尽快自我调节，以免给身体造成不必要的伤害。

(4) 在身体不适的情况下应及时向指导老师和企业导师反映，不能隐瞒病情。

(5) 牢记紧急电话：如当地的医院，公安局，政府和支持单位的电话号码和其它紧急号码（报警：110；急救：120；火警：119）。

地下水科学与工程专业辅修课程教学计划表

Course Descriptions of Groundwater Science and 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									
学科基础课 Disciplinary Fundamental Courses	20431700	水文地质学基础 The Fundamental of Hydrogeology	2.5	40	40		16	4	4						2.5			
	20434800	地下水动力学 Groundwater Hydraulics	2.5	40	40		8	4	4						2.5			
	20434900	水文地球化学/附水分析 Hydro-Geochemistry	2.5	40	40		8	8	8						2.5			
	小计 Sum		7.5	120	120		32	16	16						7.5			
专业主干课 Main Specialty Courses	20431800	水力学 Hydraulics	2	32	32		8									2		
	20435600	水文学原理 B The Principles of Hydrology B	2	32	32		8										2	
	20403400	环境地质学 A Environmental Geology A	2	32	32			8									2	
	20405700	同位素水文学 Isotope Hydrology	2	32	28	4												2
	20435000	应用水文地质学 Applied Hydrogeology	2.5	40	40		8	8	8									2.5
	20414500	地下水污染与防治 Groundwater Pollution & Prevention	2	32	32		12	2	2									2
	小计 Sum		12.5	200	196		36	18	10							2	4	6.5
实践环节 Practical Work	40435400	应用水文地质学课程设计	1	1 周														1
	小计 Sum		1	1 周														1
总计 Total			21	320+1 周	316	4	68	34	36						7.5	2	4	7.5

地下水科学与工程辅修专业课程分类统计

Course Classifications and Statistics of Groundwater Science and 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 Hour	学分总计 Total Credits
学时/学分	120/7.5	200/12.5	1 周/1	320+1 周	21
学分所占比例	35.7%	59.5%	4.8%	100%	100%

