

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：

本专业培养具有扎实自然科学知识、创新意识、良好科学作风，在德、智、体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和水资源方面的专业基础知识，同时具备计算机仿真技术、3S 技术、现代分析测试技术、外语和地下水数值模拟技术等方面应用能力，能够运用先进工程技术手段从事地下水资源开发与保护，以及针对人类活动诱发的水文地质工程地质问题，进行勘察、评价及治理的高级工程技术人才。

专业毕业要求：

1. 基础知识：掌握数学、物理、化学、水力学、水文学等方面基础理论知识，具有扎实的自然科学基础，良好的工程管理基础；能够将数学、自然科学、工程基础和专业知用于解决复杂工程问题。
2. 问题分析：掌握水文水资源、水环境、地下水有关的基础理论、基础知识和分析、设计方法；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、调研、评价、制图、设计计算等基本技能，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；能够设计针对复杂工程问题的解决方案，设计满足特定需求的系统、单元（部件）或工艺流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。
4. 研究：掌握水资源及水环境（尤其是地下水及其环境）方面的专业基础知识和专业理论，能从事地表水、地下水资源及水环境保护的勘测、规划设计、预测、评价与管理等方面的研究和开发；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；能够基于科学原理并采用科学方法对复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。
5. 使用现代工具：能够针对水文与水资源专业问题，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、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. 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。
8. 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。
9. 管理与沟通：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、组织管理能力和团队合作精神，能够开展管理协调、技术洽谈工作。

10. 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 | 掌握数学、物理、化学、水力学、水文学等方面基础理论知识 | ① 课堂教学 ：高等数学 B、大学物理 C、大学化学 C、线性代数 C、水力学、水文学原理及水文测验、工程力学 B、土力学等。 ② 课外学习 ：水力学实验、物理实验 B、化学实验等。 |
| 2 | 掌握水文水资源、水环境有关的基础理论、基础知识和分析、设计方法 | ① 课堂教学 ：水文地质学基础 A、地下水动力学 A、生态水文学、地下水污染与防治等。 ② 课外学习 ：水文地质学基础，应用水文地质学、地下水动力学实验等。 |
| 3 | 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、地质环境监测、工程招标投标与概预算等。 ② 课外学习 ：测量教学实习、周口店地质实习，三峡专业实习等。。 |
| 4 | 能从事地表水、地下水资源及水环境保护的勘测、规划设计、预测、评价与管理等方面的研究和开发 | ① 课堂教学 ：应用水文地质学、环境同位素原理与技术、地质环境调查与评价等。 ② 课外学习 ：水文地质学基础、应用水文地质学课程设计等。 |
| 5 | 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、数学实验、GIS 原理与应用、地下水数值模拟与应用等。 ② 课外学习 ：计算机课程设计、数学实验计算机教学、GIS 计算机教学、地下水数值模拟与应用计算机教学等。 |
| 6 | 了解与本专业相关的方针、政策和法律法规 | ① 课堂教学 ：环境法规、环境评价 C、形式与政策、专业技能培训。 ② 课外学习 ：引导关注水资源环境问题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。 |
| 7 | 能够在工程实践中理解并遵守工程职业道德和规范 | 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 |

| 序号 | 毕业要求 | 实现途径（教学过程） |
|----|---------------------------------------|---|
| | | 法讲座等活动。 |
| 8 | 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 ：普通地质学、地貌学及第四纪地质学等。 ② 课外学习 ：社会调查、地质认识实习（北戴河）、地质教学实习（周口店）、专业教学实习（三峡）等。 |
| 9 | 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 | ① 课堂教学 ：大学英语、文献信息检索等 ② 课外学习 ：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。 |
| 10 | 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 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、地质技能大赛等活动。 |

主干学科：地质工程、水利工程、环境工程。

专业核心课程：普通地质学、构造地质学、水力学、水文地质学基础、地下水动力学、水文地球化学、土力学、应用水文地质学、环境地质学等。

主要专业实验：水力学实验；水文地质学基础系列实验、水动力学实验；水化学分析实验；土力学实验等。

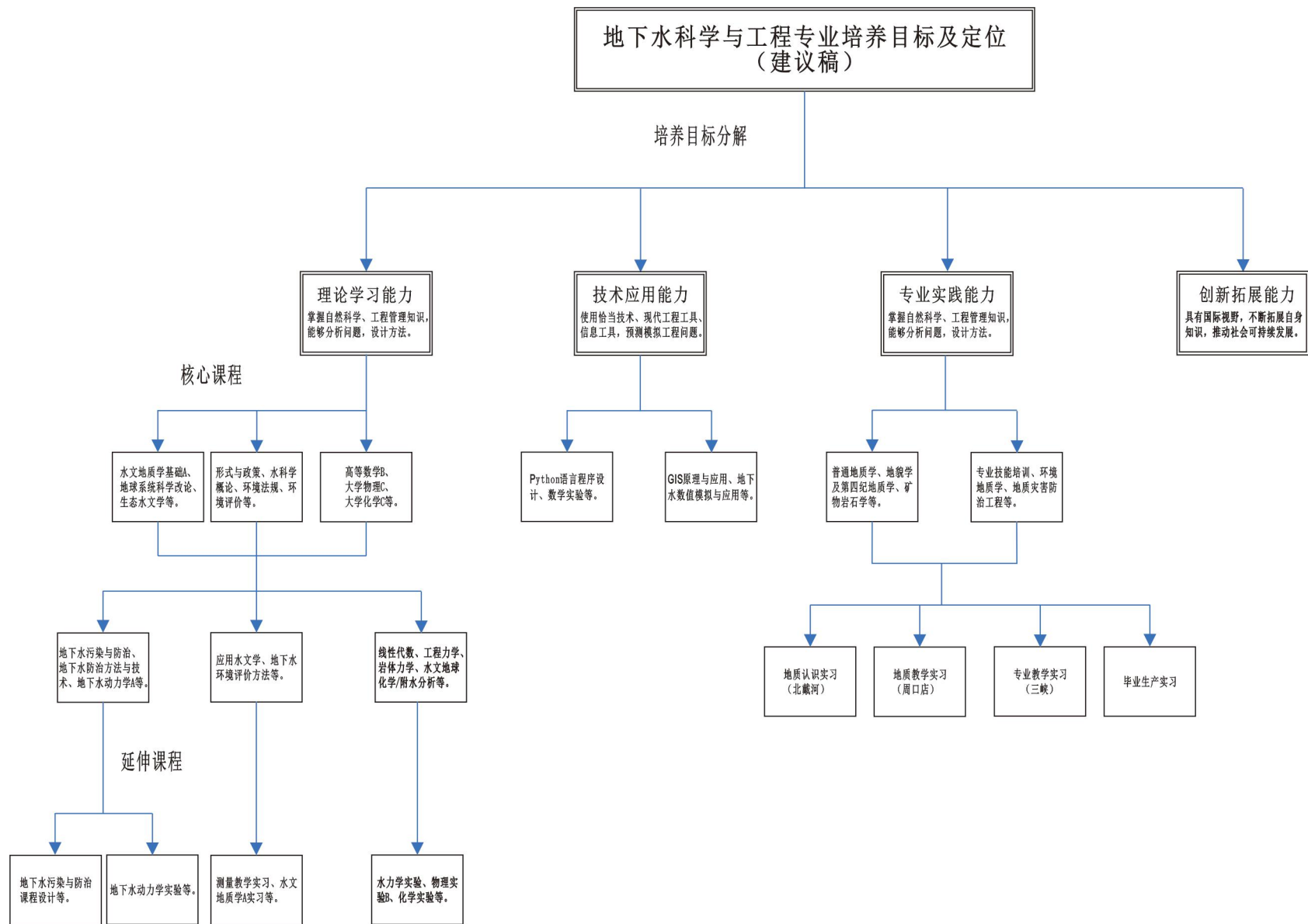
主要实践性教学环节：工程测量实习、北戴河地质认识实习、周口店地质教学实习，三峡专业教学实习、计算机语言编程课程设计、水文地质学基础课程设计、应用水文地质学课程设计、地下水防治方法与技术课程设计、毕业实习与毕业设计等约 33~34 周。

毕业学分要求：168 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：安全工程、土木工程。

相近专业：环境工程、地质工程。



Program for Groundwater Science and Engineering

Specialty and Code: Groundwater Science and Engineering 081404T

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.

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 have the ability to comprehensively analyse and solve practical problems of engineering and to be capable of providing solutions for complex problems, with design 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 analyze 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. **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.

8. **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.

9. Management and Communication: understand and master relevant management and decision-making methods, and be able to effectively communicate with industry peers and the public on professional issues of the subject, including report writing, document designing, statement presenting, opinion expressing and instruction responding. Students are also expected to have a certain international perspective, strong English comprehensive ability, to be able to read the English technical literature of this major, and to exchange and communicate in cross-cultural background. In addition, students have excellent ability of communication, organization and management, as well as team cooperation spirit, and develop the management coordination and technical negotiation.

10. 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. | <p>①Classroom Teaching: Advanced mathematics (B), College physics (C), College chemistry (C), linear algebra (C), Hydraulics, Principle and test of hydrology, Engineering Mechanics (B), Soil Mechanics, Rock Mechanics.</p> <p>②Experiments: Hydraulic Testing, Hydrology test, Physical experiment (B), Chemical experiment etc.</p> |
| 2 | To master basic theory, analysis and design method of water resources and water environment. | <p>① Classroom Teaching : The Fundamental of Hydrogeology (A), Groundwater Dynamics (A), Ecological Hydrology, Groundwater Pollution and Prevention, etc.</p> |

| No. | Graduation requirements | Pathways (Teaching Process) |
|-----|---|--|
| | | 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 : Surveying, Geotechnical testing techniques, 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, evaluation and management of surface water, groundwater resources and water environmental protection. | ① Classroom Teaching : Applied hydrogeology , Applied hydrogeology, environmental isotope principles and techniques, Survey and Assessment of Geological Environment 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 : Environmental Regulations, Environmental Assessment (C), Situation and Policy, Registered Geotechnical |

| No. | Graduation requirements | Pathways (Teaching Process) |
|-----|--|---|
| | | <p>Engineer Vocational Skills Training.</p> <p>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.</p> |
| 7 | To be capable of understanding and adhering to engineering ethics and practices in engineering practice. | <p>① Classroom Teaching: Morality Education and Fundamentals of Law, Career Planning and Employment Guidance.</p> <p>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.</p> |
| 8 | To be capable of assuming the roles of individuals, team members, and responsible individuals in a multidisciplinary team. | <p>① Classroom Teaching: General Geology, Geomorphology and Quaternary Geology.</p> <p>② Extracurricular Learning: Social Survey, Primary Field Training (Beidaihe), Geological Field Training (Zhoukoudian), Professional Teaching Practice (The Three Gorges), etc.</p> |
| 9 | To be capable of effectively communicating with industry peers and the public on professional issues in the discipline. | <p>① Classroom Teaching: College English, Literature Information Retrieval, etc.</p> <p>② Extracurricular 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.</p> |
| 10 | To have strong self-acquisition ability, | ① Classroom Teaching : Psychology and |

| No. | Graduation requirements | Pathways (Teaching Process) |
|-----|---|---|
| | to be capable of continuously expanding their knowledge and acquiring new knowledge for life. | Self-growth. ② Extracurricular 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. |

Major Disciplines: Geotechnical Engineering, Hydraulic Engineering and Environmental Engineering.

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

Lab Experiments: Hydraulic Testing, Testing of the Fundamental of Hydrogeology Hydrodynamics Testing, Hydrochemistry Analysis Testing, Soil Mechanics 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 Prevention Method and Technology, Graduation Practice and Design. All the above field practice will require 33~ 34 weeks.

Required Credits for Graduation: 168 points.

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

Recommended Minors: Security Engineering, Civil Engineering.

Related Specialties: Environmental Engineering, Geological 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 | 11706200 | 马克思主义基本原理概论 Principles of Marxism | 3 | 48 | 48 | | | | | | | | 3 | | | | | |
| | | 11706500 | 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 | 4 | 64 | 64 | | | | | | | | 4 | | | | | |
| | | 11711800 | 中国近现代史纲要 The Essentials of Modern Chinese History | 2 | 32 | 32 | | | | | | 2 | | | | | | | |
| | | 12005200 | 思想道德修养与法律基础 Morality Education and Fundamentals of Law | 3 | 48 | 48 | | | | | | 3 | | | | | | | |
| | | 21929201 | Python 语言程序设计 A [Python Language Programming A] (56=40+16) | 2.5 | 56 | 40 | | 16 | | | | | 2.5 | | | | | | |
| | | 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 | | | | | |
| | | 12005300 | 军事理论 Military Theory | 1 | 16 | 16 | | | | | | 1 | | | | | | | |
| | 选修 Elective | 20428800 | 地球系统科学概论 Introduction to Earth Sciences | 2 | 32 | 24 | 8 | | | | | 2 | | | | | | | |
| | | 70400600 | 生态学概论 Ecology | 1.5 | 24 | 24 | | | | | | | | 1.5 | | | | | |
| | | 包括地球系统科学概论、生态学概论两门必修课程总计 12 学分，含创新创业选修课学分，跨学科选修课不低于 4 学分 | | 8.5 | 136 | 136 | | | | | | | | | | | | | |
| | | 小计 Sum | | 42.5 | 776 | 752 | 8 | 16 | 0 | 48 | 0 | 12 | 6.5 | 12.5 | 1 | 0 | 0 | 0 | 0 |
| 大类平台课 Platform Courses | 20430100 | 微生物学基础 Foundations in Microbiology | 1.5 | 24 | 24 | | | | | | | 1.5 | | | | | | | |
| | 20430200 | 环境地球科学大类导论课 Introduction to Environmental Earth Sciences | 0.5 | 8 | 8 | | | | | | | | 0.5 | | | | | | |
| | 212127*2 | 高等数学 B Advanced Mathematics B | 10 | 160 | 160 | | | | | | 4 | 6 | | | | | | | |
| | 21206300 | 数学实验 Mathematic Experiments | 1 | 16 | 16 | | | | | | | 1 | | | | | | | |

| 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 | | | | | | | | | |
| | 21212803 | 线性代数 C Linear Algebra C（水文环境） | 2 | 32 | 32 | | | | | | | | 2 | | | | | |
| | 21213503 | 概率论与数理统计 C Probability and Statistics C | 2 | 32 | 32 | | | | | | | | 2 | | | | | |
| | 212130*3 | 大学物理 C College Physics C | 6 | 96 | 96 | | | | | | | 3.5 | 2.5 | | | | | |
| | 21216902 | 物理实验 B Physical Experiments B | 1.5 | 48 | 4 | 44 | | | | | | 1.5 | | | | | | |
| | 20326903 | 大学化学 C College Chemistry C | 3 | 48 | 48 | | | | | | | 3 | | | | | | |
| | 20327003 | 大学化学实验 C College Chemistry Experiment C | 1 | 24 | | 24 | | | | | | 1 | | | | | | |
| | 20119600 | 普通地质学 Physical Geology | 2.5 | 48 | 40 | | 8 | | | | | 2.5 | | | | | | |
| | 21130401 | 测量学 A Surveying A | 2 | 48 | 32 | | 16 | | | | | | 2 | | | | | |
| | 小计 Sum | | 33 | 584 | 492 | 68 | 24 | 0 | 0 | 0 | 6.5 | 19.5 | 7 | 0 | 0 | 0 | 0 | 0 |
| 学科基础课 Disciplinary Fundamental Courses | 20113100 | 矿物岩石学 Mineralogy and Lithology | 3 | 48 | 10 | 38 | | | | | | 3 | | | | | | |
| | 20103600 | 地貌学及第四纪地质学 Geomorphology and Quaternary Geology | 2.5 | 40 | 36 | 4 | | | | | | | | 2.5 | | | | |
| | 20508002 | 工程力学 C Engineering Mechanic C（水文） | 3.5 | 64 | 56 | 8 | | | | | | | | 3.5 | | | | |
| | 20119800 | 构造地质学 B Structure Geology B | 2.0 | 48 | 32 | | 16 | | | | | | 2 | | | | | |
| | 20732000 | 建筑制图 Architecture Drawing | 3 | 56 | 48 | | 8 | | | | | | | 3 | | | | |
| | 小计 Sum | | 14 | 256 | 182 | 50 | 24 | 0 | 0 | 0 | 0 | 3 | 2 | 9 | 0 | 0 | 0 | 0 |
| 专业主干课 Main Specialty Courses | 20431800 | 水力学 Hydraulics | 2 | 40 | 32 | | 8 | | | | | | | 2.0 | | | | |
| | 20435600 | 水文学原理及水文测验 The Principles of Hydrology | 2 | 40 | 32 | | 8 | | | | | | | | 2.5 | | | |
| | 2031700 | 水文地质学基础 The Fundamental of Hydrogeology | 2.5 | 64 | 40 | | 16 | 4 | 4 | | | | | | 2.5 | | | |
| | 20434800 | 地下水动力学 Groundwater Hydraulics | 2.5 | 56 | 40 | | 8 | 4 | 4 | | | | | | | 2.5 | | |
| | 20434900 | 水文地球化学/附水分析* Hydro-Geochemistry | 2.5 | 64 | 40 | | 8 | 8 | 8 | | | | | | 2.5 | | | |
| | 20539500 | 岩体力学 Rock Mechanics | 2 | 40 | 32 | | 8 | | | | | | | | | 2.5 | | |
| | 20403400 | 环境地质学 B Environmental Geology B | 2 | 32 | 32 | | | | | | | | | 2 | | | | |
| | 20435000 | 应用水文地质学 Aplied Hdrogeology | 2.5 | 64 | 40 | | 8 | 8 | 8 | | | | | | | | 2.5 | |

| 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 | | | | | | | | | |
| | 20435100 | 地下水数值模拟基础与应用* Groundwater Modeling | 1.5 | 40 | 24 | | 8 | | 8 | | | | | | 1.5 | | | |
| | 20414500 | 地下水污染与防治 Groundwater Pollution & Prevention | 2 | 48 | 32 | | 12 | 2 | 2 | | | | | | 2 | | | |
| | 21100700 | GIS 原理与应用 Principles & Applications of GIS (Bilingual Teaching) | 1.5 | 42 | 24 | 16 | | | 2 | | | | | | 1.5 | | | |
| | 20405700 | 环境同位素原理与技术 Environment Isotope Principles | 2 | 32 | 28 | 4 | | | | | | | 2 | | | | | |
| | 小计 Sum | | 25 | 546 | 396 | 20 | 84 | 26 | 36 | 0 | 0 | 0 | 0 | 4 | 9.5 | 12.5 | 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 | 14 | 224 | 224 | | | | | | | | | | | | | |
| 合计 Sub-total | | | 128.5 | 2386 | 2046 | 146 | 148 | 26 | 84 | 0 | 18.5 | 29 | 21.5 | 14 | 9.5 | 12.5 | 0 | 0 |
| 实践环节 Practical Work | 44300400 | 军事训练 Military Training | 1 | 2 周 | | | | | | | 1 | | | | | | | |
| | 41928500 | Python 语言课程设计 A Course Design for Python Language A | 1.5 | 1.5 周 | | | | | | | | 1.5 | | | | | | |
| | 41120901 | 测量教学实习 A Surveying Practice A | 1 | 1 周 | | | | | | | | 1 | | | | | | |
| | 40438800 | 地质与环境认识实习（北戴河） Primary Field Training (Beidaihe) | 3 | | | | | | | | | 3 | | | | | | |
| | 40115602 | 地质教学实习（周口店）B Geological Field Training (Zhoukoudian) B | 4 | 4 周 | | | | | | | | | | 4 | | | | |
| | 40421402 | 专业教学实习（三峡）B Professional Teaching Practice (The Three Gorges) B | 4 | 4 周 | | | | | | | | | | | | 4 | | |
| | 40435300 | 水文地质学基础课程设计 Course Design for the Fundamental of Hydrogeology | 1 | 1 周 | | | | | | | | | | | 1 | | | |
| | 40435400 | 应用水文地质学课程设计 Course Design for applied hydrogeology | 2 | 2 周 | | | | | | | | | | | | 2 | | |
| | 40435500 | 地下水防治方法与技术课程设 计 Professional Course Project Design | 1 | 1 周 | | | | | | | | | | | | | 1 | |
| | 40421600 | 毕业实习 Practice for Graduation | 8 | 8 周 | | | | | | | | | | | | | 8 | |

| 课程类别 Classi- fication | 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 | | 34.5 | 34.5 周 | | | | | | | 1 | 5.5 | 0 | 4 | 1 | 6 | 9 | 8 |
| 创新创业自主学习 Freedom study | ZZ35000S | 社会调查 Social Investigation | 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 | | | 168 | 2386 +34.5 周 | 204 6 | 146 | 148 | 26 | 84 | 0 | 19.5 | 34.5 | 21.5 | 18 | 10.5 | 18.5 | 9 | 8 |
| 可开出专业选修课列表 Specialty Elective Courses | 水文地质 方向 | 水文学原理及水文测验 The Principles of Hydrology | 2.0 | 40 | 32 | | 8 | | | | | | 2 | | | | | |
| | | 水文统计及水文计算 Hydrological Statistic and Analysis | 2.5 | 48 | 40 | | 8 | | | | | | | 2.5 | | | | |
| | | 岩溶水文地质学 Karst Hydrogeology | 1.5 | 24 | 24 | | | | | | | | | | 1.5 | | | |
| | | 生态地质学 Ecological Geology | 1.5 | 32 | 24 | | | 8 | | | | | | | | 1.5 | | |
| | | 生态水文学 Eco-hydrology | 2 | 32 | 32 | | | | | | | | | 2 | | | | |
| | | 包气带水文学 Vadose Zone Hydrology | 1.5 | 26 | 16 | 8 | | | 2 | | | | | | | 1.5 | | |
| | | 专业技能培训（必选） | 1 | 16 | | | | | | | | | | | | 1 | | |
| | | 工程招标投标与概预算 Engineering Budget and Bidding | 2.0 | 32 | 24 | 8 | | | | | | | | | | | 2 | |
| | | 水污染控制工程 Water Pollution Control Engineering | 3 | 48 | 36 | 12 | | | | | | | | | | | 3 | |
| | | 环境监测（含地质环境监测） Monitoring of Geological Environment | 2 | 32 | 24 | 8 | | | | | | | | | 2 | | | |
| | | 工程水文学 Engineering Hydrology | 2 | 32 | 32 | | | | | | | | | | | | 2 | |
| | 地下水环境修复方 向 | 土壤污染和防治 Soil Pollution and Remediation | 2 | 36 | 24 | | 12 | 4 | | | | | | | | | 2 | |
| | | 环境法规 Environmental Law | 1.5 | 24 | 24 | | | | | | | | | | | 1.5 | | |
| | | 环境监测 Environmental Monitoring | 2 | 40 | 32 | | 8 | | | | | | | 2.0 | | | | |

| 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 | | | | | | | | | | |
| | | 环境评价（必选） Environmental Assessment | 2 | 32 | 32 | | | | | | | | | | 2.0 | | | | |
| | | 固体废物处理与处置 B Solid Waste Treatment and Disposal B | 1.5 | 40 | 24 | | | 8 | | 8 | | | | | 2 | | | | |
| | | 水污染控制工程 Water Pollution Control Engineering | 3 | 48 | 36 | 12 | | | | | | | | | | | 3 | | |
| | | 地下水污染与防治（必选） Groundwater Pollution & Prevention | 2 | 48 | 32 | | | 12 | 2 | 2 | | | | | | 2 | | | |
| | | 微生物生态学 Microbial Ecology | 2 | 32 | 32 | | | | | | | | | | | 2 | | | |
| | | 湖泊生态系统演化 Ecosystem Evolution of Lake | 2 | 32 | 32 | | | | | | | | | | | 2 | | | |
| | | 污染水体生态修复技术 Bio-Remediation Technique on Polluted Water | 2 | 32 | 32 | | | | | | | | | | | 2 | | | |
| | | 水环境工程技术 Environmental Engineering for Polluted Water Body | 2 | 32 | 32 | | | | | | | | | | 2 | | | | |
| | | 专业技能培训（必选） | 1 | 16 | 16 | | | | | | | | | | | 1.0 | | | |
| | | 环境地质方向 | 城市地质环境调查与评价（必选） Survey and Assessment of Geological Environment | 2 | 44 | 32 | | | 8 | 4 | | | | | | | 2 | | |
| | 环境监测（含地质环境监测） Monitoring of Geological Environment | | 2 | 40 | 32 | | | 8 | | | | | | | 2 | | | | |
| | 生态地质学 Ecological Geology | | 1.5 | 24 | 24 | | | | 8 | | | | | | 1.5 | | | | |
| | 矿山地质环境保护与治理 Protection and Control of Geological Environment | | 2 | 44 | 32 | | | 12 | | | | | | | | | 2 | | |
| | 岩土测试技术 Rock and Soil Testing Techniques | | 2 | 32 | 22 | 10 | | | | | | | | | | 2 | | | |
| | 专业技能培训（必选） | | 1 | 16 | 16 | | | | | | | | | | | | 1 | | |
| | 土壤污染和防治 Soil Pollution and Remediation | | 1.5 | 36 | 24 | | | 12 | 4 | | | | | | | | 2 | | |
| | 环境同位素原理与技术 Environment Isotope Principles | | 2 | 32 | 28 | 4 | | | | | | | | | 2 | | | | |
| | 生态地质学 Ecological Geology | | 1.5 | 24 | 24 | | | | 8 | | | | | | | | | 1.5 | |
| | 创新创业类课程 | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

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 | 584/30.5 | 192/12.0 | 584+256/33+14 | 496/25 | 224/14 | 34.5 周 /34.5 | 5 | 2378+34.5 周 | 168 |
| 学分所占比 例 | 25.3% | | 28% | 14.9% | 8.3% | 20.5% | 3% | | 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。

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。

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 | | | | | | | | | |
| Fundamental Courses 学科基础课 | 20114900 | 普通地质学 Physical Geology | 2.5 | 48 | 40 | | 8 | | | | | | | | 2.5 | | | |
| | 20113100 | 矿物岩石学 Mineralogy and Lithology | 3 | 48 | 10 | 38 | | | | | | | | | | 3 | | |
| | 20104002 | 构造地质学 B Structure Geology B | 2 | 48 | 32 | | 16 | | | | | | | | | | 2 | |
| | 小计 Sum | | 7.5 | 144 | 82 | 38 | 24 | | | | | | | | 2.5 | 3 | 2 | |
| Main Specialty Courses 专业主干课 | 20431800 | 水力学 Hydraulics | 2 | 40 | 32 | | 8 | | | | | | | | | 2 | | |
| | 20431700 | 水文地质学基础 The Fundamental of Hydrogeology | 2.5 | 56 | 40 | | 16 | | | | | | | | | | 2.5 | |
| | 20434800 | 地下水动力学 Groundwater Hydraulics | 2.5 | 56 | 40 | | 8 | 4 | 4 | | | | | | | | 2.5 | |
| | 20434900 | 水文地球化学/附水分析 Hydro-Geochemistry | 2.5 | 64 | 40 | | 8 | 8 | 8 | | | | | | | | | 2.5 |
| | 20435000 | 应用水文地质学 Aplied Hdrogeology | 2.5 | 64 | 40 | | 8 | 8 | 8 | | | | | | | | | 2.5 |
| | 小计 Sum | | 12 | 280 | 192 | | 48 | 20 | 20 | | | | | | | | 2 | 5 |
| Practical Work 实践环节 | 40435400 | 应用水文地质学课程设计 | 2 | 2 周 | | | | | | | | | | | | | | |
| | 小计 Sum | | 2 | 2 周 | | | | | | | | | | | | | | |
| 总计 Total | | | 21.5 | 424 | 274 | 38 | 72 | 20 | 20 | | | | | | 2.5 | 5 | 9 | 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 | 144/7.5 | 280/12 | 2 周/2 | 424+2 周 | 21.5 |
| 学分所占比例 | 35% | 56% | 9% | 100% | 100% |